◇**BLACK BOX**®

5.8-GHz 300-Mbps Wireless Ethernet Kit

User's Manual

Configure the radio as an access point, subscriber unit for multipoint-to-point applications, or as a pair of bridges for point-to-point configuration.

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or go to **blackbox.com** and click on "Talk to Black Box."
You'll be live with one of our technical experts in less than 60 seconds.

Federal Communications Commission and Industry Canada Radio Frequency Interference Statements

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

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

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

Instrucciones de Seguridad
(Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:
    A: El cable de poder o el contacto ha sido dañado; u
    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o
    C: El aparato ha sido expuesto a la lluvia; o
    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
    E: El aparato ha sido tirado o su cubierta ha sido dañada.

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Chapter 1: Specifications

1. Specifications

Antennas	LWE200A-KIT: 200 Watts EIRP with 23 dBi directional antennas; LWE200A-AP: 1 Watt EIRP with 6 dBi omnidirectional antenna; LWE200A-S: 4 Watt EIRP with 23 dBi directional antenna
Approvals	FCC, IC, CE
Browser Management Tools	Data communication statistics, network settings, channel selection
Cable	CAT6A outdoor/direct burial recommended
Channel Bandwidth	20/40 MHz HT above
Data Security	AES 128-bit
Enclosure	NEMA-rated die-cast aluminum, rubber gasket seals
Frequency	5.725–5.850 GHz
Modulation	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
Mounting	Heavy-duty pole-mount bracket included
Operating Environment	-40 to +158° F (-40 to +70° C), sealed for outdoor operation: die-cast aluminum package with rubber gasket seals

Range	Line-of-sight: LWE200A-KIT: 15 miles (24 km);
	    LWE200A-AP: 5 miles (8 km);
	    LWE200A-S: 5 miles (8 km)

Receiver Sensitivity	LWE200A-KIT, LWE200A-S: -115 dBm; LWE200A-AP: -101 dBm
RF Channels	(2) non-overlapping with 40-MHz channel bandwidth, 5.745 GHz or 5.805 GHz
RF Data Rate	Up to 300 Mbps
Connector	RJ-45 with weatherproof sealing gland for 10-/100-/1000BASE-T Ethernet

Power	Input: Gigabit power over Ethernet injectors and 18-VDC power supplies (included):
	    120-VAC 60-Hz;
	Output:
	    LWE200A-KIT: 200 Watts EIRP with 23 directional antennas;
	    LWE200A-AP: 1 Watt EIRP with 6-dBi omnidirectional antenna;
	    LWE200A-S: 4 Watts EIRP with 23-dBi directional antenna

Dimensions	LWE200A-KIT: 15.2" square; LWE200A-AP: 8.75"H x 8.75"W x 3.25"D case plus 12" tall antenna, weight 7 lb.; LWE200A-S: 15.2"H x 15.2"W x 3.25"D, not including pole-mount bracket, weight 7 lb.
Weight	LWE200A-KIT: Each unit: 7 lb. (3.2 kg); LWE200A-AP, LWE200A-S: 7 lb. (3.2 kg)

2. Overview

2.1 Introduction

These wireless extenders provide secure, robust data transmissions at high data rates. They operate at 5-GHz and 300-Mbps, which enables them to transmit high-definition video from security and surveillance cameras at the edge of your network.

The LWE200A-KIT includes (2) high-power, 23 dBi directional antennas with 200 Watts EIRP. One is a subscriber unit and one is the access point. They are pre-configured to work with each other, and can be located up to 15 miles (24 km) away from each other.

The LWE200A-AP (sold separately) is a radio with dual 6 dBi omindirectional antennas. It serves as an access point (master) in a point-to-point or point-to-multipoint network. The LWE200A-S (sold separately) is a radio with a dual flat-panel high-gain 23 dBi directional antenna. The LWE200A-AP and LWE200A-S can be located up to 5 miles (8 km) away from each other. In a point-to-multipoint configuration. Multiple LWE200A-S radios can serve as subscriber units (clients) in conjunction with an LWE200A-AP radio.

The extenders use state-of-the-art MIMO technology to achieve very high data rates through a combination of multiple spatial streams and higher-level OFDM modulation.

The extenders support an SSL interface, allowing your network to use a secure connection (HTTPS).

