3com®

User Guide

Wireless LAN Access Point 8760

3CRWE876075 / WL-546

www.3com.com/

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3Com Corporation
350 Campus Drive
Marlborough, MA
01752-3064

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TERMINOLOGY

Access Point—An internetworking device that seamlessly connects wired and wireless networks.

Ad Hoc—An ad hoc wireless LAN is a group of computers, each with wireless adapters, connected as an independent wireless LAN.

Backbone—The core infrastructure of a network. The portion of the network that transports information from one central location to another central location where it is unloaded onto a local system.

Base Station—In mobile telecommunications, a base station is the central radio transmitter/receiver that maintains communications with the mobile radiotelephone sets within its range. In cellular and personal communications applications, each cell or micro-cell has its own base station; each base station in turn is interconnected with other cells' bases.

BSS—Basic Service Set. It is an access point and all the LAN PCs that are associated with it.

CSMA/CA—Carrier Sense Multiple Access with Collision Avoidance.

EAP—Extensible Authentication Protocol, which provides a generalized framework for several different authentication methods.

ESS—Extended Service Set. More than one BSS is configured to become an ESS. LAN mobile users can roam between different BSSs in an ESS (ESS-ID, SSID).

Ethernet—A popular local area data communications network, which accepts transmission from computers and terminals.

Infrastructure—An integrated wireless and wired LAN is called an infrastructure configuration.

RADIUS—Remote Access Dial-In User Server is an authentication method used in conjunction with EAP for 802.1x authentication and session based keys.

Roaming—A wireless LAN mobile user moves around an ESS and maintains a continuous connection to the infrastructure network.

RTS Threshold—Transmitters contending for the medium may not be aware of each other (they are "hidden nodes"). The RTS/CTS mechanism can solve this problem. If the packet size is smaller than the preset RTS Threshold size, the RTS/CTS mechanism will not be enabled.

VAP—Virtual Access Point. An access point radio capable of operating as four separate access points.

VLAN—Virtual Local Area Network. A LAN consisting of groups of hosts that are on physically different segments but that communicate as though they were on the same segment.

WEP—Wired Equivalent Privacy is based on the use of security keys and the popular RC4 encryption algorithm. Wireless devices without a valid WEP key will be excluded from network traffic.

WDS—Wireless Distribution System.

WPA—Wi-Fi Protected Access.

1 INTRODUCTION

The 3Com® Wireless 8760 Dual-radio 11a/b/g PoE Access Point offers a dual-mode architecture that supports 802.11g, 802.11a, and 802.11b wireless users on a single device. This means you can mix and match radio bands to meet different coverage and bandwidth needs within the same area.

With their flexibility and unfettered access, wireless LANs are changing the way people work. Now with 3Com's enterprise-class wireless access point, you can build a cost-effective, reliable, secure wireless network that provides users with seamless connectivity to the Internet, company intranet, and the wired corporate network from anywhere they happen to be—conference room, cafeteria or office.

3Com's dual-mode design supports 802.11g, 802.11a, and 802.11b wireless standards on a single access point. This capability increases configuration and coverage flexibility and protects your network investment for both existing and emerging wireless standards.

Industry-leading security features and comprehensive management and performance features combine to make these enterprise class wireless access points an ideal choice for organizations ready to serve their increasingly mobile workforce.

PRODUCT FEATURES

Access Point 8760—Creates an enterprise-class wireless LAN supporting up to 256 simultaneous users. The access point supports two radios and external antennas including WDS bridging ability on both radios.

SECURITY

3Com offers one of the most robust suite of standards-based security on the market today.

To protect sensitive data broadcast over the wireless LAN, 3Com supports WPA and WPA2 security standards. 3Com strengthens this basic security mechanism with additional security features, including:

- MAC address access control lists
- IEEE 802.1x per-port user authentication with RADIUS server support
- IEEE 802.1x supplicant support
- SSH v2
- HTTP/HTTPS
- SNMP v3
- Legacy WEP 40/64 bit, 128 bit and 152 bit
- Wireless Protected Access (WPA) and WPA2
- Extensible Authentication Protocol (EAP) support: EAP-MD5, EAP-TLS, EAP-TTLS, and PEAP

Performance and Reliability

3Com wireless access point performance features ensure reliable and seamless connections for users wherever they roam:

- Automatic channel selection automatically finds the least loaded channel for interference-free communication.
- Auto network connect and dynamic rate shifting keep users connected through a wide variety of conditions by changing to the optimum connection speed as they move through the network.
- Virtual Access Point (VAP) support provides flexibility by allowing a single access point radio to operate as up to four separate access points.
- Wireless Distribution System (WDS) Bridging support allows you to create large wireless networks in areas where pulling wires is restricted or cost-prohibitive by linking several wireless access points together with WDS links.

Virtual Access Point (VAP) Support

Virtual Access Point (VAP) support allows an access point radio to operate as four separate access points, providing multiple wireless services to clients in a network. Each VAP can be configured to provide access to different network resources and can support different levels of security.

For example, in a university network, an access point (AP) could be used to offer two services: The first service provides access to protected data for authenticated university staff members, while the second service provides open access to the Internet for unauthenticated users, such as students or visitors.

Up to four VAPs per radio are available, and each VAP can be configured with its own security settings.

For information on setting up and configuring VAPs, see "Wired Equivalent Privacy (WEP)" on page 4-65.

WDS Bridging and Spanning Tree Protocol (STP) Support

A Distribution System (DS) is a network (typically a wired network) that interconnects separate access points into a single LAN. With WDS, the interconnection no longer needs to be physically wired. WDS uses the wireless medium to interconnect separate access points, thereby eliminating the cost and inconvenience that may hinder wire installations.

A WDS link can be used in a simple point-to-point link, a complex point-to-multipoint link, or a multilayer topology.

MANAGEABILITY

3Com offers a wide range of standards-based management support, from SNMP to 3Com Network Supervisor and HP OpenView for seamless integration with your wired network.

Wireless Infrastructure Device Manager lets you configure parameters, run diagnostics, backup and restore configurations, and monitor performance from anywhere on the network using an embedded web server browser.

With Power over Ethernet (PoE) support, the same Category 5 cable that connects your access point to the data network also provides its power. A single cable installation dramatically improves your choice of mounting configurations because you no longer need to consider AC power outlet locations. PoE support makes it easier than ever to overcome installation problems with difficult-to-wire or hard-to-reach locations.

WIRELESS NETWORK STANDARDS

Understanding the characteristics of the 802.11g and 802.11a standards can help you make the best choice for your wireless implementation plans.

802.11G

802.11g operates in the 2.4 GHz band at up to 54Mbps, and supports the widest coverage—up to 100 meters (328 feet). However, is subject to a greater risk of radio interference because it operates in the more popular 2.4 GHz band.

For those organizations demanding even higher speeds, a “turbo mode” feature can boost throughput rates up to 108 Mbps. Consider 802.11g when you need wider coverage and vendor compatibility and you are:

- Maintaining support for existing 802.11b users and the existing wireless investment while providing for expansion into 802.11g.
- Implementing a complete wireless LAN solution, including bridges, gateways, access points and clients; Wi-Fi certification guarantees compatibility among vendors
- Providing access to hot spots in public spaces such as coffee shops or university cafeterias

802.11A

802.11a operates at the 5 GHz band and supports data rates at up to 54 Mbps. For those organizations demanding even higher speeds, a “turbo mode” feature can boost throughput rates up to 108 Mbps. And because there are fewer devices in the 5 GHz band, there’s less potential for RF interference. However, because it is at an entirely different radio spectrum, it is not compatible with 802.11g.

The higher spectrum provides about 50 meters (164 feet) of coverage—about half what 802.11g offers.

Consider 802.11a when you need high throughput in a confined space and you are:

- Running high-bandwidth applications like voice, video, or multimedia over a wireless network that can benefit from a fivefold increase in data throughput
- Transferring large files like computer aided design files, preprint publishing documents or graphics files, such as MRI scans for medical applications, that demand additional bandwidth
- Supporting a dense user base confined to a small coverage area. Because 802.11a has a greater number of non-overlapping channels, you can pack more access points in a tighter space.

APPROVED CHANNELS

Use of this product is only authorized for the channels approved by each country. For proper installation, select your country from the country selection list.

To conform to FCC and other country restrictions your product may be limited in the channels that are available. If other channels are permitted in your country please visit the 3Comwebsite for the latest software version.

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.

3Com Wireless 8760 Dual Radio 11a/b/g PoE Access Point
Model WL-546

Industry Canada – RF Compliance

This device complies with RSS 210 of Industry Canada.

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 this device.

L ’ utilisation de ce dispositif est autorisée seulement aux conditions suivantes: (1) il ne doit pas produire de brouillage et (2) l’ utilisateur du dispositif doit étre prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

The term "IC" before the equipment certification number only signifies that the Industry Canada technical specifications were met.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication. To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

Pour empecher que cet appareil cause du brouillage au service faisant l'objet d'une licence, il doit etre utilize a l'interieur et devrait etre place loin des fenetres afin de Fournier un ecram de blindage maximal. Si le matriel (ou son antenne d'emission) est installe a l'exterieur, il doit faire l'objet d'une licence.

High power radars are allocated as primary users of the 5.25 to 5.35 GHz and 5.65 to 5.85 GHz bands. These radar stations can cause interference with and/or damage this device.

This device must not be co-located or operated in conjunction with any other antenna or transmitter.

Industry Canada – Emissions Compliance Statement

This Class B digital apparatus complies with Canadian ICES-003.

Avis de Conformité à la Réglementation d’Industrie Canada

Cet appareil numérique de la classe B est conform à la norme NMB-003 du Canada.

Safety Compliance Notice

This device has been tested and certified according to the following safety standards and is intended for use only in Information Technology Equipment which has been tested to these or other equivalent standards:

- UL Standard 60950-1
- CAN/CSA C22.2 No. 60950-1
- IEC 60950-1
- EN 60950-1

EU Compliance

Usage restrictions apply.
See documentation

This equipment may be operated in

AT	BE	CY	CZ	DK	EE	FI	FR
DE	GR	HU	IE	IT	LV	LT	LU
MT	NL	PL	PT	SK	SI	ES	SE
GB	IS	LI	NO	CH	BG	RO	TR

Intended use: IEEE 802.11a/b/g radio LAN device

NOTE: To ensure product operation is in compliance with local regulations, select the country in which the product is installed.

2 INSTALLING THE ACCESS POINT

This equipment must be installed in compliance with local and national building codes, regulatory restrictions, and FCC rules. For the safety of people and equipment, this product must be installed by a professional technician/installer.

⚠ ***CAUTION**: Before installing, see the important warnings and cautions in "Safety Information" on page 8.*

INSTALLATION REQUIREMENTS

The following items are required for installation:

- Access Point 8760.
- Two standard detachable antennas.
- 3Com installation CD.
- Wall-mount installation hardware (supplied): mounting plate, mounting screws, and plastic anchors for drywall mounting.
- If you do not have IEEE 802.3af power-over-Ethernet LAN equipment, use the 3Com Integrated Power-over-Ethernet power supply that comes with the access point.

  If your LAN equipment complies with the IEEE 802.3af power-over-Ethernet standard, you can connect directly to the equipment, and the 3Com power supply is not needed.
- Standard category 5 straight (8-wire) Ethernet cable.

  The cable must be long enough to reach the power supply or the power-over-Ethernet LAN port.

  If you use the 3Com power supply, you need an additional Ethernet cable to connect the access point to the LAN.

- To access and use the Web configuration management system, you need a computer that is running Internet Explorer 5.0 or newer and one of the following operating systems: Windows 2000, or Windows XP. It is recommended that this computer become the dedicated workstation for managing and configuring the access point and the wireless network.

POWER REQUIREMENTS

The access point complies with the IEEE 802.3af power-over-Ethernet standard. It receives power over standard category 5 straight (8-wire) Ethernet cable. Installation requires the use of either the 3Com power supply provided or IEEE 802.3af compliant power supply equipment (output power rated 48 V dc @ 400 mA maximum). Such equipment must be safety certified according to UL, CSA, IEC or other applicable national or international safety requirements for the country of use. All references to the power supply in this document refer to equipment that meets these requirements.

Because the power supply plug is the only means of disconnecting the access point from power, make sure the power outlet is accessible.

See “Using the Power Supply” on page 14 and “Using a Power-Over-Ethernet LAN Port” on page 14.

SAFETY INFORMATION

This equipment must be installed in compliance with local and national building codes, regulatory restrictions, and FCC rules. For the safety of people and equipment, only professional network personnel should install the access point, cables, and antennas.

⚠ ***CAUTION:*** *If you supply your own Ethernet cable for connecting power, be sure that it is category 5 straight-through (8-wire) cable that has not been altered in any way. Use of nonstandard cable could damage the access point.*

⚠ ***CAUTION:*** *To comply with FCC radio frequency (RF) exposure limits, a minimum body-to-antenna distance of 20 centimeter (8 inches) must be maintained when the access point is operational.*

⚠ ***CAUTION:*** *To avoid possible injury or damage to equipment, you must use either the provided power supply or IEEE 802.3af compliant power supply equipment that is safety certified according to UL, CSA, IEC, or other applicable national or international safety requirements for the country of use. All references to power supply in this document refer to equipment meeting these requirements.*

CAUTION: *The 3Com power supply input relies on a 16A rated building fuse or circuit protector for short circuit protection of the line to neutral conductors.*

CAUTION: *It is the responsibility of the installer to ensure that the Power-over-Ethernet (POE) power supply is properly connected. Connection to any other device, such as a standard Ethernet card or another POE supply, may result in permanent damage to equipment, electric shock, or fire. Refer to the installation instructions for proper installation.*

DECIDING WHERE TO PLACE EQUIPMENT AND PERFORMING A SITE SURVEY

The access point is ideally designed for vertical installation on a wall surface, but can also be flat-surface mounted in an elevated location where it will not be disturbed. Ceiling installation is not recommended.

Whether you choose to mount the access point on a wall or place it on a flat surface, make sure to select a clean, dry location that is elevated enough to provide good reception and network coverage. Do not mount the access point on any type of metal surface. Do not install the access point in wet or dusty areas. The site should not be close to transformers, heavy-duty motors, fluorescent lights, microwave ovens, refrigerators or any other electrical equipment that can interfere with radio signals.

If you are connecting the access point to a wired network, the location must provide an Ethernet connection. You will need to run an Ethernet cable from the power supply to the access point.

An access point provides coverage at distances of up to 100 Meters (300 Feet). Signal loss can occur if metal, concrete, brick, walls, floors or other architectural barriers block transmission. If your location includes these kinds of obstructions, you may need to add additional access points to improve coverage

Configuring a wireless LAN can be as easy as placing a 3Com Wireless Access Point in a central area and making the necessary connections to the AP and the clients. However, installing multiple Access Points may require more planning.

If you plan to use an optional antenna instead of the standard detachable antennas that are supplied, review "Selecting and Connecting a Different Antenna Model" on page 18 before selecting the final location and be sure to allow for routing the antenna cable as required.

For optimal performance, ensure the access point operates in temperature ranges between 0° C to 50° C (14° F to 122° F).

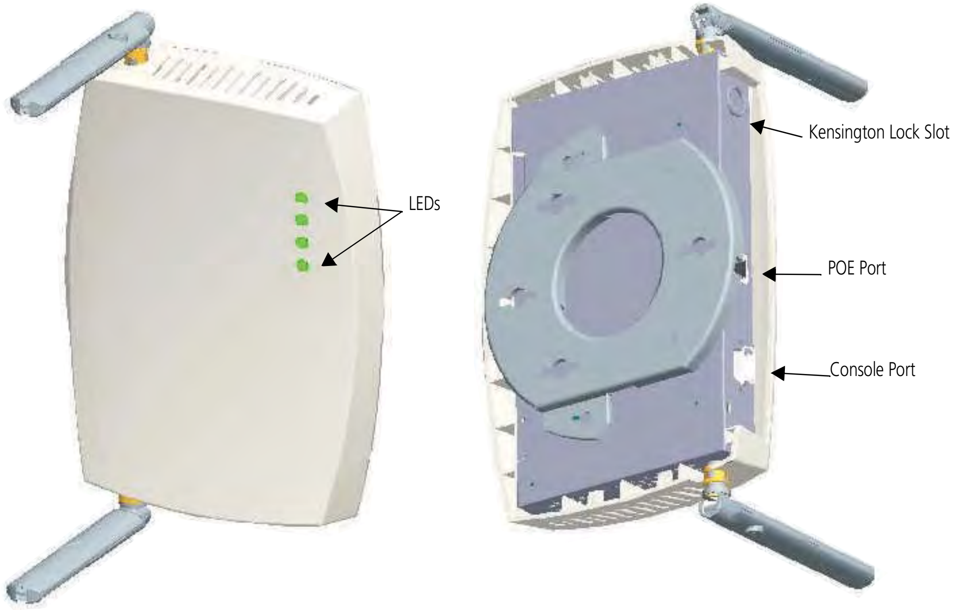
CAUTION: *Regulatory restrictions dictate that when this device is operational, the minimal body-to-antenna distance is 20 cm (8 inches).*

BEFORE YOU BEGIN

Record the access point MAC address in a safe place before the access point is installed in a hard-to-reach location. The MAC address is printed on the back of the access point housing.

The following illustration shows the front and rear views of the access point, including the LEDs and connecting ports.

Figure 1 Front and Rear Panel Description



Connecting the Standard Antennas

The Access Point 8760 is supplied with standard detachable antennas. These should be attached before the access point is installed. If using an alternate antenna, see “Selecting and Connecting a Different Antenna Model” on page 18.

1 Carefully unpack the standard detachable antennas.

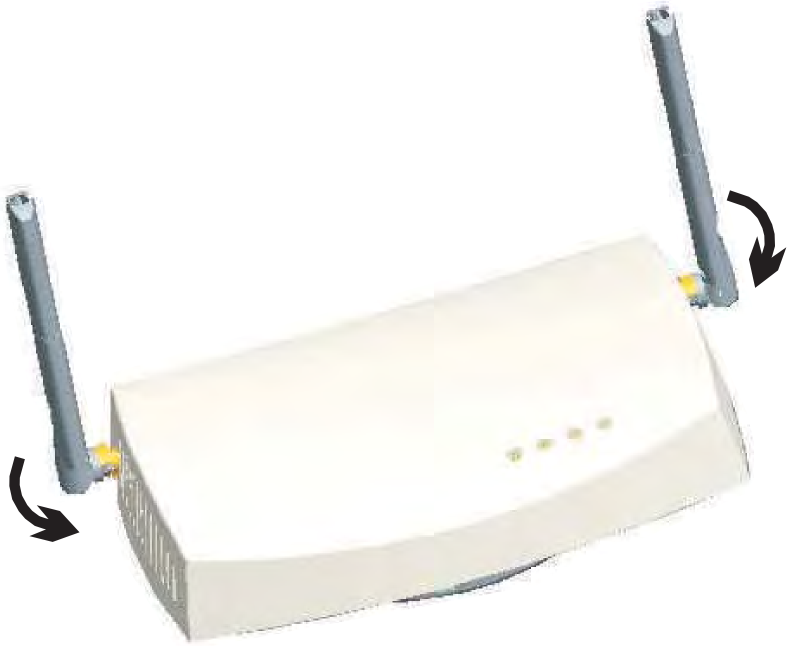
⚠ ***CAUTION:*** *Do not handle the antenna tips, especially after they are connected to the access point, as this could lead to electrostatic discharge (ESD), which could damage the equipment.*

2 Screw an antenna into each of the sockets in the access point housing.

3 Hand-tighten the antennas at the very base of the RSMA connectors.

4 Position the antennas so they turn out and away from the access point at a 45-degree angle. After network startup, you may need to adjust the antennas to fine-tune coverage in your area.

Figure 2 Antenna Adjustment



Depending on the coverage required for your site, you may want to replace the standard detachable antennas with one of the external antennas available for use with the access point. See "Selecting and Connecting a Different Antenna Model" on page 18.

CONNECTING POWER

It is advisable to connect the power and check the Ethernet cables and LEDs before installing the unit in a hard-to-reach location.

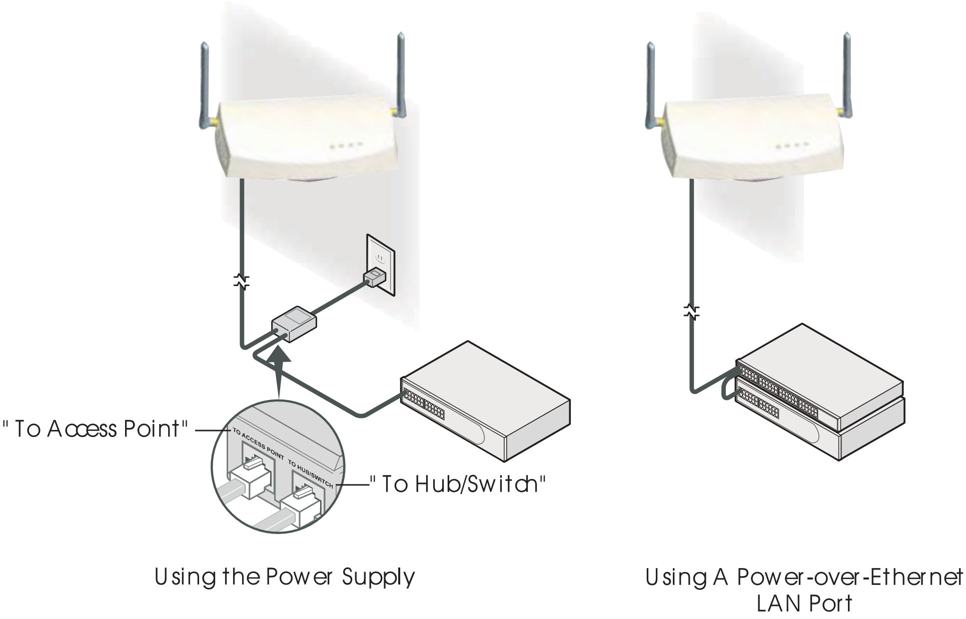
The access point complies with the IEEE 802.3af power-over-Ethernet standard. It receives power over a standard category 5 straight (8-wire) Ethernet cable.

There are two ways to supply power to the access point:

- Use the 3Com Integrated Power-over-Ethernet power supply. In this case, you need to supply a second Ethernet cable to connect to the wired LAN.
- Connect the access point directly to your own power-over-Ethernet hub or switch, which must also comply with the IEEE 802.3af standard.

If you supply your own Ethernet cable for connecting power, be sure that it is standard category 5 straight-through (8-wire) cable that has not been altered in any way. Use of nonstandard cable could damage the access point.

Figure 3 Connecting Power



USING THE POWER SUPPLY

CAUTION: *To avoid damaging network equipment, make sure that the cables are connected from access point to power supply to LAN as shown above and described below.*

The power supply can be located at any point between the access point and the LAN access port, wherever a convenient power outlet exists. If you supply your own Ethernet cable for connecting power, be sure that it is standard category 5 straight-through (8-wire) cable that has not been altered in any way. Use of nonstandard cable could damage the access point.

Refer to the illustration above, and follow these steps:

1 Connect one end of the Ethernet cable to the Ethernet port on the access point.

2 Connect the other end of the Ethernet cable to the port labeled *To Access Point* on the power supply.

3 Connect the power cord to the power supply and plug the cord into a power outlet.

4 To link the access point to your Ethernet network, plug one end of another Ethernet cable into the port labeled To *Hub/Switch* on the power supply, and plug the other end into a LAN port (on a hub or in a wall).

USING A POWER-OVER-ETHERNET LAN PORT

If your LAN equipment complies with the IEEE 802.3af power-over-Ethernet standard, you can connect the access point directly to a LAN port. For example, the illustration above right shows a connection through a 3Com Ethernet Power Supply to a 3Com Switch.

CHECKING THE LEDS

When power is connected, the access point LEDs light. The illustration and the following table describe the LEDs and their functions.

Table 1 System LEDs

LED	Color	Indicates
Power	Green	The access point is powered up and operating normally.
	Off	The access point is not receiving power or there is a fault with the power supply.
Link	Green	The access point has a 10/100 Mbps Fast Ethernet connection.
	Flashing	Indicates that the access point is transmitting or receiving data on a 10/100 Mbps Ethernet LAN. Flashing rate is proportional to network activity.
	Off	No link is present.
11a	Green	The access point has WLAN frame transmission over the 802.11a 5.3 GHz radio band.
	Off	No link is present.
11g	Green	The access point has WLAN frame transmission over the 802.11g 2.4 GHz radio band.
	Off	No link is present.

RESET BUTTON

This button is used to reset the access point or restore the factory default configuration. If you hold down the button for less than 5 seconds, the access point will perform a hardware reset. If you hold down the button for 5 seconds or more, any configuration changes you may have made are removed, and the factory default configuration is restored to the access point.

WALL, CEILING, OR ELECTRICAL BOX MOUNTING

To mount the access point to a wall, ceiling, or electrical box:

1. Remove the access point from the mounting bracket.
2. Screw the mounting bracket to a wall, ceiling, or electrical box (NEMA enclosure):
   - If mounting to a solid surface wall or ceiling, use two of the sheet metal screws and two of the wall anchors (included).
   - If mounting to drywall, use two sheet metal screws and two wall anchors (not included).
   - If mounting to an electrical box (NEMA enclosure), use two threaded screws (not included).
3. Route the power cable (if using an external power supply) and Ethernet cable through the large opening on the back of the mounting bracket.

CAUTION: *For easy installation and removal of the access point from the mounting bracket, make sure that there is sufficient flexibility with the cable and that there is adequate service loop (that is, enough cable routed through the mounting bracket to easily connect the cable to the access point.) If not enough cable is routed through the back of the mounting bracket, or if the cable is inflexible, it can be difficult to install or remove the access point from the mounting bracket.*

The figures below show a cable being routed through the large opening on the back of the mounting bracket and then the mounting bracket being mounted to a wall.

Figure 4 Routing a Cable

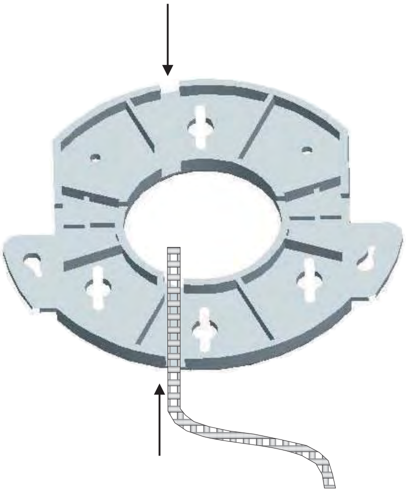
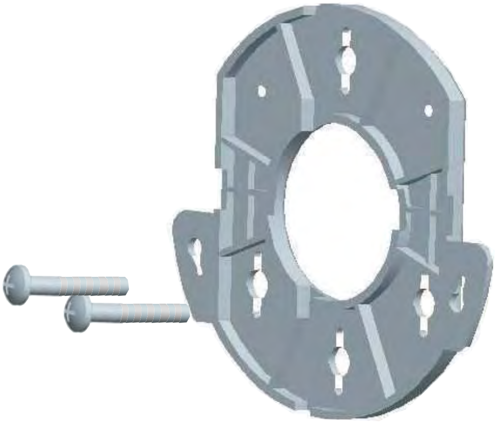


Figure 5 Mounting Bracket

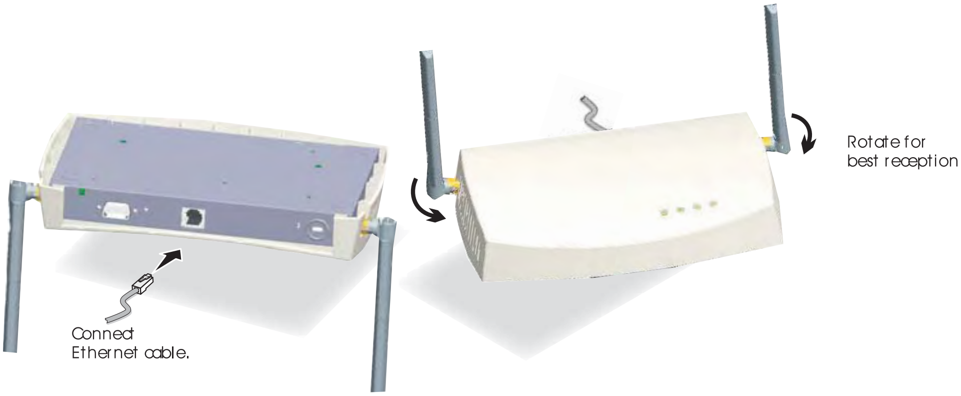


4 Connect the Ethernet cable to the port on the back of the access point.

FLAT SURFACE INSTALLATION

The access point can also be placed on a flat surface such as a table, desktop or filing cabinet. Do not install the access point on any type of metal surface. If you choose a flat surface mount, select a location that is clear of obstructions and provides good reception.

Figure 6 Flat Surface Installation



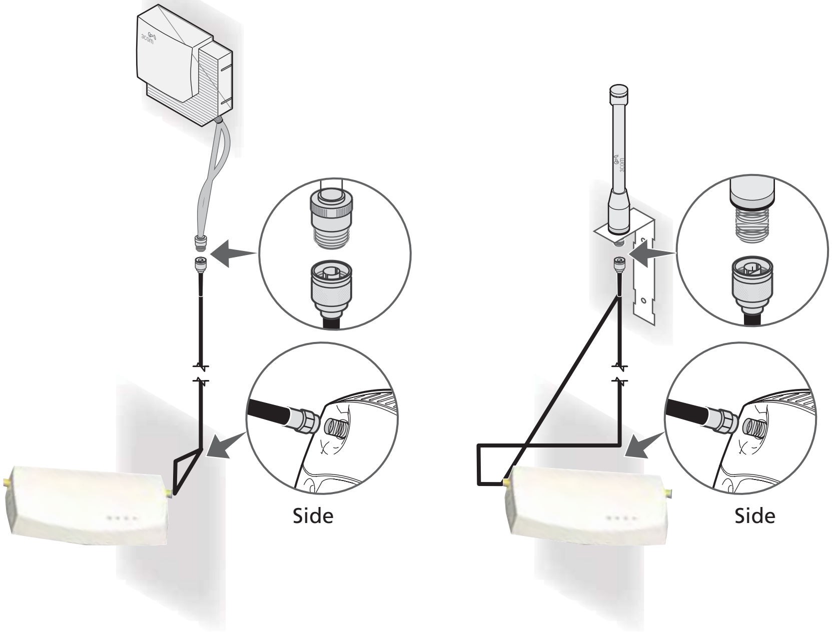
***NOTE**: Regulatory restrictions dictate that when this device is operational, the minimal body-to-antenna distance is 20 cm (8 inches).*

SELECTING AND CONNECTING A DIFFERENT ANTENNA MODEL

The standard detachable antennas supplied with the Access Point are suitable for a broad variety of environments. If you require a different type of antenna for the Access Point, several options are available by model number from the 3Com Web site (www.3Com.com).

For each of the antenna models, you will need an RSMA to SMA adapter cable (model 3CRWE586), either a 6-foot accessory cable (model 3CWE580) or a 20-foot accessory cable (model 3CWE581) to provide the transition from the RSMA connector on the access point to the N-type connector on the antenna.

Figure 7 Connecting Antennae



1 Position the antenna so that there are minimal obstacles between it and any client with which it will communicate. While maintaining a direct line of sight between the antenna and a client is not strictly necessary, such an arrangement helps to ensure a strong signal. Ensure that access is available for routing the antenna cable from the antenna to the access point.

2 If they are installed, remove both standard detachable antennas.

3 Connect one end of the optional antenna cable to the antenna and secure the antenna in place.

4 Connect the free end of the antenna cable to the connection on the access point, as shown in the illustration above.

5 Make certain that the antennas and antenna masts are appropriately grounded to prevent injury or damage from lightning strikes. Proper grounding for outdoor installations may require the purchase of a third-party lightning arrestor.

INSTALLING SOFTWARE UTILITIES

The installation CD includes documentation and software utilities to help you set up and administer the wireless components of your network.

To view product documentation, select *View the Documentation* from the CD Startup Menu and then select the item you want to view.

The software Tools and Utilities include:

- **3Com Wireless Infrastructure Device Manager.** Use this tool to discover access points and select devices for administrative changes.
- **3Com 3CDaemon Server Tool.** This tool can act in four different capacities:
  - As a TFTP Server, necessary for firmware upgrades, and backup and restore functions. Use this option if you do not have a TFTP server set up.
  - As a SysLog Server, which is necessary to view SysLog messages.
  - As an optional TFTP Client.
  - As an optional FTP Server.

To install a tool from the CD:

1. Power up the computer and put the 3Com CD in the CD-ROM drive.
2. The setup menu should appear when the CD autostarts. If no menu appears, you can run the setup.exe startup program from the Windows Start menu. For example, if your CD drive is the D drive: Start / Run / d:setup.exe.
3. From the CD startup menu, select *Tools and Utilities*.
4. Select the item you want to install and follow the instructions on the screen.

3 INITIAL CONFIGURATION

The Access Point 8760 offers a variety of management options, including a web-based interface.

The initial configuration steps can be made through the web browser interface. The access point requests an IP address via DHCP by default. If no response is received from the DHCP server, then the access point uses the default address 169.254.2.1.

If the default AP configuration does not meet your network requirements, or if you want to customize the settings for your own network, you can use these tools to change the configuration:

1 Launch the 3Com Wireless Infrastructure Device Manager (Widman) utility

2 Directly connect to the device through it’s Ethernet port or console port

NETWORKS WITH A DHCP SERVER

If your network has a DHCP server, an IP address is automatically assigned to the AP. It takes between one and two minutes for the Access Point to determine if there is a DHCP server on the network. Use the 3Com Wireless Infrastructure Device Manager (Widman) included on the 3Com Installation CD to locate the Access Point on the network and view its IP address. After you determine the AP’s IP address, you can enter that IP address into a web browser on a computer on the same subnet to view the Access Point’s system status or change its configuration.

NETWORKS WITHOUT A DHCP SERVER

If your network does not have a DHCP server, the Access Point uses a factory assigned IP address (169.254.2.1). You can use that IP address to configure the Access Point, or you can assign a new IP address to the Access Point. To verify that the Access Point is using the default IP address assigned at the factory:

1 Connect a computer directly to the Access Point using the supplied standard Category 5 UTP Ethernet cable.

2 Enter the Access Point’s default IP address (169.254.2.1) into the computer’s web browser. If the Configuration Management System starts, the Access Point is using the factory assigned IP address. You can configure the Access Point with the following login information:

- Login name: **admin**
- Password: **password**

If the Configuration Management System does not start, the Access Point is on a different subnet than the computer. Install and start the 3Com Wireless Infrastructure Device Manager to discover the Access Point’s IP address.

USING THE 3COM INSTALLATION CD

The 3Com Installation CD contains the following tools and utilities: 3Com Wireless Infrastructure Device Manager-an administration tool that helps you select 3Com wireless LAN devices and launch their configurations in your Web browser.

LAUNCH THE 3COM WIRELESS INFRASTRUCTURE DEVICE MANAGER (WIDMAN) UTILITY

1 Turn on the computer.

2 Insert the 3Com Installation CD into the CD-ROM drive.

The CD will Autorun. If it does not Autorun, you can start the setup menu from the Windows Start menu. For example: **Start > Run > d: setup.exe**.