2.2 What's Included

LWE200A-KIT:

- (1) LWE200A radio (configured as an access point)

- (1) LWE200A radio (configured as a subscriber unit)

- (2) heavy-duty pole-mount brackets (support 1–4 inch pole)

- (2) gigabit power-over-Ethernet injectors

- (2) 18-VDC power supplies (USA plug only)

- A printed Quick Start Guide

LWE200A-AP:

- (1) LWE200A-AP radio (configured as an access point)

- (1) heavy-duty pole-mount bracket (supports 1–4 inch pole)

- (1) gigabit power-over-Ethernet injector

- (1) 18-VDC power supply (USA plug only)

- A printed Quick Start Guide

LWE200A-S:

- (1) LWE200A-S radio (configured as a subscriber unit)

- (1) heavy-duty pole-mount bracket (supports 1–4 inch pole)

- (1) gigabit power-over-Ethernet injector

- (1) 18-VDC power supply (USA plug only)

- A printed Quick Start Guide

To download this user manual, go to ftp://ftp.blackbox.com/manuals/L/LWE200A_user.pdf, or visit the Black Box Web site (blackbox.com) and enter LWE200A in the search bar.

3. Physical Setup

Both radios in the LWE200A-KIT look identical: they have 23 dBi directional antennas and die-cast aluminum enclosures. One radio's firmware is configured to act as the Access Point (master) and the other radio's firmware is configured to act as the Subscriber Unit (client). The LWE200A-KIT range is 15 miles (24 km).

To create a point-to-multipoint system, you need one LWE200A-AP Access Point and one or more LWE200A-S Subscriber Units. The LWE200A-AP has a 6 dBi omnidirectional antenna and the LWE200A-S has a 23 dBi directional antenna. The line-of-sight range between the LWE200A-AP and an LWE200A-S unit is 5 miles (8 km).

We recommend connecting and powering up the units on the bench before deploying in the field because it is much easier to troubleshoot problems and to adjust the configuration if necessary without having to climb poles to do it. Activate the LWE200A-S units one at a time until they can be given distinct IP addresses.

If the factory default digital configuration is satisfactory, you can proceed directly to physical deployment. If you wish to make any changes, you may want to perform the procedures in the next section before mounting the radios in their final locations. If data security is important, you will likely want to change passwords and encryption keys.
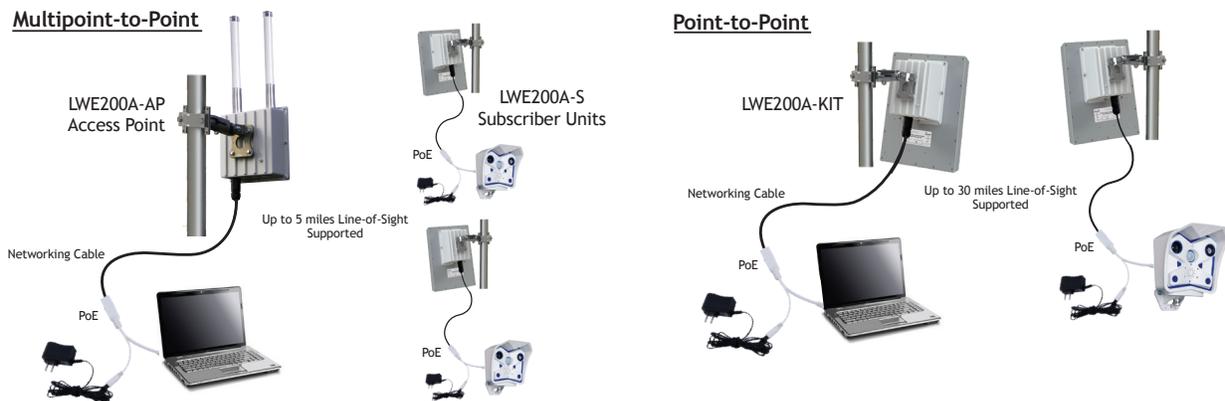

Figure 3-1. Multipoint and point-to-point configurations.

STEP 1: Gather the parts: In addition to the radios and the accompanying PoE (power over Ethernet) injectors, you will need at least two networking cables and a PC with a LAN connection. If desired, you may also want a data source such as a surveillance camera with a TCP/IP interface.

STEP 2: Make the connections: Connect the devices as shown in the diagram.