3 In the menu, click Tools and Utilities.

4 In the next screen, click the software you want to install.

5 Follow the on screen instructions to complete the installation.

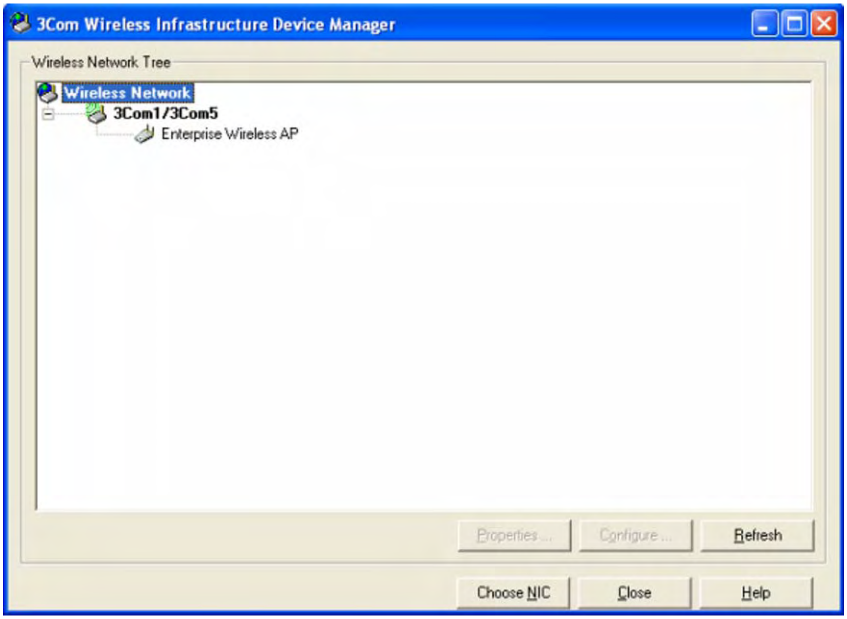
Reboot the computer if prompted to do so.

LAUNCHING THE 3COM WIRELESS INTERFACE DEVICE MANAGER

To be able to configure the Access Point you need to run the Wireless Interface Device Manager. Go to **Start > Programs > 3Com Wireless > Wireless Interface Device Manager**.

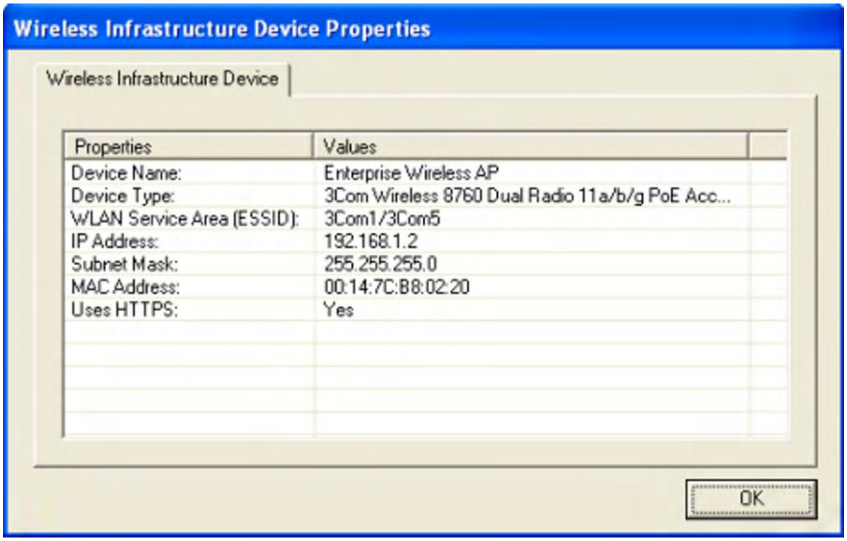
If the device is working correctly the following screen should be seen.

Figure 1 Wireless Interface Device Manager



Click on the Properties button to see the following screen

Figure 2 Wireless Interface Device Manager - Properties


Wireless Infrastructure Device Properties
Wireless Infrastructure Device
OK

Properties	Values
Device Name:	Enterprise Wireless AP
Device Type:	3Com Wireless 8760 Dual Radio 11a/b/g PoE Acc...
WLAN Service Area (ESSID):	3Com1/3Com5
IP Address:	192.168.1.2
Subnet Mask:	255.255.255.0
MAC Address:	00:14:7C:B8:02:20
Uses HTTPS:	Yes

Directly connect to the device through its Ethernet port or console port.

Follow the instructions below to login into the AP Configuration screen:

1 Load a web browser and enter <http://169.254.2.1>.

2 The Logon screen appears.

To log on to the Web interface:

1 Username, type **admin** (case sensitive).

2 Password, type **password**

3 Click **Log On**.

FIRST TIME ONLY

When you log in for the first time, you may be asked to select your country. Choose your country from the drop-down list and then click Apply.

Click on the Setup Wizard for initial configuration.

For a new access point installation, the default WLAN Service Area (ESSID) is 3Com and no security is set. Unless it detects a DHCP server on the network, the access point uses Auto IP to assign an IP address of the form 169.254.2.1.

Use the 3Com Wireless Infrastructure Device Manager to locate 3Com Wireless LAN devices and launch their configurations. When installing the device manager, make sure the computer is connected to the same network as the device to be configured. After installing and launching the device manager, select the device to be configured from network tree and click Configure to launch the configuration Web interface.

USING THE SETUP WIZARD

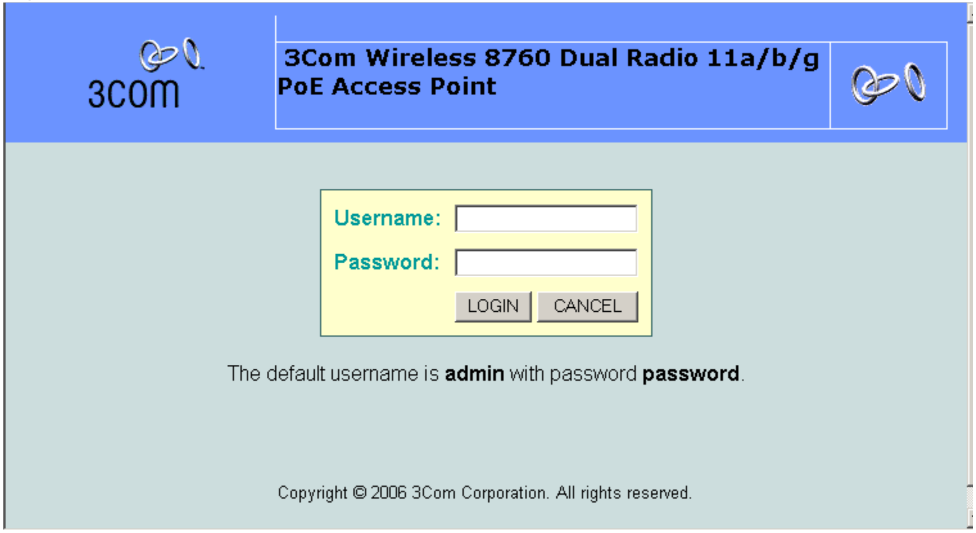
There are only a few basic steps you need to complete to connect the access point to your corporate network and provide network access to wireless clients. The Setup Wizard takes you through configuration procedures for the wireless Service Set Identifier, the radio channel selection, IP configuration and basic authentication for wireless clients.

The access point can be managed by any computer using a web browser (such as Internet Explorer 5.0 or above). Enter the default IP address: http://169.254.2.1.

NOTE: *If you changed the default IP address via the command line interface above, use that address instead of the one shown here.*

Logging In – Enter the username "admin," and password "password," then click LOGIN. For information on configuring a user name and password, see page 35.

Figure 3 Login Page



3Com Wireless 8760 Dual Radio 11a/b/g PoE Access Point

Username:

Password:

The default username is **admin** with password **password**.

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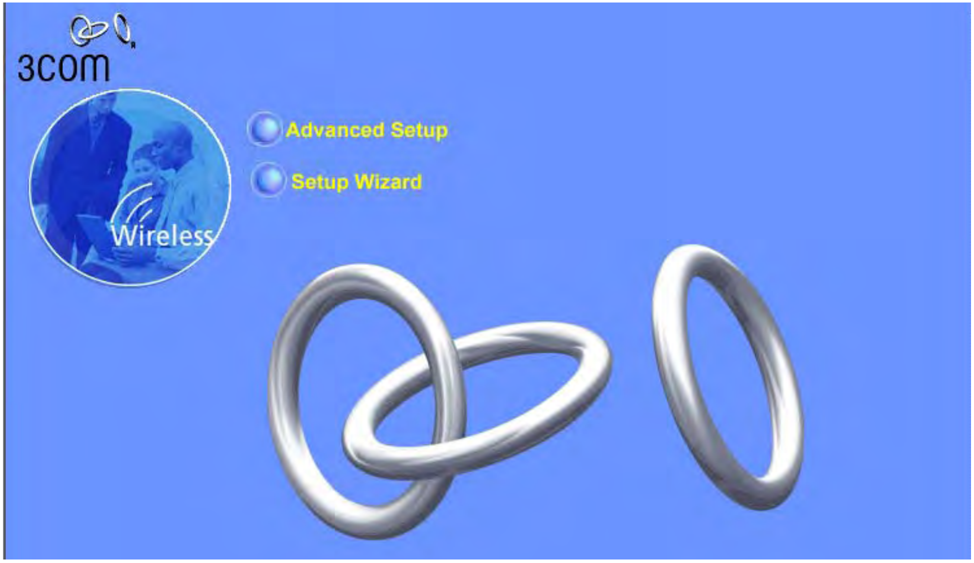
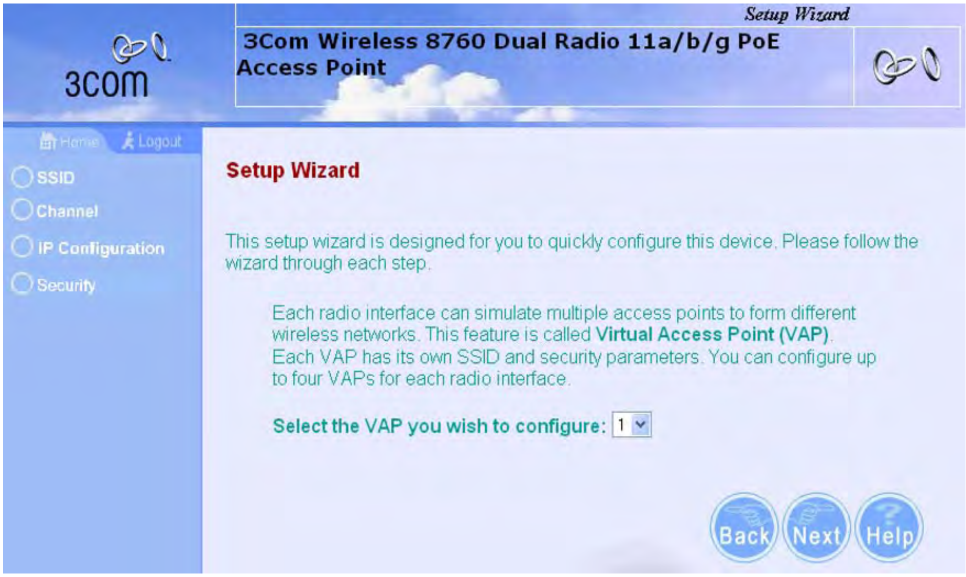
The home page displays the Main Menu.

Figure 4 Home Page



Launching the Setup Wizard – To perform initial configuration, click Setup Wizard on the home page, select the VAP you wish to configure, then click on the [Next] button to start the process.

Figure 5 Setup Wizard - Start



Setup Wizard

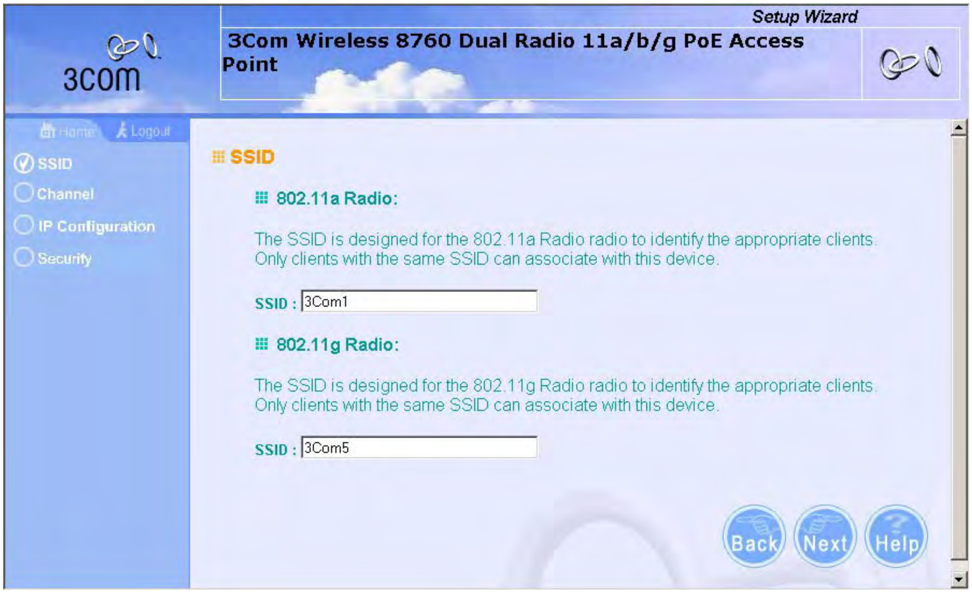
This setup wizard is designed for you to quickly configure this device. Please follow the wizard through each step.

Each radio interface can simulate multiple access points to form different wireless networks. This feature is called **Virtual Access Point (VAP)**. Each VAP has its own SSID and security parameters. You can configure up to four VAPs for each radio interface.

Select the VAP you wish to configure: 1

1 **Service Set ID** – Enter the service set identifier in the SSID box which all wireless clients must use to associate with the access point. The SSID is case sensitive and can consist of up to 32 alphanumeric characters.

Figure 6 Setup Wizard - Step 1



SSID

802.11a Radio:

The SSID is designed for the 802.11a Radio radio to identify the appropriate clients. Only clients with the same SSID can associate with this device.

SSID : 3Com1

802.11g Radio:

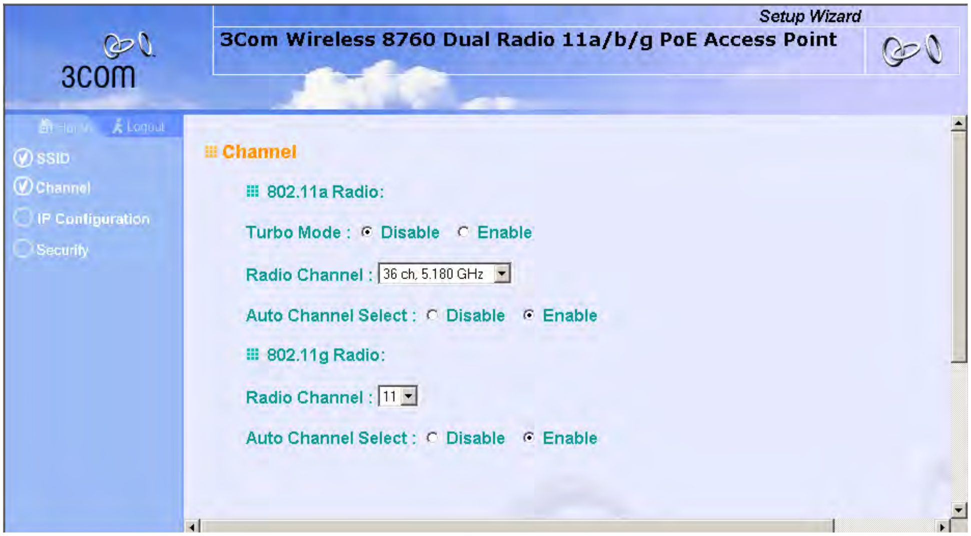
The SSID is designed for the 802.11g Radio radio to identify the appropriate clients. Only clients with the same SSID can associate with this device.

SSID : 3Com5

2 **Radio Channel** – You must enable radio communications for 802.11a and 802.11b/g, and set the operating radio channel.

NOTE: *Available channel settings are limited by local regulations, which determine the channels that are available. This User Guide shows channels and settings that apply to North America (United States and Canada), with 13 channels available for the 802.11a interface and 11 channels for the 802.11g interface. Other regions my have different channels and settings available.*

Figure 7 Setup Wizard - Step 2



Setup Wizard

3Com Wireless 8760 Dual Radio 11a/b/g PoE Access Point

Channel

802.11a Radio:

Turbo Mode : ● Disable ○ Enable

Radio Channel : 36 ch, 5.180 GHz

Auto Channel Select : ○ Disable ● Enable

802.11g Radio:

Radio Channel : 11

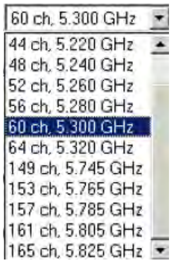
Auto Channel Select : ○ Disable ● Enable

- 802.11a

  Turbo Mode – If you select Enable, the access point will operate in turbo mode with a data rate of up to 108 Mbps. Normal mode support 13 channels, Turbo mode supports only 5 channels. (Default: Disabled)

  802.11a Radio Channel – Set the operating radio channel number. (Default: 60ch, 5.300 GHz)

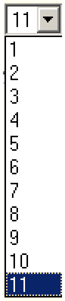
  Auto Channel Select – Select Enable for automatic radio channel detection. (Default: Enabled)



- 802.11b/g

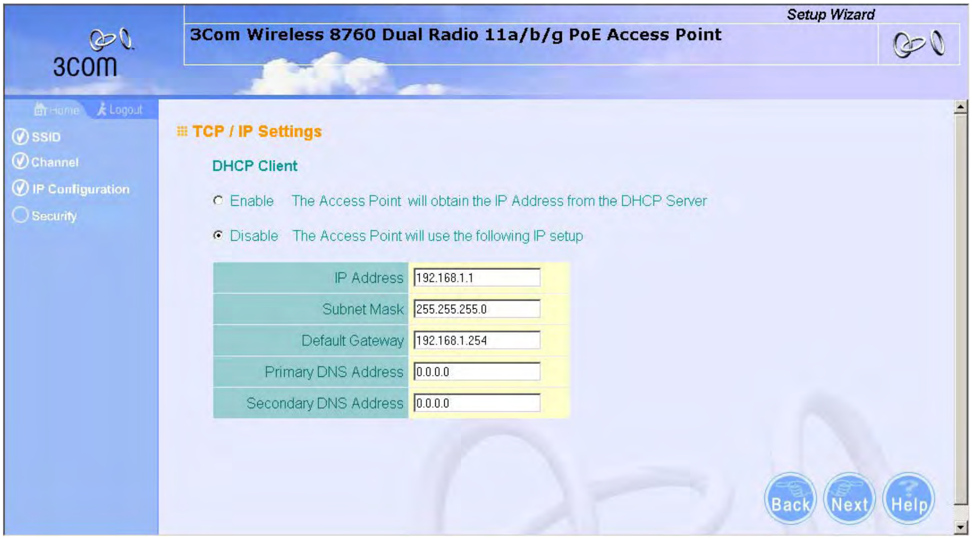
  Turbo Mode - If you select Enable, the access point will operate in turbo mode with a data rate of up to 108 Mbps. Normal mode support 11 channels, Turbo mode supports only 1 channel. (Default: Disabled)

  802.11g Radio Channel - Set the operating radio channel number. (Range 1-11; Default: 1)



3 **IP Configuration** – Either enable or disable Dynamic Host Configuration Protocol (DHCP) for automatic IP configuration. If you disable DHCP, then manually enter the IP address and subnet mask. If a management station exists on another network segment, then you must enter the IP address for a gateway that can route traffic between these segments. Then enter the IP address for the primary and secondary Domain Name Servers (DNS) servers to be used for host-name to IP address resolution.

Figure 8 Setup Wizard - Step 3



TCP / IP Settings

DHCP Client

○ Enable The Access Point will obtain the IP Address from the DHCP Server

● Disable The Access Point will use the following IP setup

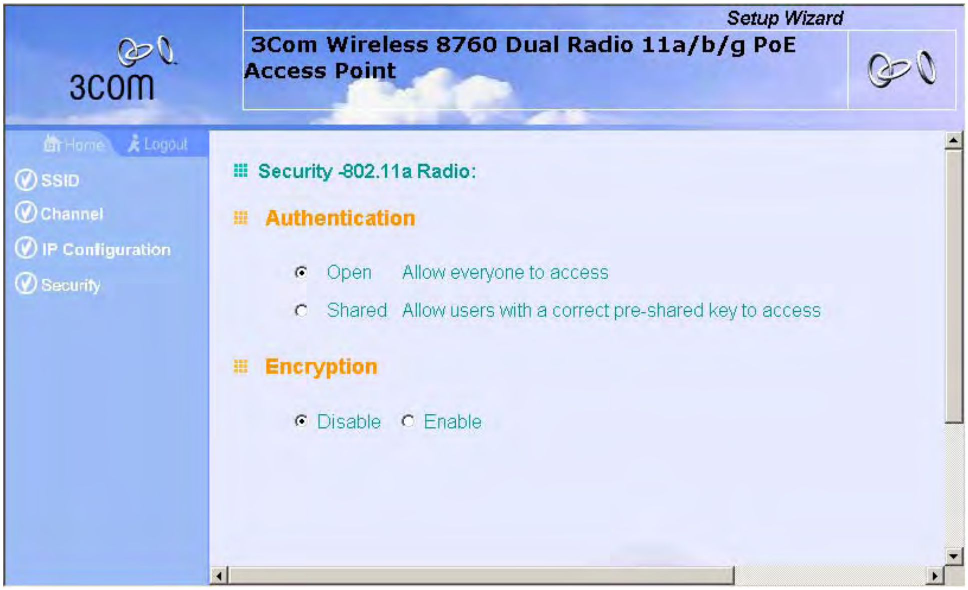
IP Address	192.168.1.1
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.254
Primary DNS Address	0.0.0.0
Secondary DNS Address	0.0.0.0

DHCP Client – With DHCP Client enabled, the IP address, subnet mask and default gateway can be dynamically assigned to the access point by the network DHCP server. (Default: Disabled)

***NOTE:** If there is no DHCP server on your network, then the access point will automatically start up with its default IP address, 169.254.2.1.*

4 **Security** – Set the Authentication Type to “Open” to allow open access without authentication, or “Shared” to require authentication based on a shared key. Enable encryption to encrypt data transmissions. To configure other security features use the Advanced Setup menu as described in Chapter 4.

Figure 9 Setup Wizard - Step 4



Security -802.11a Radio:

Authentication

● Open Allow everyone to access

○ Shared Allow users with a correct pre-shared key to access

Encryption

● Disable ○ Enable

Authentication Type – Use "Open System" to allow open access to all wireless clients without performing authentication, or "Shared Key" to perform authentication based on a shared key that has been distributed to all stations. (Default: Open System)

WEP – Wired Equivalent Privacy is used to encrypt transmissions passing between wireless clients and the access point. (Default: Disabled)

Shared Key Setup – If you select "Shared Key" authentication, enable WEP, then configure the shared key by selecting 64-bit or 128-bit key type and entering a hexadecimal or ASCII string of the appropriate length. The key can be entered as alphanumeric characters or hexadecimal (0~9, A~F, e.g., D7 0A 9C 7F E5). (Default: 128 bit, hexadecimal key type)

64-Bit Manual Entry: The key can contain 10 hexadecimal digits, or 5 alphanumeric characters.

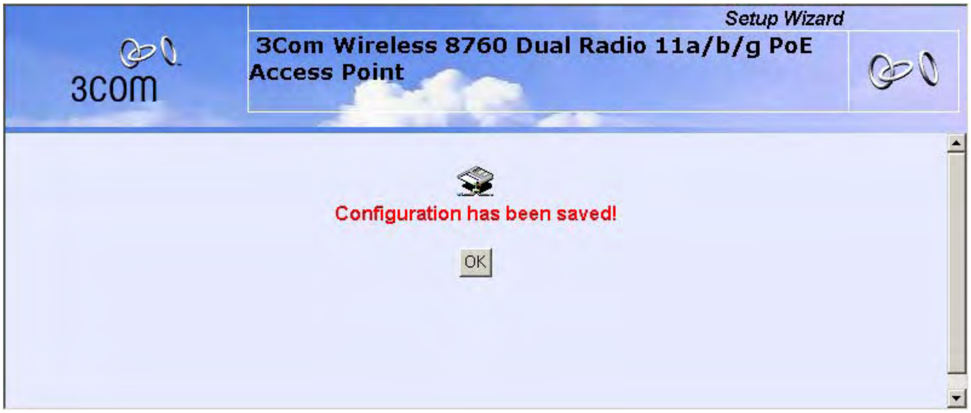
128-Bit Manual Entry: The key can contain 26 hexadecimal digits or 13 alphanumeric characters.

***NOTE:** All wireless devices must be configured with the same Key ID values to communicate with the access point.*

5 Click Finish.

6 Click the OK button to complete the wizard.

Figure 10 Setup Wizard - Completed



Configuration has been saved!

4 SYSTEM CONFIGURATION

Before continuing with advanced configuration, first complete the initial configuration steps described in Chapter 4 to set up an IP address for the access point.

The access point can be managed by any computer using a web browser (such as Internet Explorer 5.0 or above). Enter the configured IP address of the access point, or use the default address: http://169.254.2.1.

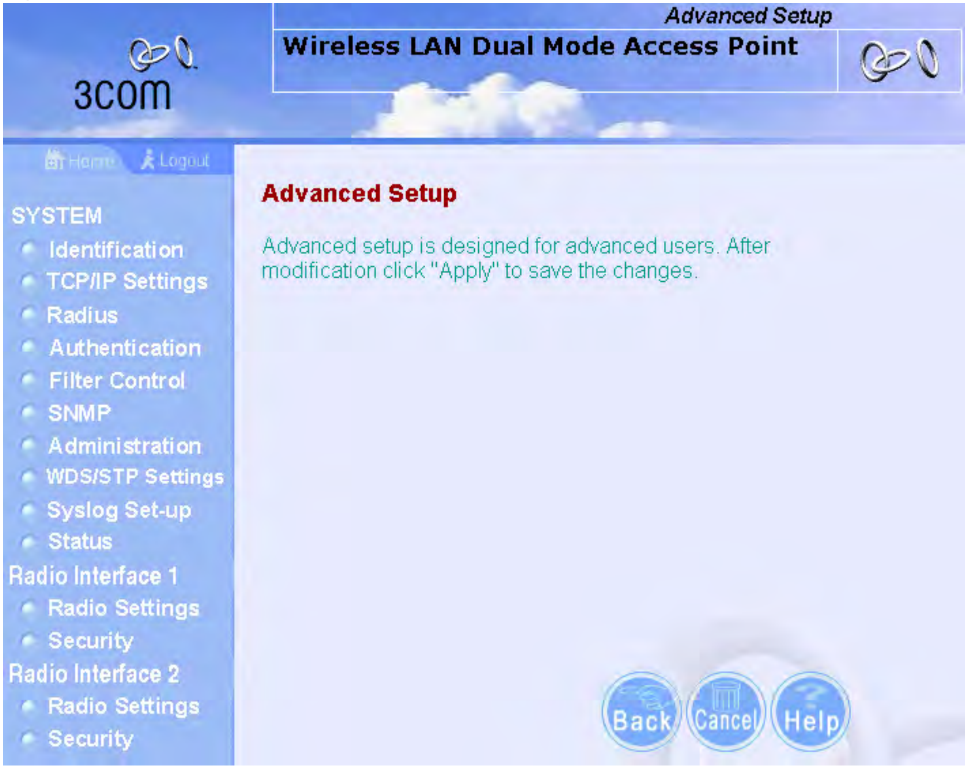
To log into the access point, enter the default user name "admin" and the password "password," then press "LOGIN."

For a new access point installation, the default WLAN Service Area (ESSID) is 3Com and no security is set. Unless it detects a DHCP server on the network, the access point uses Auto IP to assign an IP address of the form 169.254.2.1.

Use the 3Com Wireless Infrastructure Device Manager to locate 3Com Wireless LAN devices and launch their configurations. When installing the device manager, make sure the computer is connected to the same network as the device to be configured. After installing and launching the device manager, select the device to be configured from network tree and click Configure to launch the configuration Web interface.

When the home page displays, click on Advanced Setup. The following page will display.

Figure 11 Advanced Setup



Advanced Setup

Advanced setup is designed for advanced users. After modification click "Apply" to save the changes.

The information in this chapter is organized to reflect the structure of the web screens for easy reference. However, it is recommended that you configure a user name and password as the first step under Administration to control management access to this device (page 4-35).

ADVANCED SETUP

The Advanced Setup pages include the following options.

Table 1 Advanced Setup

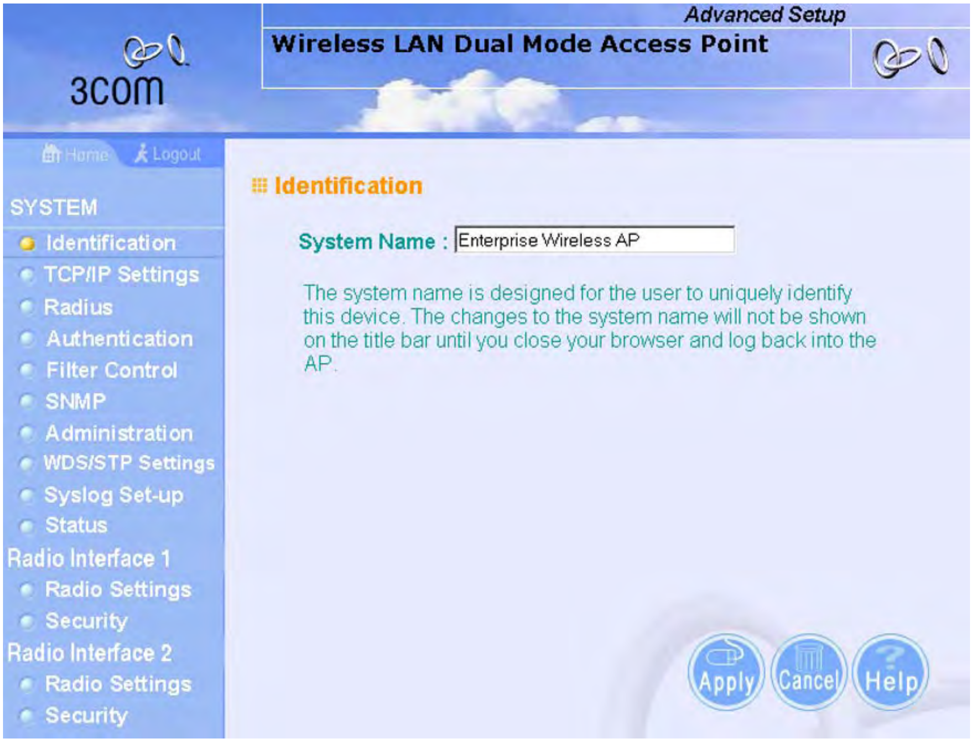
Menu	Description	Page
System	Configures basic administrative and client access	4-16
Identification	Specifies the host name	4-16
TCP / IP Settings	Configures the IP address, subnet mask, gateway, and domain name servers	4-17
RADIUS	Configures the RADIUS server for wireless client authentication and accounting	4-20

Menu	Description	Page
Authentication	Configures 802.1X client authentication, with an option for MAC address authentication	4-22
Filter Control	Filters communications between wireless clients, access to the management interface from wireless clients, and traffic matching specific Ethernet protocol types	4-27
SNMP	Configures SNMP settings	4-31
Administration	Configures user name and password for management access; upgrades software from local file, FTP or TFTP server; resets configuration settings to factory defaults; and resets the access point	4-35
WDS/STP Settings	Configures WDS bridging and Spanning Tree Protocol features	page 4-40
Syslog Set-up	Controls logging of error messages; sets the system clock via SNTP server or manual configuration	4-46
Status	Displays information about the access point and wireless clients	4-72
AP Status	Displays configuration settings for the basic system and the wireless interface	4-72
Station Status	Shows the wireless clients currently associated with the access point	4-73
Event Logs	Shows log messages stored in memory	4-74
802.11a Interface	Configures the IEEE 802.11a interface	4-48
Radio Settings	Configures common radio signal parameters and other settings for each VAP interface	4-49
Security	Enables each virtual access point (VAP) interface, sets the Service Set Identifier (SSID), and configures wireless security	4-62
802.11b/g Interface	Configures the IEEE 802.11g interface	4-48
Radio Settings	Configures common radio signal parameters and other settings for each VAP interface	4-55
Security	Enables each VAP interface, sets the SSID, and configures wireless security	4-62

SYSTEM IDENTIFICATION

The system name for the access point can be left at its default setting. However, modifying this parameter can help you to more easily distinguish different devices in your network.

Figure 12 System Identification



Identification

System Name : Enterprise Wireless AP

The system name is designed for the user to uniquely identify this device. The changes to the system name will not be shown on the title bar until you close your browser and log back into the AP.

System Name – An alias for the access point, enabling the device to be uniquely identified on the network. (Default: Enterprise Wireless AP; Range: 1-32 characters)

TCP / IP SETTINGS

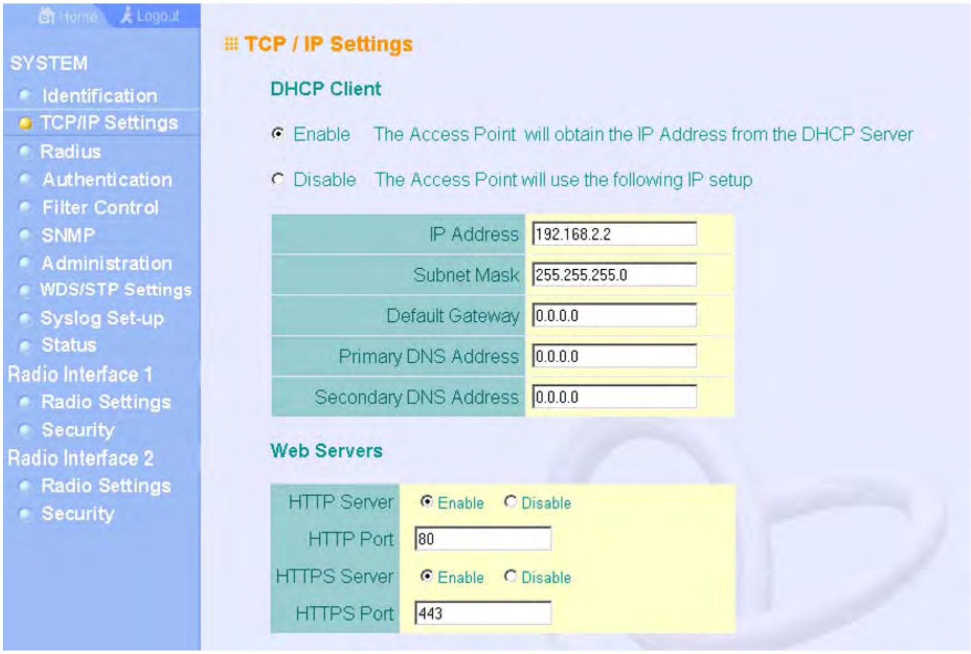
Configuring the access point with an IP address expands your ability to manage the access point. A number of access point features depend on IP addressing to operate.