Feed the networking cable (not provided) through the Ethernet feed-through that allows an RJ-45 plug to pass through and be tightened down around the cable to provide a weatherproof seal. Place the opposite end of the networking cable into the female end of the PoE. The male end of the PoE injector will connect to your PC. Repeat connection steps for all other radios.

Place the radios at least 10 feet apart with their antennas pointing in different directions.

NOTE: Do not point the two radio antennas directly at each other because their close proximity will overload the radio receivers.

STEP 3: Mounting the units: Mount each radio securely using the mounting brackets provided. If lightning protection is needed, provide a strong DC ground connection to the metal housing.

STEP 4: Powering up: Plug in a power source for the PoE injector into wall outlet. Plug other end into barrel connection of PoE injector. Refer to the connection diagram on the top of the PoE.

4. Digital Configuration

Digital configuration is done via the built-in browser interface. The radio should be powered on and connected at least temporarily to a network containing a computer that can run a conventional Web browser.

STEP 1: Browse to the Access Point's interface: Enter http://192.168.88.12 into your Web browser's address bar. If you are successful, you will see a login page like this:

Figure 4-1. Login page.

If not, the browser will time out and you will need to doublecheck the IP addresses and subnet masks, if you think that the IP address of the radio has been changed. Below are instructions to provision your PC's IP address to communicate to your radios.

To configure static IP address for Windows® 7, go to:

Start > Control Panel > Network and Internet > Network and Sharing Center
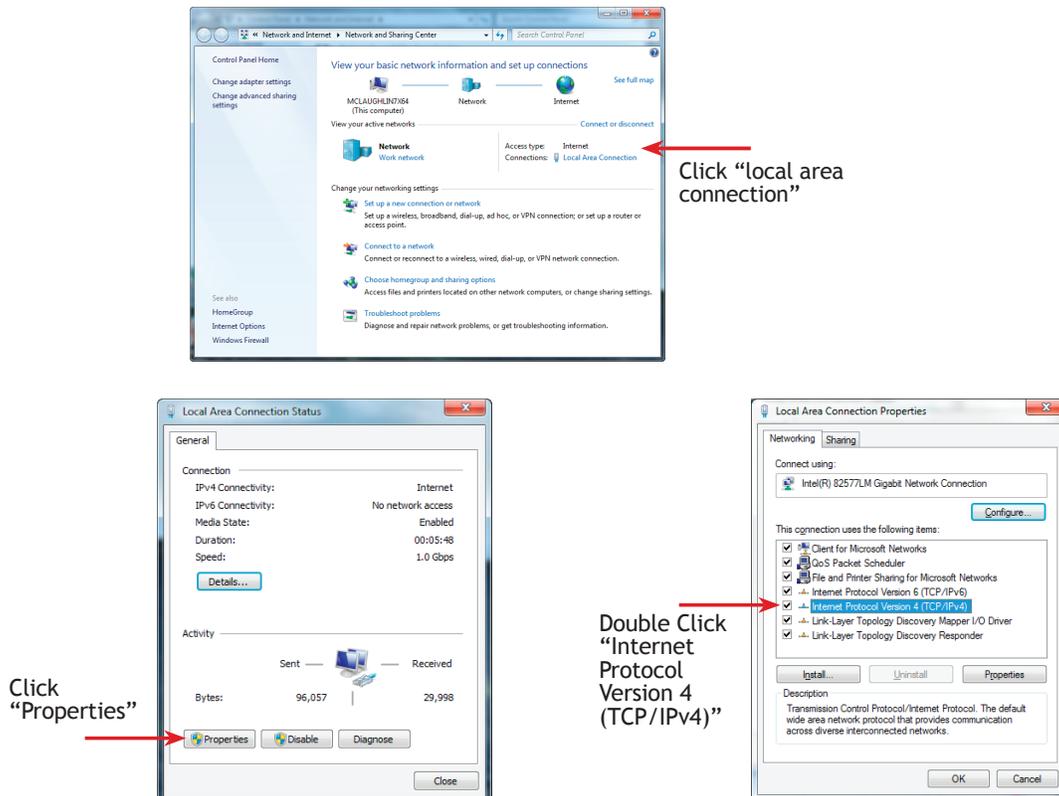
Figure 4-2. Configure static address screens.

Click "Use the following IP address."