***NOTE:** You can use the web browser interface to access IP addressing only if the access point already has an IP address that is reachable through your network.*

By default, the access point will be automatically configured with IP settings from a Dynamic Host Configuration Protocol (DHCP) server. Use 3Com Wireless Infrastructure Device Manager to discover or set the initial IP address of the unit. WIDMAN will allow you to launch a web browser on the Access Point's web management interface by selecting the Access Point and the configure button.

***NOTE:** If there is no DHCP server on your network, or DHCP fails, the access point will automatically start up with a default IP address of 169.254.2.1.*

Figure 13 TCP/IP Settings



TCP / IP Settings

DHCP Client

● Enable The Access Point will obtain the IP Address from the DHCP Server

○ Disable The Access Point will use the following IP setup

IP Address	192.168.2.2
Subnet Mask	255.255.255.0
Default Gateway	0.0.0.0
Primary DNS Address	0.0.0.0
Secondary DNS Address	0.0.0.0

Web Servers

HTTP Server	● Enable ○ Disable
HTTP Port	80
HTTPS Server	● Enable ○ Disable
HTTPS Port	443

DHCP Client (Enable) – Select this option to obtain the IP settings for the access point from a DHCP (Dynamic Host Configuration Protocol) server. The IP address, subnet mask, default gateway, and Domain Name Server (DNS) address are dynamically assigned to the access point by the network DHCP server.
(Default: Enabled)

DHCP Client (Disable) – Select this option to manually configure a static address for the access point.

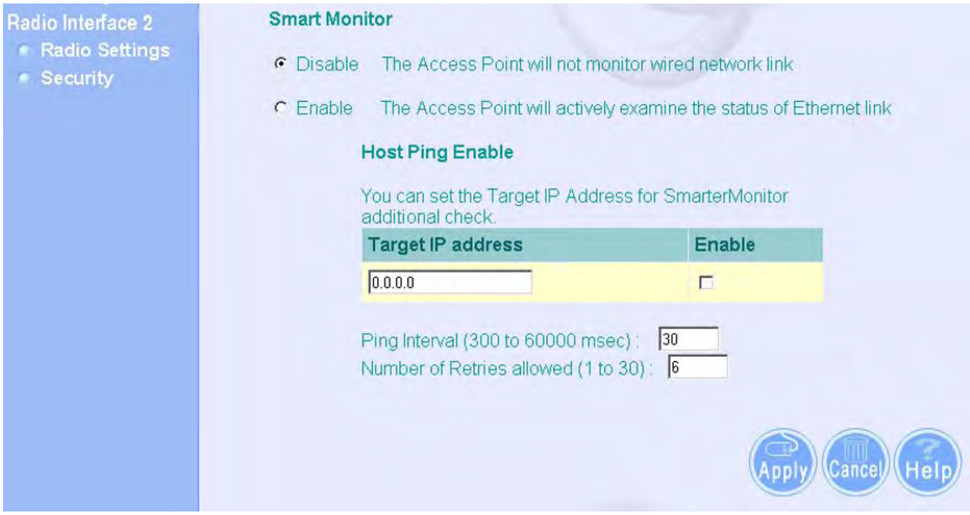
- IP Address: The IP address of the access point. Valid IP addresses consist of four decimal numbers, 0 to 255, separated by periods.
- Subnet Mask: The mask that identifies the host address bits used for routing to specific subnets.
- Default Gateway: The default gateway is the IP address of the router for the access point, which is used if the requested destination address is not on the local subnet.
  If you have management stations, DNS, RADIUS, or other network servers located on another subnet, type the IP address of the default gateway router in the text field provided. Otherwise, leave the address as all zeros (0.0.0.0).
- Primary and Secondary DNS Address: The IP address of Domain Name Servers on the network. A DNS maps numerical IP addresses to domain names and can be used to identify network hosts by familiar names instead of the IP addresses.

If you have one or more DNS servers located on the local network, type the IP addresses in the text fields provided. Otherwise, leave the addresses as all zeros (0.0.0.0).

Web Servers – Allows monitoring of the access point from a browser and secure connection.

- HTTP Server: Allows the access point to be monitored or configured from a browser.
- HTTP Port: Specifies the port to be used by the web browser interface.
- HTTPS Server: Enables the secure HTTP server on the access point.
- HTTPS Port: Specifies the UDP port number used for a secure HTTP connection to the access pointís Web interface.

Figure 14 Smart Monitor



Smart Monitor

● Disable The Access Point will not monitor wired network link

○ Enable The Access Point will actively examine the status of Ethernet link

Host Ping Enable

You can set the Target IP Address for SmarterMonitor additional check.

Target IP address	Enable
0.0.0.0	□

Ping Interval (300 to 60000 msec) : 30

Number of Retries allowed (1 to 30) : 6

By enabling Smart Monitor (known as Link Integrity in the CLI) and setting a target IP address, the AP will periodically (set by the ping interval) check to see if the target address responds to pings. If it fails to respond to a ping after the configured number of retries, it will disable both radios so that no clients can connect to the AP.

This is used to disable the AP when it cannot not reach a critical network element such as the RADIUS server, VPN Terminator, Mail Server etc.

- Disable / Enable: Disables or enables a link check to a host device on the wired network.
- Target IP address: Specifies the IP address of a host device in the wired network.
- Enable: Enables traffic between the host's IP address and the AP.
- Ping Interval: Specifies the time between each Ping sent to the link host. (Range:300~30000 miliseconds; Default: 30 miliseconds)
- Number of Retries allowed: Specifies the number of consecutive failed Ping counts before the link is determined as lost. (Range:1~30; Default:6)

RADIUS

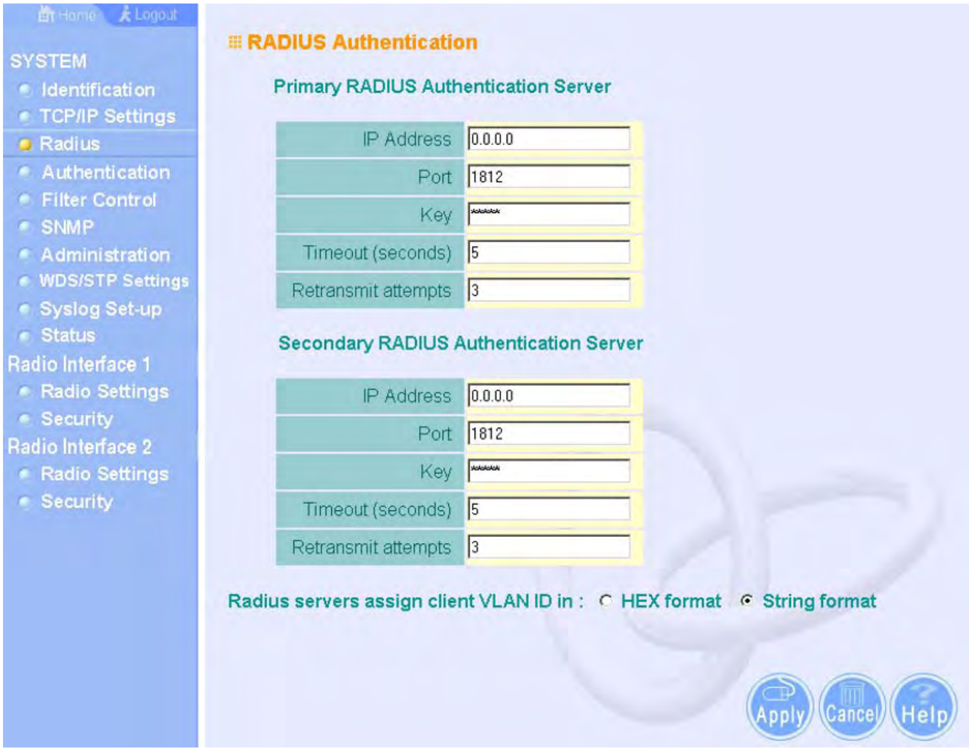
Remote Authentication Dial-in User Service (RADIUS) is an authentication protocol that uses software running on a central server to control access to RADIUS-aware devices on the network. An authentication server contains a database of user credentials for each user that requires access to the network.

A primary RADIUS server must be specified for the access point to implement IEEE 802.1X network access control and Wi-Fi Protected Access (WPA) wireless security. A secondary RADIUS server may also be specified as a backup should the primary server fail or become inaccessible.

In addition, the configured RADIUS server can also act as a RADIUS Accounting server and receive user-session accounting information from the access point. RADIUS Accounting can be used to provide valuable information on user activity in the network.

NOTE: *This guide assumes that you have already configured RADIUS server(s) to support the access point. Configuration of RADIUS server software is beyond the scope of this guide, refer to the documentation provided with the RADIUS server software.*

Figure 15 RADIUS Authentication



RADIUS Authentication

Primary RADIUS Authentication Server

IP Address	0.0.0.0
Port	1812
Key	*****
Timeout (seconds)	5
Retransmit attempts	3

Secondary RADIUS Authentication Server

IP Address	0.0.0.0
Port	1812
Key	*****
Timeout (seconds)	5
Retransmit attempts	3

Radius servers assign client VLAN ID in : ○ HEX format ● String format

Primary Radius Server Setup – Configure the following settings to use RADIUS authentication on the access point.

- IP Address: Specifies the IP address or host name of the RADIUS server.
- Port: The UDP port number used by the RADIUS server for authentication messages. (Range: 1024-65535; Default: 1812)
- Key: A shared text string used to encrypt messages between the access point and the RADIUS server. Be sure that the same text string is specified on the RADIUS server. Do not use blank spaces in the string. (Maximum length: 255 characters)
- Timeout: Number of seconds the access point waits for a reply from the RADIUS server before resending a request. (Range: 1-60 seconds; Default: 5)
- Retransmit attempts: The number of times the access point tries to resend a request to the RADIUS server before authentication fails. (Range: 1-30; Default: 3)

NOTE: *For the Timeout and Retransmit attempts fields, accept the default values unless you experience problems connecting to the RADIUS server over the network.*

Secondary Radius Server Setup – Configure a secondary RADIUS server to provide a backup in case the primary server fails. The access point uses the secondary server if the primary server fails or becomes inaccessible. Once the access point switches over to the secondary server, it periodically attempts to establish communication again with primary server. If communication with the primary server is re-established, the secondary server reverts to a backup role.

VLAN ID Format – A VLAN ID (a number between 1 and 4094) can be assigned to each client after successful authentication using IEEE 802.1X and a central RADIUS server. The user VLAN IDs must be configured on the RADIUS server for each user authorized to access the network. VLAN IDs can be entered as hexadecimal numbers or as ASCII strings.

AUTHENTICATION

Wireless clients can be authenticated for network access by checking their MAC address against the local database configured on the access point, or by using a database configured on a central RADIUS server. Alternatively, authentication can be implemented using the IEEE 802.1X network access control protocol.

A client’s MAC address provides relatively weak user authentication, since MAC addresses can be easily captured and used by another station to break into the network. Using 802.1X provides more robust user authentication using user names and passwords or digital certificates. You can configure the access point to use both MAC address and 802.1X authentication, with client station MAC authentication occurring prior to IEEE 802.1X authentication. However, it is better to choose one or the other, as appropriate.

IEEE 802.1X is a standard framework for network access control that uses a central RADIUS server for user authentication. This control feature prevents unauthorized access to the network by requiring an 802.1X client application to submit user credentials for authentication. The 802.1X standard uses the Extensible Authentication Protocol (EAP) to pass user credentials (either digital certificates, user names and passwords, or other) from the client to the RADIUS server. Client authentication is then verified on the RADIUS server before the access point grants client access to the network.

The 802.1X EAP packets are also used to pass dynamic unicast session keys and static broadcast keys to wireless clients. Session keys are unique to each client and are used to encrypt and correlate traffic passing between a specific client and the access point. You can also enable broadcast key rotation, so the access point provides a dynamic broadcast key and changes it at a specified interval.

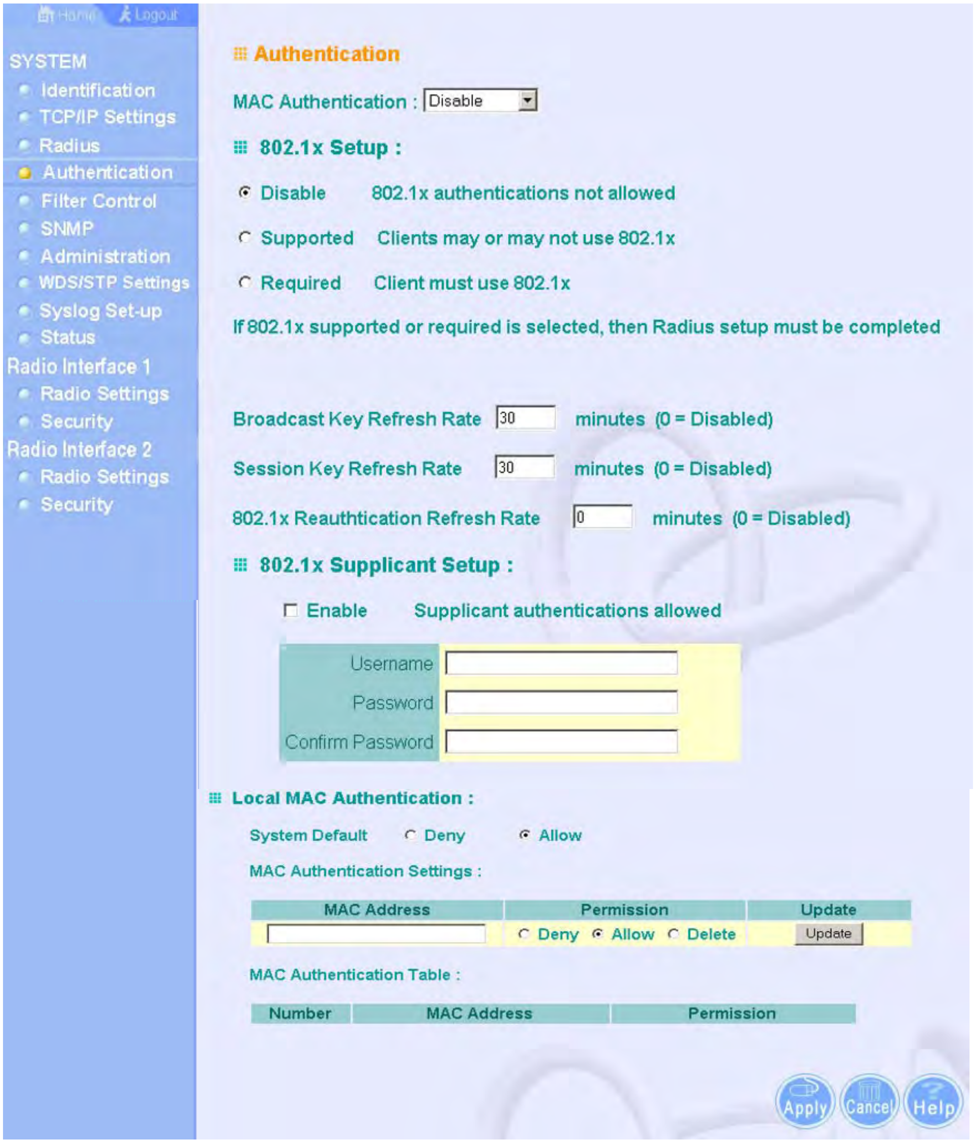
The access point can also operate in a 802.1X supplicant mode. This enables the access point itself to be authenticated with a RADIUS server using a configured MD5 user name and password. This prevents rogue access points from gaining access to the network.

Take note of the following points before configuring MAC address or 802.1X authentication:

- Use MAC address authentication for a small network with a limited number of users. MAC addresses can be manually configured on the access point itself without the need to set up a RADIUS server, but managing a large number of MAC addresses across many access points is very cumbersome. A RADIUS server can be used to centrally manage a larger database of user MAC addresses.
- Use IEEE 802.1X authentication for networks with a larger number of users and where security is the most important issue. When using 802.1X authentication, a RADIUS server is required in the wired network to centrally manage the credentials of the wireless clients. It also provides a mechanism for enhanced network security using dynamic encryption key rotation or W-Fi Protected Access (WPA).

***NOTE:** If you configure RADIUS MAC authentication together with 802.1X, RADIUS MAC address authentication is performed prior to 802.1X authentication. If RADIUS MAC authentication succeeds, then 802.1X authentication is performed. If RADIUS MAC authentication fails, 802.1X authentication is not performed.*

Figure 16 Authentication



Authentication

MAC Authentication : Disable

802.1x Setup :

● Disable 802.1x authentications not allowed

○ Supported Clients may or may not use 802.1x

○ Required Client must use 802.1x

If 802.1x supported or required is selected, then Radius setup must be completed

Broadcast Key Refresh Rate 30 minutes (0 = Disabled)

Session Key Refresh Rate 30 minutes (0 = Disabled)

802.1x Reauthtication Refresh Rate 0 minutes (0 = Disabled)

802.1x Supplicant Setup :

□ Enable Supplicant authentications allowed

Username

Password

Confirm Password

Local MAC Authentication :

System Default ○ Deny ● Allow

MAC Authentication Settings :

MAC Address	Permission	Update
	○ Deny ● Allow ○ Delete	Update

MAC Authentication Table :

Number	MAC Address	Permission

MAC Authentication – You can configure a list of the MAC addresses for wireless clients that are authorized to access the network. This provides a basic level of authentication for wireless clients attempting to gain access to the network. A database of authorized MAC addresses can be stored locally on the access point or remotely on a central RADIUS server.
(Default: Disabled)

- Disabled: No checks are performed on an associating station's MAC address.
- Local MAC: The MAC address of the associating station is compared against the local database stored on the access point. Use the Local MAC Authentication section of this web page to set up the local database, and configure all access points in the wireless network service area with the same MAC address database.
- Radius MAC: The MAC address of the associating station is sent to a configured RADIUS server for authentication. When using a RADIUS authentication server for MAC address authentication, the server must first be configured in the Radius window (see "RADIUS" on page 20). The database of MAC addresses and filtering policy must be defined in the RADIUS server.

NOTE: *MAC addresses on the RADIUS server can be entered in four different formats (see "RADIUS" on page 20).*

You can enable 802.1X as optionally supported or as required to enhance the security of the wireless network. (Default: Disable)

- Disable: The access point does not support 802.1X authentication for any wireless client. After successful wireless association with the access point, each client is allowed to access the network.
- Supported: The access point supports 802.1X authentication only for clients initiating the 802.1X authentication process (i.e., the access point does not initiate 802.1X authentication). For clients initiating 802.1X, only those successfully authenticated are allowed to access the network. For those clients not initiating 802.1X, access to the network is allowed after successful wireless association with the access point. The 802.1X supported mode allows access for clients not using WPA or WPA2 security.
- Required: The access point enforces 802.1X authentication for all associated wireless clients. If 802.1X authentication is not initiated by a client, the access point will initiate authentication. Only those clients successfully authenticated with 802.1X are allowed to access the network.

NOTE: *If 802.1X is enabled on the access point, then RADIUS setup must be completed (See "RADIUS" on page 20.)*

When 802.1X is enabled, the broadcast and session key rotation intervals can also be configured.

- Broadcast Key Refresh Rate: Sets the interval at which the broadcast keys are refreshed for stations using 802.1X dynamic keying. (Range: 0-1440 minutes; Default: 0 means disabled)
- Session Key Refresh Rate: The interval at which the access point refreshes unicast session keys for associated clients. (Range: 0-1440 minutes; Default: 0 means disabled)
- 802.1X Reauthentication Refresh Rate: The time period after which a connected client must be re-authenticated. During the re-authentication process of verifying the client's credentials on the RADIUS server, the client remains connected the network. Only if re-authentication fails is network access blocked. (Range: 0-65535 seconds; Default: 0 means disabled)

802.1X Supplicant – The access point can also operate in a 802.1X supplicant mode. This enables the access point itself to be authenticated with a RADIUS server using a configured MD5 user name and password. This prevents rogue access points from gaining access to the network.

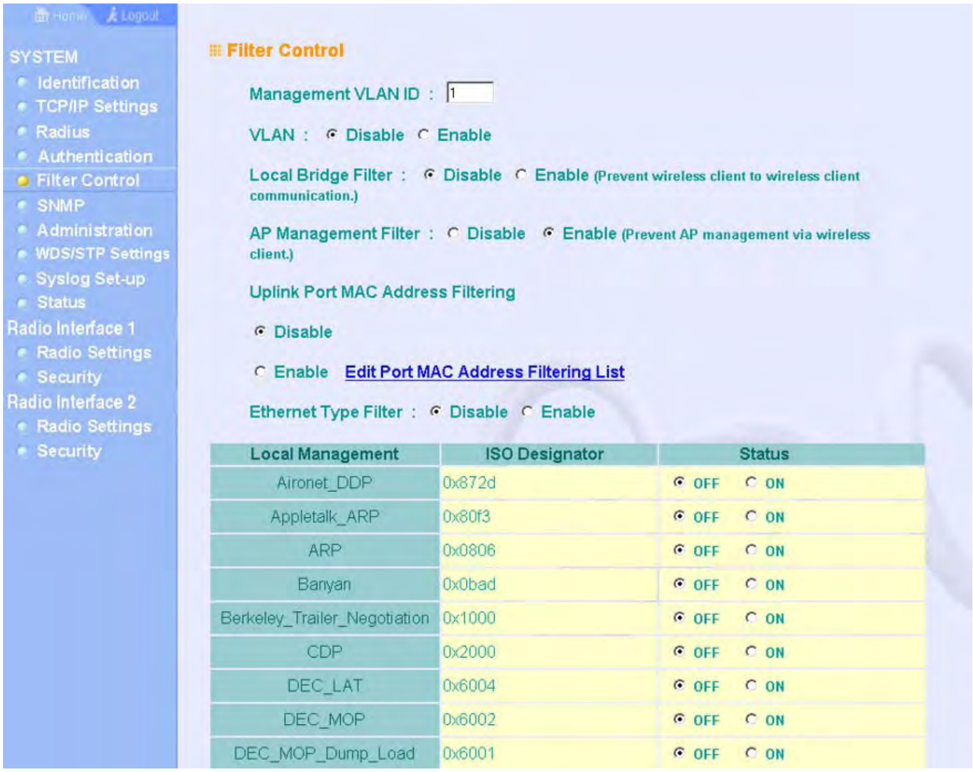
Local MAC Authentication – Configures the local MAC authentication database. The MAC database provides a mechanism to take certain actions based on a wireless client's MAC address. The MAC list can be configured to allow or deny network access to specific clients.

- System Default: Specifies a default action for all unknown MAC addresses (that is, those not listed in the local MAC database).
  - Deny: Blocks access for all MAC addresses except those listed in the local database as "Allow."
  - Allow: Permits access for all MAC addresses except those listed in the local database as "Deny."
- MAC Authentication Settings: Enters specified MAC addresses and permissions into the local MAC database.
  - MAC Address: Physical address of a client. Enter six pairs of hexadecimal digits separated by hyphens; for example, 00-90-D1-12-AB-89.
  - Permission: Select Allow to permit access or Deny to block access. If Delete is selected, the specified MAC address entry is removed from the database.
  - Update: Enters the specified MAC address and permission setting into the local database.
- MAC Authentication Table: Displays current entries in the local MAC database.

FILTER CONTROL

The access point can employ network traffic frame filtering to control access to network resources and increase security. You can prevent communications between wireless clients and prevent access point management from wireless clients. Also, you can block specific Ethernet traffic from being forwarded by the access point.

Figure 17 Filter Control



Filter Control

Management VLAN ID : 1

VLAN : ● Disable ○ Enable

Local Bridge Filter : ● Disable ○ Enable (Prevent wireless client to wireless client communication.)

AP Management Filter : ○ Disable ● Enable (Prevent AP management via wireless client.)

Uplink Port MAC Address Filtering

● Disable

○ Enable Edit Port MAC Address Filtering List

Ethernet Type Filter : ● Disable ○ Enable

Local Management	ISO Designator	Status
Aironet_DDP	0x872d	● OFF ○ ON
Appletalk_ARP	0x80f3	● OFF ○ ON
ARP	0x0806	● OFF ○ ON
Banyan	0x0bad	● OFF ○ ON
Berkeley_Trailer_Negotiation	0x1000	● OFF ○ ON
CDP	0x2000	● OFF ○ ON
DEC_LAT	0x6004	● OFF ○ ON
DEC_MOP	0x6002	● OFF ○ ON
DEC_MOP_Dump_Load	0x6001	● OFF ○ ON

Inter Client STAs Communication Filter – Sets the global mode for wireless-to-wireless communications between clients associated to Virtual AP (VAP) interfaces on the access point. (Default: Prevent Inter and Intra VAP client Communication)

- Disabled: All clients can communicate with each other through the access point.

- Prevent Intra VAP client communication: When enabled, clients associated with a specific VAP interface cannot establish wireless communications with each other. Clients can communicate with clients associated to other VAP interfaces.
- Prevent Inter and Intra VAP client communication: When enabled, clients cannot establish wireless communications with any other client, either those associated to the same VAP interface or any other VAP interface.

AP Management Filter – Controls management access to the access point from wireless clients. Management interfaces include the web, Telnet, or SNMP. (Default: Disabled)

- Disabled: Allows management access from wireless clients.
- Enabled: Blocks management access from wireless clients.

Uplink Port MAC Address Filtering Status – Prevents traffic with specified source MAC addresses from being forwarded to wireless clients through the access point. You can add a maximum of eight MAC addresses to the filter table. (Default: Disabled)

- MAC Address: Specifies a MAC address to filter, in the form xx-xx-xx-xx-xx-xx.
- Permission: Adds or deletes a MAC address from the filtering table.

Ethernet Type Filter – Controls checks on the Ethernet type of all incoming and outgoing Ethernet packets against the protocol filtering table. (Default: Disabled)

- Disabled: Access point does not filter Ethernet protocol types.
- Enabled: Access point filters Ethernet protocol types based on the configuration of protocol types in the filter table. If the status of a protocol is set to "ON," the protocol is filtered from the access point.

NOTE: *Ethernet protocol types not listed in the filtering table are always forwarded by the access point.*

VLAN

The access point can employ VLAN tagging support to control access to network resources and increase security. VLANs separate traffic passing between the access point, associated clients, and the wired network. There can be a VLAN assigned to each associated client, a default VLAN for each VAP (Virtual Access Point) interface, and a management VLAN for the access point.

Note the following points about the access point's VLAN support:

- The management VLAN is for managing the access point through remote management tools, such as the web interface, SSH, SNMP, or Telnet. The access point only accepts management traffic that is tagged with the specified management VLAN ID.
- All wireless clients associated to the access point are assigned to a VLAN. If IEEE 802.1X is being used to authenticate wireless clients, specific VLAN IDs can be configured on the RADIUS server to be assigned to each client. If a client is not assigned to a specific VLAN or if 802.1X is not used, the client is assigned to the default VLAN for the VAP interface with which it is associated. The access point only allows traffic tagged with assigned VLAN IDs or default VLAN IDs to access clients associated on each VAP interface.
- When VLAN support is enabled on the access point, traffic passed to the wired network is tagged with the appropriate VLAN ID, either an assigned client VLAN ID, default VLAN ID, or the management VLAN ID. Traffic received from the wired network must also be tagged with one of these known VLAN IDs. Received traffic that has an unknown VLAN ID or no VLAN tag is dropped.
- When VLAN support is disabled, the access point does not tag traffic passed to the wired network and ignores the VLAN tags on any received frames.

NOTE: *Before enabling VLAN tagging on the access point, be sure to configure the attached network switch port to support tagged VLAN frames from the access point's management VLAN ID, default VLAN IDs, and other client VLAN IDs. Otherwise, connectivity to the access point will be lost when you enable the VLAN feature.*

Using IEEE 802.1X and a central RADIUS server, up to 64 VLAN IDs can be mapped to specific wireless clients, allowing users to remain within the same VLAN as they move around a campus site. This feature can also be used to control access to network resources from clients, thereby improving security.

A VLAN ID (1-4094) can be assigned to a client after successful IEEE 802.1X authentication. The client VLAN IDs must be configured on the RADIUS server for each user authorized to access the network. If a client does not have a configured VLAN ID on the RADIUS server, the access point assigns the client to the configured default VLAN ID for the VAP interface.

NOTE: *When using IEEE 802.1X to dynamically assign VLAN IDs, the access point must have 802.1X authentication enabled and a RADIUS server configured. Wireless clients must also support 802.1X client software.*

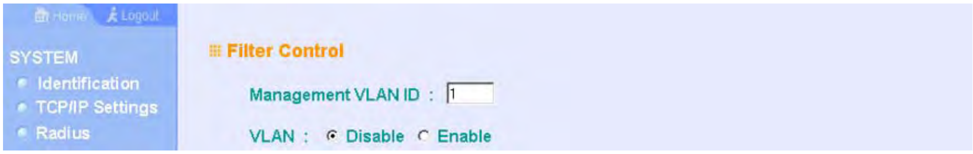
When setting up VLAN IDs for each user on the RADIUS server, be sure to use the RADIUS attributes and values as indicated in the following table.

Number	RADIUS Attribute	Value
64	Tunnel-Type	VLAN (13)
65	Tunnel-Medium-Type	802
81	Tunnel-Private-Group-ID	VLANID (1 to 4094 as hexadecimal or string)

VLAN IDs on the RADIUS server can be entered as hexadecimal digits or a string (see “radius-server vlan-format” on page 63).

NOTE: *The specific configuration of RADIUS server software is beyond the scope of this guide. Refer to the documentation provided with the RADIUS server software.*

Figure 18 Filter Control - VLAN ID



Filter Control

Management VLAN ID : 1

VLAN : ● Disable ○ Enable

VLAN – Enables or disables VLAN tagging support on the access point.

Management VLAN ID – The VLAN ID that traffic must have to be able to manage the access point. (Range 1-4094; Default: 1)

SNMP

Simple Network Management Protocol (SNMP) is a communication protocol designed specifically for managing devices on a network. Equipment commonly managed with SNMP includes switches, routers and host computers. SNMP is typically used to configure these devices for proper operation in a network environment, as well as to monitor them to evaluate performance or detect potential problems.

Managed devices supporting SNMP contain software, which runs locally on the device and is referred to as an agent. A defined set of variables, known as managed objects, is maintained by the SNMP agent and used to manage the device. These objects are defined in a Management Information Base (MIB) that provides a standard presentation of the information controlled by the agent. SNMP defines both the format of the MIB specifications and the protocol used to access this information over the network.

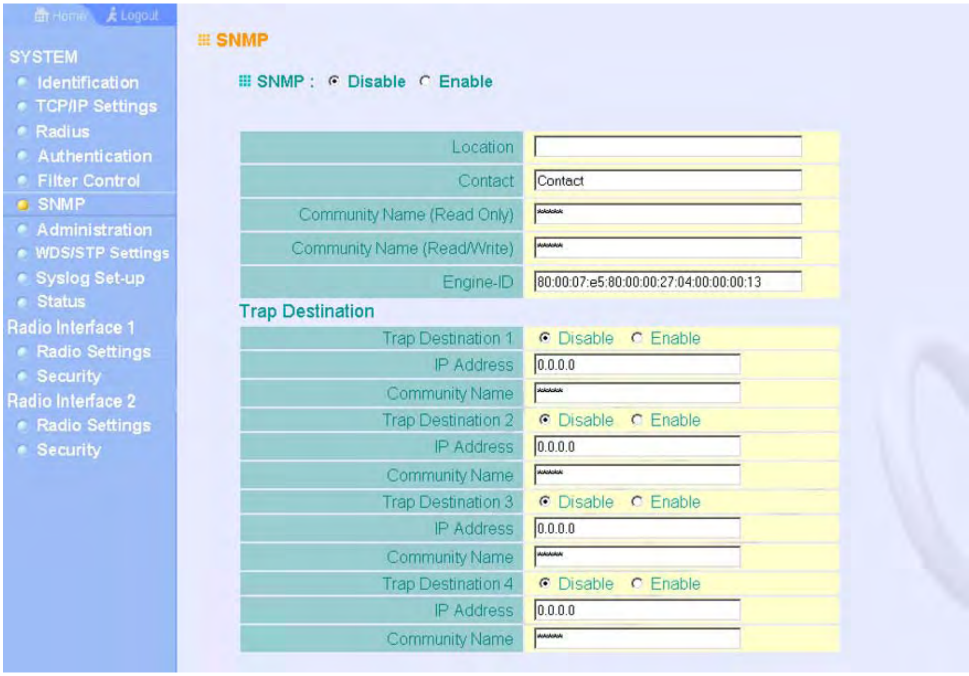
The access point includes an onboard agent that supports SNMP versions 1, 2c, and 3 clients. This agent continuously monitors the status of the access point, as well as the traffic passing to and from wireless clients. A network management station can access this information using SNMP management software that is compliant with MIB II. To implement SNMP management, the access point must first have an IP address and subnet mask, configured either manually or dynamically. Access to the onboard agent using SNMP v1 and v2c is controlled by community strings. To communicate with the access point, the management station must first submit a valid community string for authentication.

Access to the access point using SNMP v3 provides additional security features that cover message integrity, authentication, and encryption; as well as controlling notifications that are sent to specified user targets.

Configuring SNMP and Trap Message Parameters

The access point SNMP agent must be enabled to function (for versions 1, 2c, and 3 clients). Management access using SNMP v1 and v2c also requires community strings to be configured for authentication. Trap notifications can be enabled and sent to up to four management stations.

Figure 19 SNMP



SNMP

SNMP : ● Disable ○ Enable

Location	
Contact	Contact
Community Name (Read Only)	*****
Community Name (Read/Write)	*****
Engine-ID	80:00:07:e5:80:00:00:27:04:00:00:00:13

Trap Destination

Trap Destination 1	● Disable ○ Enable
IP Address	0.0.0.0
Community Name	*****
Trap Destination 2	● Disable ○ Enable
IP Address	0.0.0.0
Community Name	*****
Trap Destination 3	● Disable ○ Enable
IP Address	0.0.0.0
Community Name	*****
Trap Destination 4	● Disable ○ Enable
IP Address	0.0.0.0
Community Name	*****

SNMP – Enables or disables SNMP management access and also enables the access point to send SNMP traps (notifications). (Default: Disable)

Location – A text string that describes the system location. (Maximum length: 255 characters)

Contact – A text string that describes the system contact. (Maximum length: 255 characters)

Community Name (Read Only) – Defines the SNMP community access string that has read-only access. Authorized management stations are only able to retrieve MIB objects. (Maximum length: 23 characters, case sensitive; Default: public)

Community Name (Read/Write) – Defines the SNMP community access string that has read/write access. Authorized management stations are able to both retrieve and modify MIB objects. (Maximum length: 23 characters, case sensitive; Default: private)

Trap Destination (1 to 4) – Enables recipients (up to four) of SNMP notifications.