Populate the following information:

    IP address: 192.168.88.200

    Subnet mask: 255.0.0.0

    Default gateway: leave blank (optional)

    Click "OK."
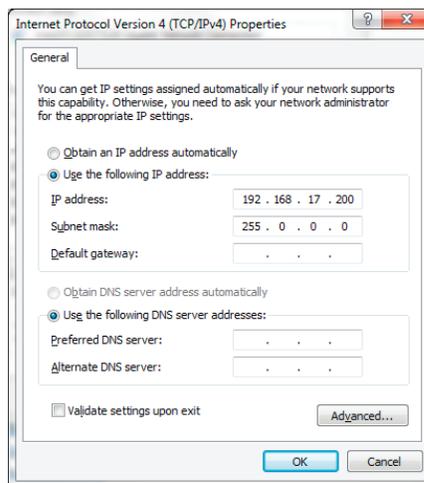
    Click "OK."

    Click "Close."

Figure 4-2 (continued). Configure static address screens.

STEP 2: Log In to the Access Point: The default login name is "admin" and the password is "password." If your login is successful, you should see the "Quick Set" page similar to this:

NOTE: You might need to scroll around in the page to see all the elements, particularly if you have a lower resolution monitor or are using Firefox as your browser.
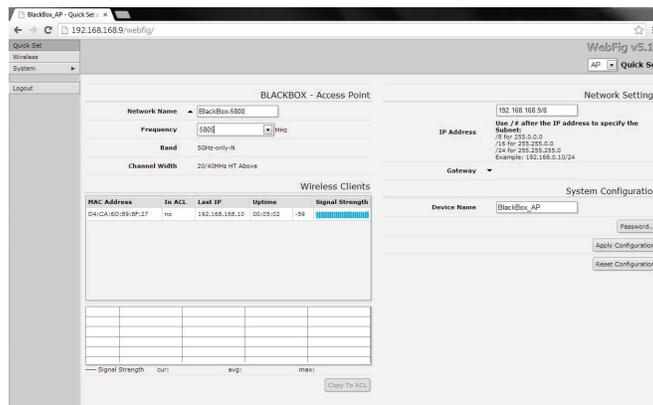
Figure 4-3. Access point login screen.

Repeat Step 2 for Subscriber Unit with IP address of 192.168.88.10.
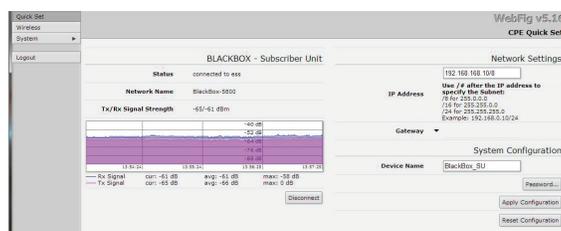
Figure 4-4. Signal strength screen #1.

If the radios are communicating, status will read "connected to ESS." The Signal Strength box will indicate whether the receivers are being overloaded. Re-position the antennas if necessary to bring the signal strength within this range: -20 dB is excellent strength and -80 dB is weak.
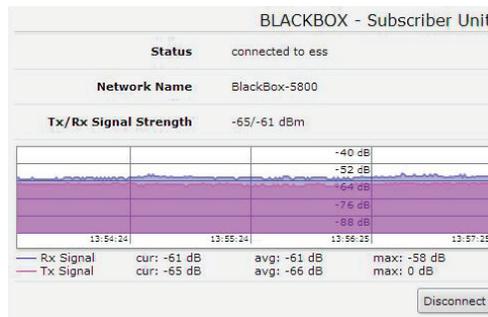

Figure 4-5. Signal strength screen #2.

4.1 Connecting to the Radio

1. Digital configuration is done via the radio's built in browser interface. The unit should be powered on and connected at least temporarily to a network containing a computer that can run a conventional Web browser.

2. The initial page after a successful login is "Quick Set." The content of this page is somewhat different for the LWE200A-AP Access Point and for the LWE200A-S Subscriber Unit.

3. Each page provides a menu on the left to navigate from section to section.

If you want to Logout or Reboot the radio, these functions are available in this menu.

Figure 4-6. Logout menu.

In the upper right of the page is a label that tells you the version of the Web interface.

Figure 4-7. Web interface version.