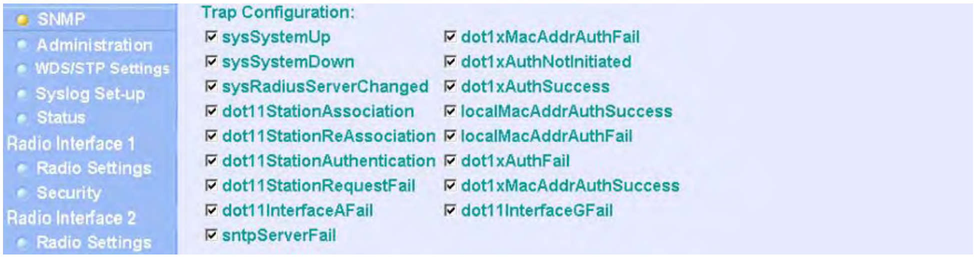
- *Trap Destination IP Address* – Specifies the recipient of SNMP notifications. Enter the IP address or the host name. (Host Name: 1 to 63 characters, case sensitive)

- *Trap Destination Community Name* – The community string sent with the notification operation. (Maximum length: 23 characters, case sensitive; Default: public)

Engine ID – Sets the engine identifier for the SNMPv3 agent that resides on the access point. This engine protects against message replay, delay, and redirection. The engine ID is also used in combination with user passwords to generate the security keys for authenticating and encrypting SNMPv3 packets. A default engine ID is automatically generated that is unique to the access point. (Range: 10 to 64 hexadecimal characters)

***NOTE:** If the local engine ID is deleted or changed, all SNMP users will be cleared. All existing users will need to be re-configured. If you want to change the default engine ID, change it first before configuring other SNMP v3 parameters.*

Figure 20 Trap Confiiguration



Trap Configuration:

☑ sysSystemUp
☑ sysSystemDown
☑ sysRadiusServerChanged
☑ dot11StationAssociation
☑ dot11StationReAssociation
☑ dot11StationAuthentication
☑ dot11StationRequestFail
☑ dot11InterfaceAFail
☑ sntpServerFail
☑ dot1xMacAddrAuthFail
☑ dot1xAuthNotInitiated
☑ dot1xAuthSuccess
☑ localMacAddrAuthSuccess
☑ localMacAddrAuthFail
☑ dot1xAuthFail
☑ dot1xMacAddrAuthSuccess
☑ dot11InterfaceGFail

Trap Configuration – Allows selection of specific SNMP notifications to send. The following items are available:

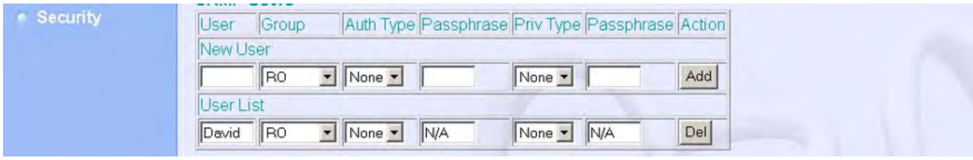
- sysSystemUp - The access point is up and running.
- sysSystemDown - The access point is about to shutdown and reboot.
- sysRadiusServerChanged - The access point has changed from the primary RADIUS server to the secondary, or from the secondary to the primary.
- dot11StationAssociation - A client station has successfully associated with the access point.
- dot11StationReAssociation - A client station has successfully re-associated with the access point.
- dot11StationAuthentication - A client station has been successfully authenticated.
- dot11StationRequestFail - A client station has failed association, re-association, or authentication.
- dot11InterfaceGFail - The 802.11b interface has failed.
- dot11InterfaceAFail - The 802.11a or 802.11g interface has failed.

- dot1xMacAddrAuthSuccess - A client station has successfully authenticated its MAC address with the RADIUS server.
- dot1xMacAddrAuthFail - A client station has failed MAC address authentication with the RADIUS server.
- dot1xAuthNotInitiated - A client station did not initiate 802.1X authentication.
- dot1xAuthSuccess - A 802.1X client station has been successfully authenticated by the RADIUS server.
- dot1xAuthFail - A 802.1X client station has failed RADIUS authentication.
- localMacAddrAuthSuccess - A client station has successfully authenticated its MAC address with the local database on the access point.
- localMacAddrAuthFail - A client station has failed authentication with the local MAC address database on the access point.
- sntpServerFail - The access point has failed to set the time from the configured SNTP server.

CONFIGURING SNMPV3 USERS

The access point allows up to 10 SNMP v3 users to be configured. Each user must be defined by a unique name, assigned to one of three pre-defined security groups, and configured with specific authentication and encryption settings.

Figure 21 Configuring SNMPv3 Users



User	Group	Auth Type	Passphrase	Priv Type	Passphrase	Action
New User						
	RO	None		None		Add
User List						
David	RO	None	N/A	None	N/A	Del

User – The SNMPv3 user name. (32 characters maximum)

Group – The SNMPv3 group name. (Options: RO, RWAuth, or RWPriv; Default: RO)

- RO – Read-only access.
- RWAuth – Read/write access with user authentication.
- RWPriv – Read/write access with both user authentication and data encryption.

Auth Type – The authentication type used for the SNMP user; either MD5 or none. When MD5 is selected, enter a password in the corresponding Passphrase field.

Priv Type – The data encryption type used for the SNMP user; either DES or none. When DES is selected, enter a key in the corresponding Passphrase field.

Passphrase – The password or key associated with the authentication and privacy settings. A minimum of eight plain text characters is required.

Action – Click the Add button to add a new user to the list. Click the edit button to change details of an existing user. Click the Del button to remove a user from the list.

NOTE: *Users must be assigned to groups that have the same security levels. For example, a user who has "Auth Type" and "Priv Type" configured to MD5 and DES respectively (that it, uses both authentication and data encryption) must be assigned to the RWPriv group. If this same user were instead assigned to the read-only (RO) group, the user would not be able to access the database.*

ADMINISTRATION

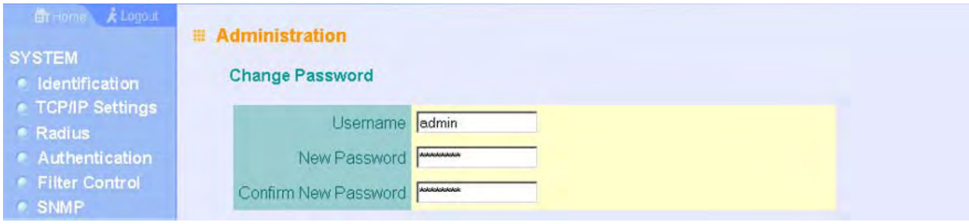
CHANGING THE PASSWORD

Management access to the web and CLI interface on the access point is controlled through a single user name and password. You can also gain additional access security by using control filters (see "Filter Control" on page 27).

To protect access to the management interface, you need to configure an Administrator's user name and password as soon as possible. If the user name and password are not configured, then anyone having access to the access point may be able to compromise access point and network security. Once a new Administrator has been configured, you can delete the default "admin" user name from the system.

NOTE: *Pressing the Reset button on the back of the access point for more than five seconds resets the user name and password to the factory defaults. For this reason, we recommend that you protect the access point from physical access by unauthorized persons.*

Figure 22 Administration



Administration

Change Password

Username	admin
New Password	********
Confirm New Password	********

Username – The name of the user. The default name is “admin.” (Length: 3-16 characters, case sensitive)

New Password – The password for management access. (Length: 3-16 characters, case sensitive)

Confirm New Password – Enter the password again for verification.

TELNET AND SSH SETTINGS

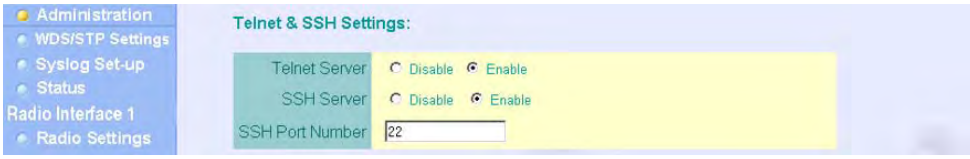
Telnet is a remote management tool that can be used to configure the access point from anywhere in the network. However, Telnet is not secure from hostile attacks. The Secure Shell (SSH) can act as a secure replacement for Telnet. The SSH protocol uses generated public keys to encrypt all data transfers passing between the access point and SSH-enabled management station clients and ensures that data traveling over the network arrives unaltered. Clients can then securely use the local user name and password for access authentication.

Note that SSH client software needs to be installed on the management station to access the access point for management via the SSH protocol.

NOTE: *The access point supports only SSH version 2.0.*

NOTE: *After boot up, the SSH server needs about two minutes to generate host encryption keys. The SSH server is disabled while the keys are being generated.*

Figure 23 Telnet and SSH Settings



Telnet & SSH Settings:

Telnet Server	○ Disable ● Enable
SSH Server	○ Disable ● Enable
SSH Port Number	22

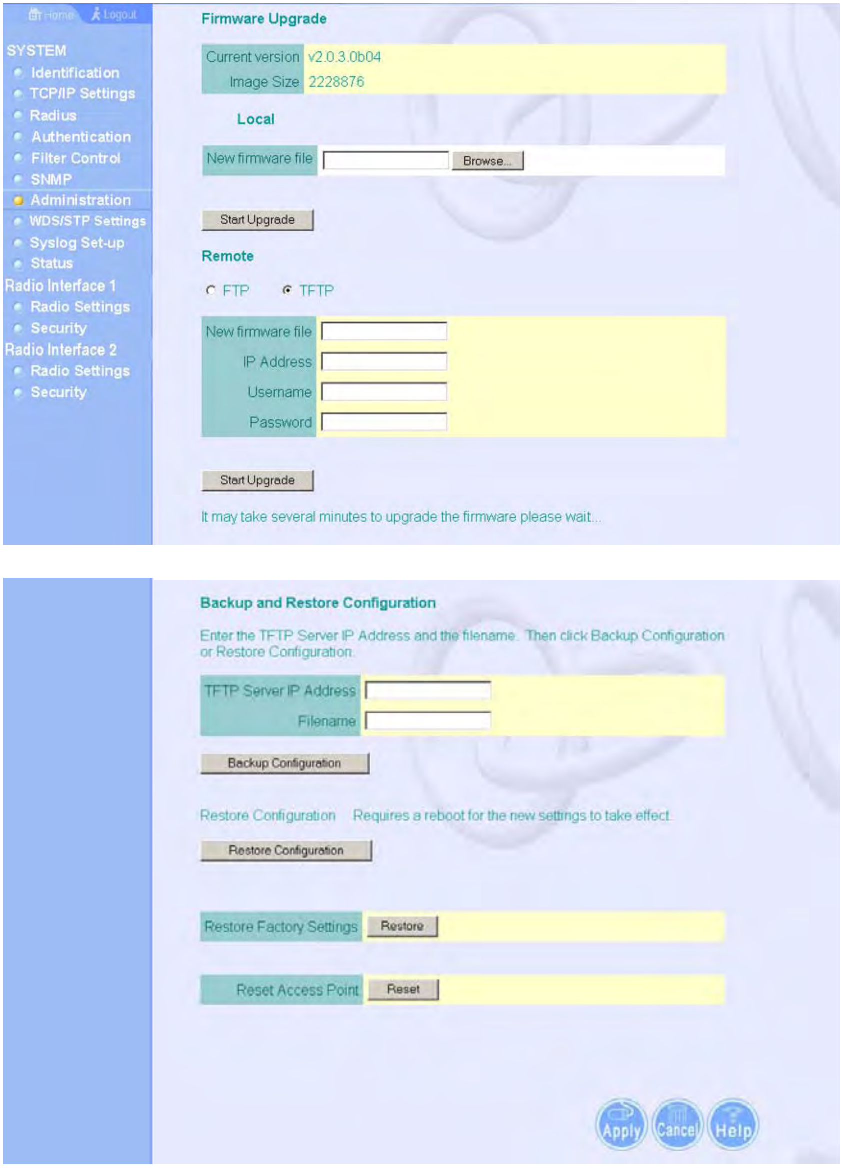
- Telnet Server Status: Enables or disables the Telnet server. (Default: Enabled)
- *SSH Server Status*: Enables or disables the SSH server. (Default: Enabled)
- *SSH Server Port*: Sets the UDP port for the SSH server. (Range: 1-65535; Default: 22)

UPGRADING FIRMWARE

You can upgrade new access point software from a local file on the management workstation, or from an TFTP server. New software may be provided periodically from your distributor.

After upgrading new software, you must reboot the access point to implement the new code. Until a reboot occurs, the access point will continue to run the software it was using before the upgrade started. Also note that new software that is incompatible with the current configuration automatically restores the access point to the factory default settings when first activated after a reboot.

Figure 24 Firmware Upgrade



Firmware Upgrade

Current version	v2.0.3.0b04
Image Size	2228876

Local

New firmware file

Remote

○ FTP ● TFTP

New firmware file

IP Address

Username

Password

It may take several minutes to upgrade the firmware please wait...

Backup and Restore Configuration

Enter the TFTP Server IP Address and the filename. Then click Backup Configuration or Restore Configuration.

TFTP Server IP Address

Filename

Restore Configuration Requires a reboot for the new settings to take effect.

Restore Factory Settings

Reset Access Point

Before upgrading new software, verify that the access point is connected to the network and has been configured with a compatible IP address and subnet mask.

If you need to download from an FTP or TFTP server, take the following additional steps:

- Obtain the IP address of the FTP or TFTP server where the access point software is stored.
- If upgrading from an FTP server, be sure that you have an account configured on the server with a user name and password.
- If VLANs are configured on the access point, determine the VLAN ID with which the FTP or TFTP server is associated, and then configure the management station, or the network port to which it is attached, with the same VLAN ID. If you are managing the access point from a wireless client, the VLAN ID for the wireless client must be configured on a RADIUS server.

Current version – Version number of runtime code.

Firmware Upgrade Local – Downloads an operation code image file from the web management station to the access point using HTTP. Use the Browse button to locate the image file locally on the management station and click Start Upgrade to proceed.

- New firmware file: Specifies the name of the code file on the server. The new firmware file name should not contain slashes (\ or /), the leading letter of the file name should not be a period (.), and the maximum length for file names is 32 characters for files on the access point. (Valid characters: A-Z, a-z, 0-9, “.”, “-”, “_”)

Firmware Upgrade Remote – Downloads an operation code image file from a specified remote FTP or TFTP server. After filling in the following fields, click Start Upgrade to proceed.

- New firmware file: Specifies the name of the code file on the server. The new firmware file name should not contain slashes (\ or /), the leading letter of the file name should not be a period (.), and the maximum length for file names on the FTP/TFTP server is 255 characters or 32 characters for files on the access point. (Valid characters: A-Z, a-z, 0-9, “.”, “-”, “_”)
- IP Address: IP address or host name of FTP or TFTP server.
- Username: The user ID used for login on an FTP server.
- Password: The password used for login on an FTP server.

Configuration File Backup/Restore – Uploads the current access point configuration file to a specified remote TFTP server. A configuration file can also be downloaded to the access point to restore a specific configuration.

- Config file: Specifies the name of the configuration file, which must always be “syscfg.” A path on the server can be specified using “/” in the name, providing the path already exists; for example, “myfolder/syscfg.” Other than to indicate a path, the file name must not contain any slashes (\ or /), the leading letter cannot be a period (.), and the maximum length for file names on the TFTP server is 255 characters. (Valid characters: A-Z, a-z, 0-9, “.”, “-”, “_”)

- IP Address: IP address or host name of the TFTP server.

Restore Factory Settings – Click the Restore button to reset the configuration settings for the access point to the factory defaults and reboot the system. Note that all user configured information will be lost. You will have to re-enter the default user name (admin) to re-gain management access to this device.

Reboot Access Point – Click the Reset button to reboot the system.

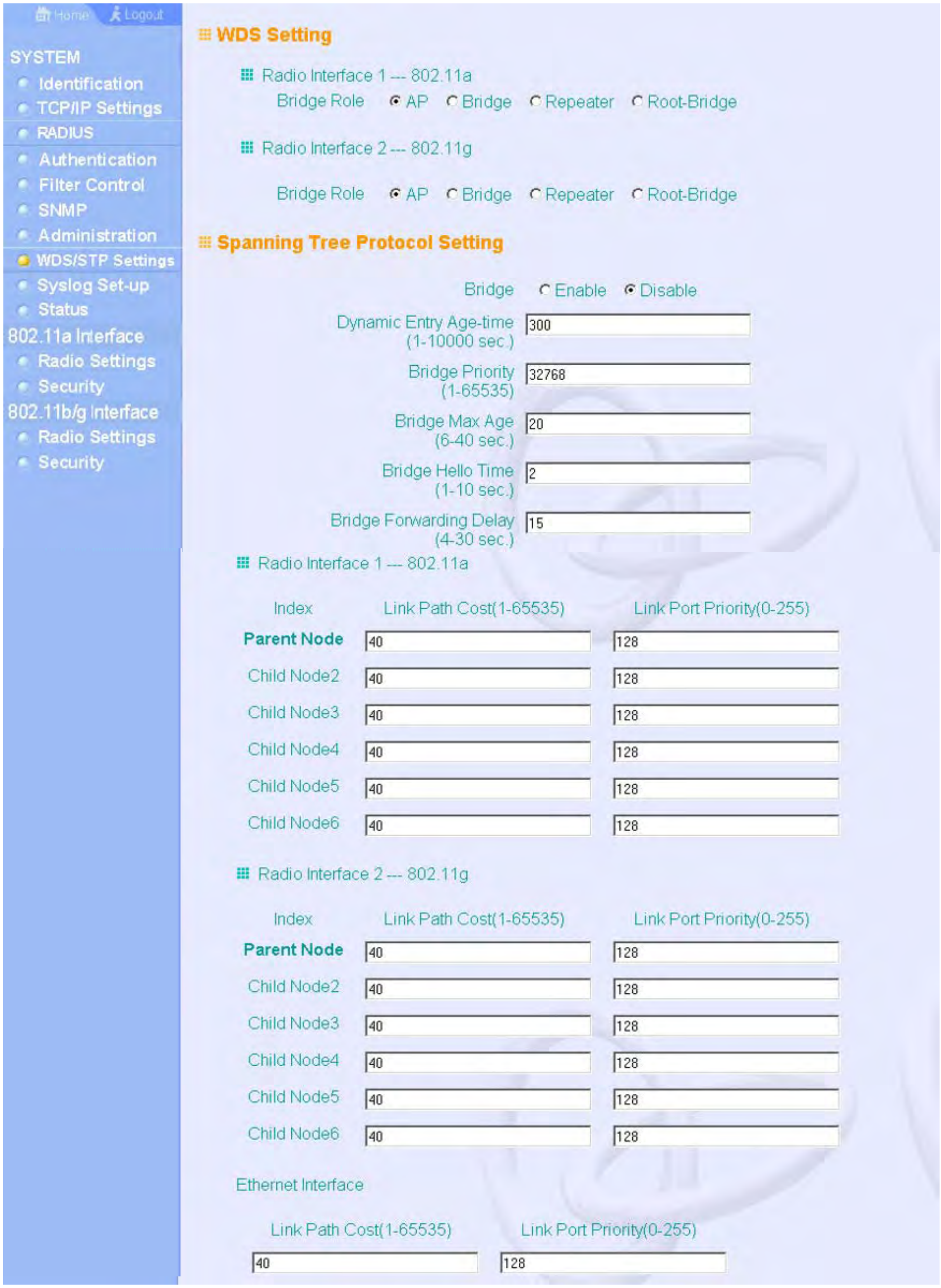
NOTE: *If you have upgraded system software, then you must reboot the access point to implement the new operation code. New software that is incompatible with the current configuration automatically restores the access point to default values when first activated after a reboot.*

WDS AND SPANNING TREE SETTINGS

Each access point radio interface can be configured to operate in a bridge or repeater mode, which allows it to forward traffic directly to other access point units. To set up bridge links between access point units, you must configure the wireless Distribution System (WDS) forwarding table by specifying the wireless MAC address of all units to which you want to forward traffic. Up to six WDS bridge or repeater links can be specified for each unit in the wireless bridge network.