4.2 Changing the Configuration—Step-by-Step

If you change the IP Address or User Password and forget their new values, you have locked yourself out of the browser interface. The LWE200A runs self-diagnostics at boot-up and will auto-correct most system configuration errors. Before contacting technical support, power cycle the radio and confirm that the problem remains.

If you lose the IP address, the LWE200A has a permanent factory IP address of 192.168.88.88 that you can use to access the radio to reset the user-defined IP address. Contact Black Box Technical Support at 724-746-5500 or info@blackbox.com for assistance.

If you are changing parameters over the RF link (we do not recommend this), be sure to make the remote changes first because the link will be broken if the SSIDs or security keys do not agree.

1. Set the IP address and subnet mask, gateway, and device name.

• In the upper right area of the Quick Set page are the data entry boxes for these parameters. They contain the current values.
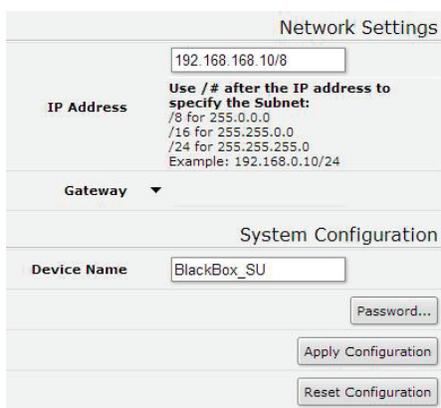
Figure 4-8. Network settings screen.

• A special notation is used for the IP Address and Subnet Mask: Use /x at the end of the IP Address to specify the subnet mask: /8 for 255.0.0.0, /16 for 255.255.0.0 and /24 for 255.255.255.0. Enter a new IP Address and subnet making sure you will be able to browse to the new address with your computer. Also, make sure that the new IP address is unique on your LAN.

• The Gateway address should be specified if you need to communicate with the radio through the Gateway. Your system administrator should have this value.

• The Device Name is an arbitrary string and simply allows you to attach a human-friendly name to this specific radio.

• Click "Apply Configuration" when you have entered new values. Nothing appears to happen, but you have been disconnected and will need to browse to the new IP Address to login again.

2. Setting the User Password:

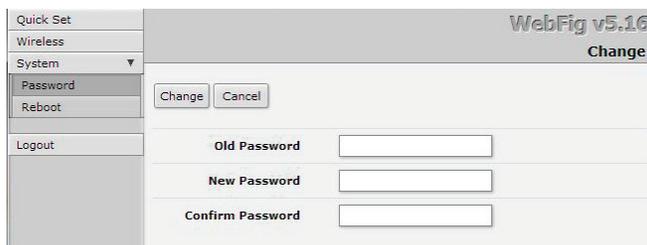• On the Main Menu at the left side of the browser window, click "System," then click "Password."

Figure 4-9. Set password screen.

• Enter the old password and the new password twice in the boxes indicated.

• Click the "Change" button.

• Logout and log back in to test.

3. Setting the Frequency (AP only), Network Name, and Encryption Key.

• On the Main Menu at the left side of the browser window, click "Wireless." This loads the Wireless Tables page. This page has two tabs at the top, "Interfaces" and "Associations."

• Click anywhere in the Wireless_Radio row to drill down to the "Interface <Wireless Radio>" page. Do not click the small "D" button unless you want to disable the radio, requiring power cycling to recover.

• On this new page are data entry boxes for Frequency (AP only), Network Name, and Encryption Key.

• The Frequency (AP only) dropdown box provides many more choices than are useful (or even legal). The only supported choices here are 5805 MHz (the default) or 5745 MHz.

Figure 4-10. Frequency dropdown box (AP only).

• The Network Name is an arbitrary character string that must be set alike in all linked radios.

• The Encryption Key is also an arbitrary character string that is used to generate the 128 bit key. It must be set alike in all linked radios and normal best practice for choosing passwords should be applied when setting this key.

• When you have entered your choices in the boxes, click the "Apply" button near the top of the page. The radio will reboot and you will need to login again to see the changes.

5. Viewing Status Information

After configuring your radios and establishing links among them, you can use the browser interface to view status and troubleshooting Information. The initial "Quick Set" page will show whether the wireless link is operating and the current signal strength. For more comprehensive information, choose "Wireless" from the Main Menu at the left side of the window. The "Wireless" page leads to most of the useful status information.
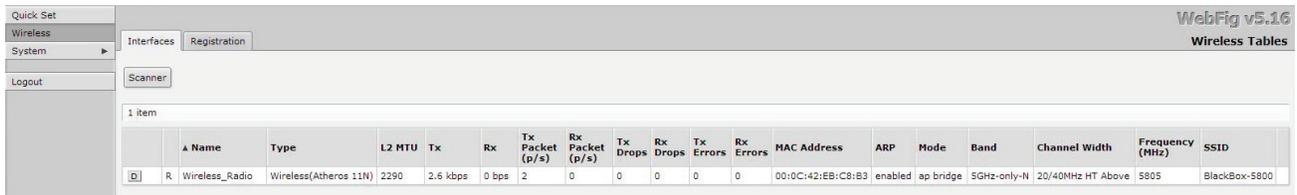

Figure 5-1. Status information screen.

The table on the Interfaces tab provides a list of the interface processes running in this radio. If it is a Subscriber Unit, there will be only one, "Wireless_Radio." If it is an Access Point, there will also be a WDS process running for each Subscriber Unit that is connected. These very long rows summarize the configuration details and current running status of the radio. You can click and drag in the heading row of the table to change the column width if part of the data is not visible.
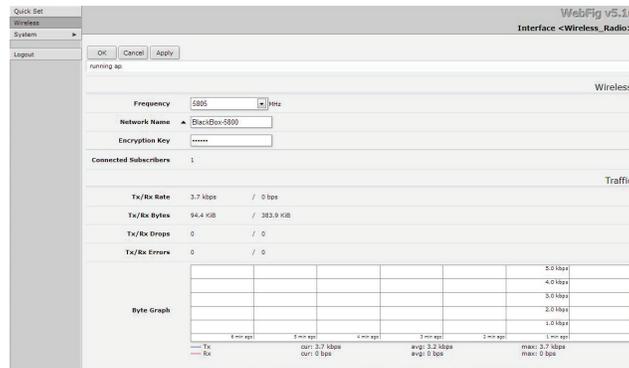

Figure 5-2. Wireless_Radio tab.

More detailed status: Do not click the small "D" button unless you want to disable the radio, requiring power cycling to recover. Clicking anywhere else on the "Wireless_Radio" line drills down to more information:

Most of the information on the top part of this page was covered in the Digital Configuration section of this manual. The status information in the lower part of the page is mostly self-explanatory. Here are a few additional notes:

• Tx/Rx Rate shows the current instantaneous values in kilobits per second. The Byte graph below shows the history of the same information.

• Tx/Rx Bytes and Packets show total values accumulated since the last Reboot.

• Tx/Rx Drops are packets not sent or received because of the radio's interface queue being full.

• Tx/Rx Errors are packets sent or received with unrecovered data errors.

This status page for the Access Point shows the total traffic with all connected Subscriber Units. To see individual data, return to the Wireless page and click anywhere in the WDS row for that Subscriber Unit.

Status	
Frequency	5805 MHz
Tx/Rx Rate	300.0Mbps/300.0Mbps
SSID	AvaLAN-1
Tx/Rx Signal Strength	-49/-43 dBm
Signal To Noise	76 dB
Tx/Rx CCQ	56/80 %

Figure 5-3. Status page.

By logging into a Subscriber Unit directly and going to the Wireless page and then clicking in the "Wireless_Radio" row, some additional status information is available that does not appear on the corresponding Access Point page:

In the "Status" section, the Tx/Rx Rate shown is the raw RF rate calculated based on the channel width and modulation scheme in use. The above screenshot shows that the radio is transmitting and receiving with 64-QAM and a 5/6 coding rate.

6. Wireless Scanner

The Wireless Scanner is used like a site survey tool. It presents statistics of the frequency that the radio supports. The scanner is used when we believe there is RF interference.

To enter scanner mode, choose "wireless" and click scanner button. See image below:
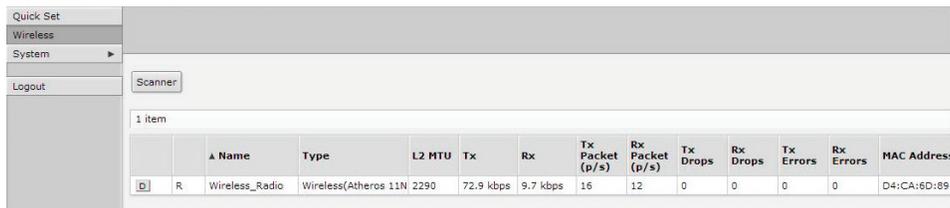

Figure 6-1. Scanner button.

The browser will populate all SSIDs that are broadcasted in the 5.8 GHz frequency.

Figure 6-2.

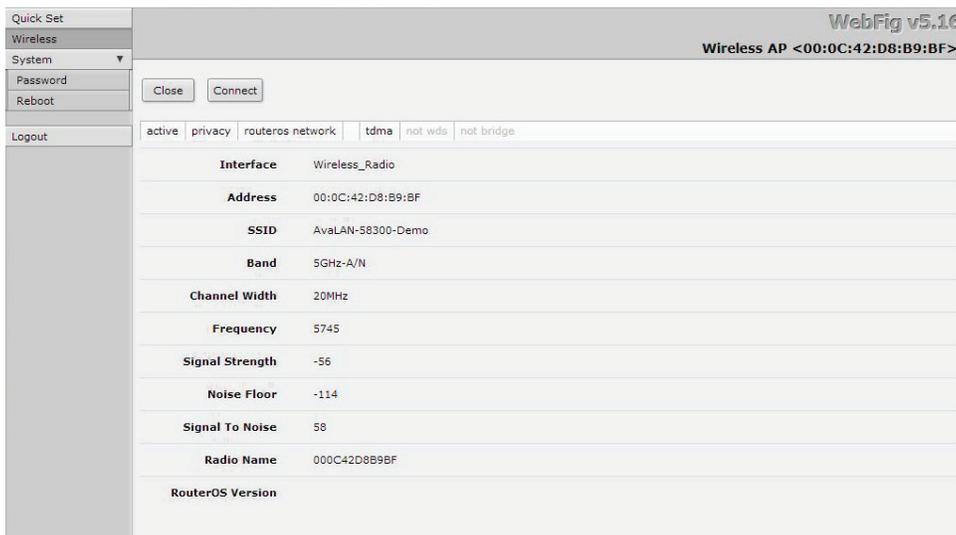Click on line item for more detailed information (example below).

Figure 6-3. Detailed information.

7. Troubleshooting

Power:

• Check that the PoE cabling matches illustrations.

• Check network connection on your switch and verify all RJ-45 cables are plugged in properly.

• Only use the PoE injector supplied.

• Ensure the 110 VAC source is providing clean and consistent AC power to the 18 VDC power supply.

• Check to see if there is a power problem at the SU side (low voltage drooping or "noisy" voltage).

• Check to see if there is a power problem at the AP side (low voltage drooping or "noisy" voltage).

Signal Quality:

• Ensure line of sight (LOS).

• Check signal strength in Web interface (-20 dB is excellent strength and -80 dB is weak).

• Radio links generally have two likely issues when they aren't working—low signal or high noise. This is simplified by saying the radio has low SNR (signal to noise ratio).

- Signal is low because something is blocking the path.

- Signal is low because the range is too far.

- Signal is low because the antenna is broken.

- Signal is low because the antenna is misaligned.

- Signal is low because the antenna cable is damaged.

- Signal is low because a connector is loose or damaged.

- Signal is reduced because something changed near the path causing a destructive reflection (a large new surface or "ground reflection" change due to hot ground surface or rain on the ground).

- Noise is high because other band users' radios (WiFi, Bluetooth, etc.) are currently transmitting on the same frequencies.

- Noise is high because other radios are currently transmitting too closely spectrally.

- Noise is high because other radios are currently transmitting too closely spatially.

Web Interface:

- Plug the RJ-45 male side of PoE directly in to computer and verify that network status shows "connected."

- Verify the local computer's network settings are in the same IP subnet range as the radio. For example, if the radio's IP address is 192.168.88.10, then the computer's IP address should be 192.168.88.200.

General recommendations:

- Perform spectral analysis of the site.

- Elevate radios.

- Reduce distance.

- Move further away physically from other 5.8-GHz radios.

- Move further away spectrally from other 5.8-GHz radios.

NOTES

724-746-5500 | blackbox.com

About Black Box

Black Box provides an extensive range of networking and infrastructure products. You'll find everything from cabinets and racks and power and surge protection products to media converters and Ethernet switches all supported by free, live 24/7 Tech support available in 60 seconds or less.

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