The Spanning Tree Protocol (STP) can be used to detect and disable network loops, and to provide backup links between bridges. This allows a wireless bridge to interact with other bridging devices (that is, an STP-compliant switch, bridge or router) in your network to ensure that only one route exists between any two stations on the network, and provide backup links which automatically take over when a primary link goes down.

Figure 25 WDS and Spanning Tree Settings



WDS Setting

Radio Interface 1 --- 802.11a

Bridge Role ● AP ○ Bridge ○ Repeater ○ Root-Bridge

Radio Interface 2 --- 802.11g

Bridge Role ● AP ○ Bridge ○ Repeater ○ Root-Bridge

Spanning Tree Protocol Setting

Bridge ○ Enable ● Disable

Dynamic Entry Age-time (1-10000 sec.) 300

Bridge Priority (1-65535) 32768

Bridge Max Age (6-40 sec.) 20

Bridge Hello Time (1-10 sec.) 2

Bridge Forwarding Delay (4-30 sec.) 15

Radio Interface 1 --- 802.11a

Index	Link Path Cost(1-65535)	Link Port Priority(0-255)
Parent Node	40	128
Child Node2	40	128
Child Node3	40	128
Child Node4	40	128
Child Node5	40	128
Child Node6	40	128

Radio Interface 2 --- 802.11g

Index	Link Path Cost(1-65535)	Link Port Priority(0-255)
Parent Node	40	128
Child Node2	40	128
Child Node3	40	128
Child Node4	40	128
Child Node5	40	128
Child Node6	40	128

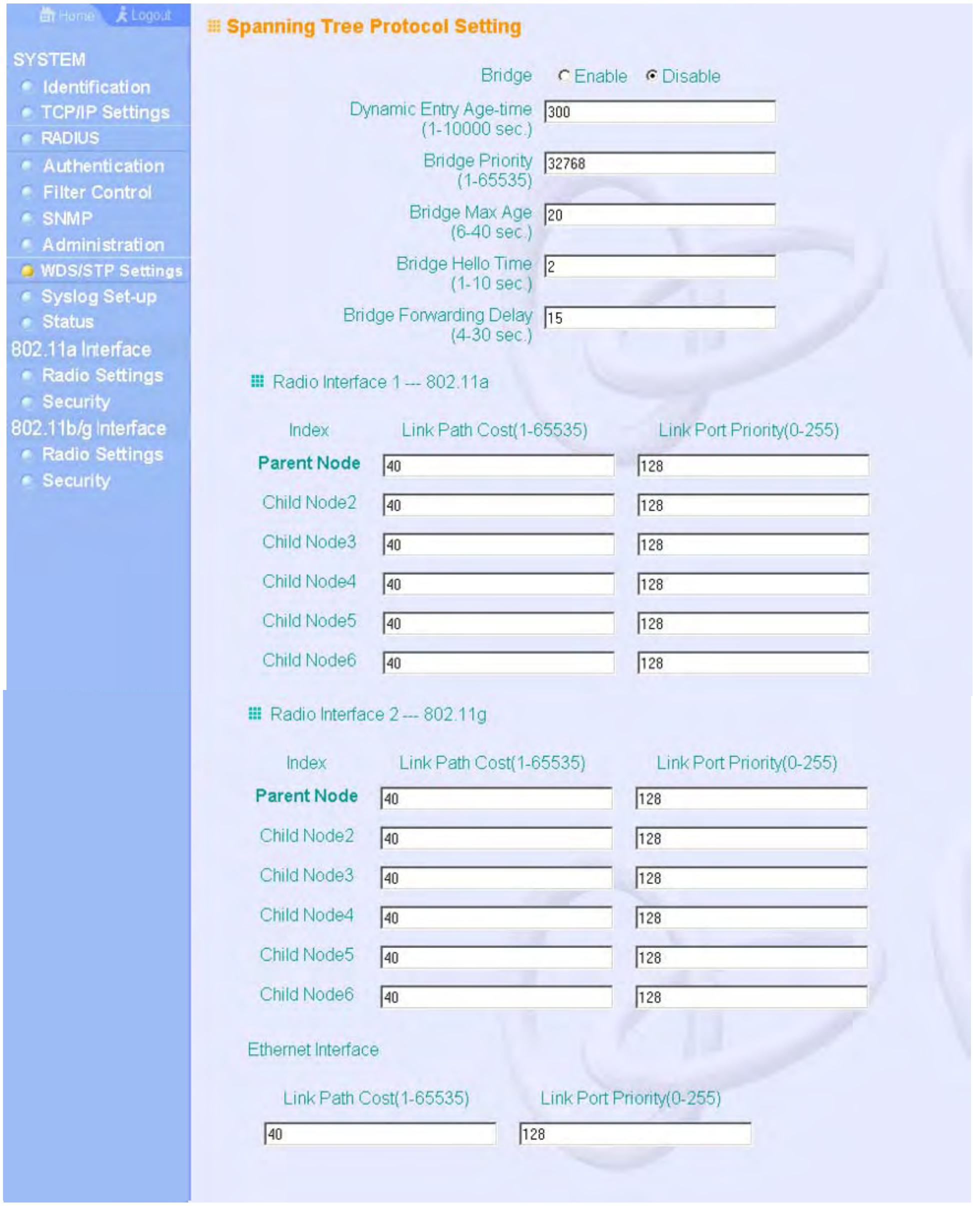
Ethernet Interface

Link Path Cost(1-65535)	Link Port Priority(0-255)
40	128

WDS Bridge – Up to six WDS bridge or repeater links (MAC addresses) per radio interface can be specified for each unit in the wireless bridge network. One unit only must be configured as the “root bridge” in the wireless network. The root bridge is the unit connected to the main core of the wired LAN. Other bridges need to specify one “Parent” link to the root bridge or to a bridge connected to the root bridge. The other five WDS links are available as “Child” links to other bridges.

- *Bridge Role* – Each radio interface can be set to operate in one of the following four modes: (Default: AP)
  - AP (Access Point): Operates as an access point for wireless clients, providing connectivity to a wired LAN.
  - Bridge: Operates as a bridge to other access points. The “Parent” link to the root bridge must be configured. Up to five other “Child” links are available to other bridges.
  - Repeater: Operates as a wireless repeater, extending the range for remote wireless clients and connecting them to the root bridge. The “Parent” link to the root bridge must be configured. In this mode, traffic is not forwarded to the Ethernet port from the radio interface.
  - Root Bridge: Operates as the root bridge in the wireless bridge network. Up to six ”Child” links are available to other bridges in the network.
- *Bridge Parent* – The physical layer address of the root bridge unit or the bridge unit connected to the root bridge. (12 hexadecimal digits in the form ”xx-xx-xx-xx-xx-xx”)
- *Bridge Child* – The physical layer address of other bridge units for which this unit serves as the bridge parent or the root bridge. Note that the first entry under the list of child nodes is reserved for the root bridge, and can only be configured if the role is set to “Root Bridge.” (12 hexadecimal digits in the form ”xx-xx-xx-xx-xx-xx”)

Figure 26 Spanning Tree Protocol



Spanning Tree Protocol Setting

Bridge	○ Enable ● Disable
Dynamic Entry Age-time (1-10000 sec.)	300
Bridge Priority (1-65535)	32768
Bridge Max Age (6-40 sec.)	20
Bridge Hello Time (1-10 sec.)	2
Bridge Forwarding Delay (4-30 sec.)	15

Radio Interface 1 --- 802.11a

Index	Link Path Cost(1-65535)	Link Port Priority(0-255)
Parent Node	40	128
Child Node2	40	128
Child Node3	40	128
Child Node4	40	128
Child Node5	40	128
Child Node6	40	128

Radio Interface 2 --- 802.11g

Index	Link Path Cost(1-65535)	Link Port Priority(0-255)
Parent Node	40	128
Child Node2	40	128
Child Node3	40	128
Child Node4	40	128
Child Node5	40	128
Child Node6	40	128

Ethernet Interface

Link Path Cost(1-65535)	Link Port Priority(0-255)
40	128

Spanning Tree Protocol – STP uses a distributed algorithm to select a bridging device (STP-compliant switch, bridge or router) that serves as the root of the spanning tree network. It selects a root port on each bridging device (except for the root device) which incurs the lowest path cost when forwarding a packet from that device to the root device. Then it selects a designated bridging device from each LAN which incurs the lowest path cost when forwarding a packet from that LAN to the root device. All ports connected to designated bridging devices are assigned as designated ports. After determining the lowest cost spanning tree, it enables all root ports and designated ports, and disables all other ports. Network packets are therefore only forwarded between root ports and designated ports, eliminating any possible network loops.

Once a stable network topology has been established, all bridges listen for Hello BPDUs (Bridge Protocol Data Units) transmitted from the root bridge. If a bridge does not get a Hello BPDU after a predefined interval (Maximum Age), the bridge assumes that the link to the root bridge is down. This bridge will then initiate negotiations with other bridges to reconfigure the network to reestablish a valid network topology.

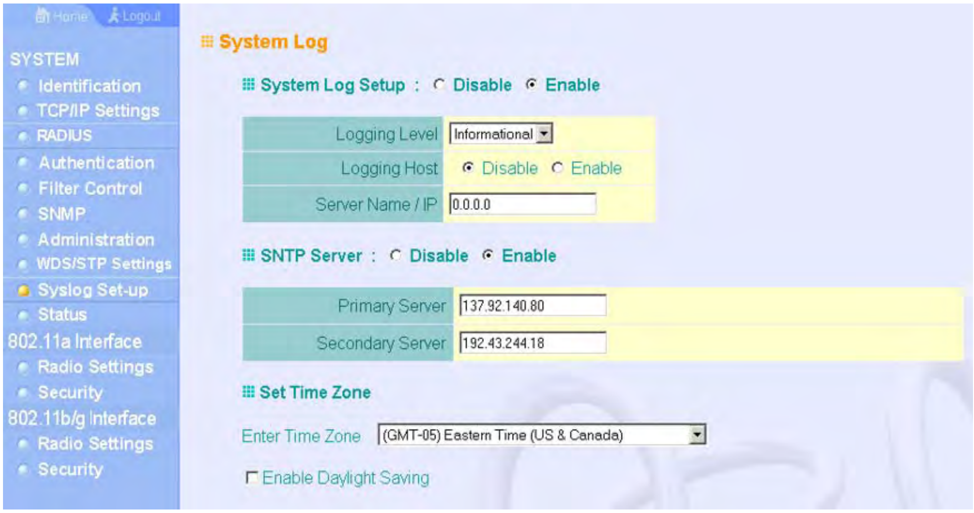
- *Bridge* – Enables/disables STP on the wireless bridge or repeater. (Default: Disabled)
- *Bridge Priority* – Used in selecting the root device, root port, and designated port. The device with the highest priority becomes the STP root device. However, if all devices have the same priority, the device with the lowest MAC address will then become the root device. (Note that lower numeric values indicate higher priority.)
  - Range: 0-65535
  - Default: 32768
- *Bridge Max Age* – The maximum time (in seconds) a device can wait without receiving a configuration message before attempting to reconfigure. All device ports (except for designated ports) should receive configuration messages at regular intervals. Any port that ages out STP information (provided in the last configuration message) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the device ports attached to the network. (Range: 6-40 seconds)
  - Default: 20
  - Minimum: The higher of 6 or [2 x (Hello Time + 1)].
  - Maximum: The lower of 40 or [2 x (Forward Delay - 1)]
- *Bridge Hello Time* – Interval (in seconds) at which the root device transmits a configuration message. (Range: 1-10 seconds)
  - Default: 2
  - Minimum: 1
  - Maximum: The lower of 10 or [(Max. Message Age / 2) -1]

- *Bridge Forwarding Delay* – The maximum time (in seconds) this device waits before changing states (i.e., discarding to learning to forwarding). This delay is required because every device must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a discarding state; otherwise, temporary data loops might result. (Range: 4-30 seconds)
  - Default: 15
  - Minimum: The higher of 4 or [(Max. Message Age / 2) + 1]
  - Maximum: 30
- *Link Path Cost* – This parameter is used by the STP to determine the best path between devices. Therefore, lower values should be assigned to ports attached to faster media, and higher values assigned to ports with slower media. (Path cost takes precedence over port priority.)
  - Range: 1-65535
  - Default: Ethernet interface: 19; Wireless interface: 40
- *Link Port Priority* – Defines the priority used for this port in the Spanning Tree Protocol. If the path cost for all ports on a switch are the same, the port with the highest priority (i.e., lowest value) will be configured as an active link in the spanning tree. This makes a port with higher priority less likely to be blocked if the Spanning Tree Protocol is detecting network loops. Where more than one port is assigned the highest priority, the port with lowest numeric identifier will be enabled.
  - Default: 128
  - Range: 0-240, in steps of 16

SYSTEM LOG

The access point can be configured to send event and error messages to a System Log Server. The system clock can also be synchronized with a time server, so that all the messages sent to the Syslog server are stamped with the correct time and date.

Figure 27 System Log



System Log

System Log Setup : ○ Disable ● Enable

Logging Level	Informational
Logging Host	● Disable ○ Enable
Server Name / IP	0.0.0.0

SNTP Server : ○ Disable ● Enable

Primary Server	137.92.140.80
Secondary Server	192.43.244.18

Set Time Zone

Enter Time Zone (GMT-05) Eastern Time (US & Canada)

□ Enable Daylight Saving

ENABLING SYSTEM LOGGING

The access point supports a logging process that can control error messages saved to memory or sent to a Syslog server. The logged messages serve as a valuable tool for isolating access point and network problems.

System Log Setup – Enables the logging of error messages. (Default: Disable)

Logging Level – Sets the minimum severity level for event logging. (Default:Informational)

Logging Host – Enables the sending of log messages to a Syslog server host. Up to four Syslog servers are supported on the access point. (Default: Disable)

Server Name / IP – Specifies a Syslog server name or IP address. (Default: 0.0.0.0)

SNTP Server – Enables the sending of log messages to a Syslog server host. (Default: Disable)
Primary Server – The IP address the primary Syslog server. (Default: 0.0.0.0)

Secondary Server – The IP address the secondary Syslog server. (Default: 0.0.0.0)

Enter Time Zone – Sets the desired time zone + or - GMT.

Enable Daylight Saving – Adjusts the clock for summertime and wintertime.

The system allows you to limit the messages that are logged by specifying a minimum severity level. The following table lists the error message levels from the most severe (Emergency) to least severe (Debug). The message levels that are logged include the specified minimum level up to the Emergency level.

Table 2 Logging Levels

Error Level	**Description**
Emergency	System unusable
Alerts	Immediate action needed
Critical	Critical conditions (e.g., memory allocation, or free memory error - resource exhausted)
Error	Error conditions (e.g., invalid input, default used)
Warning	Warning conditions (e.g., return false, unexpected return)
Notice	Normal but significant condition, such as cold start
Informational	Informational messages only
Debug	Debugging messages

NOTE: *The access point error log can be viewed using the Event Logs window in the Status section (page 4-74). The Event Logs window displays the last 128 messages logged in chronological order, from the newest to the oldest. Log messages saved in the access point's memory are erased when the device is rebooted.*

CONFIGURING SNTP

Simple Network Time Protocol (SNTP) allows the access point to set its internal clock based on periodic updates from a time server (SNTP or NTP). Maintaining an accurate time on the access point enables the system log to record meaningful dates and times for event entries. If the clock is not set, the access point will only record the time from the factory default set at the last bootup.

The access point acts as an SNTP client, periodically sending time synchronization requests to specific time servers. You can configure up to two time server IP addresses. The access point will attempt to poll each server in the configured sequence.

SNTP Server – Configures the access point to operate as an SNTP client. When enabled, at least one time server IP address must be specified.

- Primary Server: The IP address of an SNTP or NTP time server that the access point attempts to poll for a time update.

- Secondary Server: The IP address of a secondary SNTP or NTP time server. The access point first attempts to update the time from the primary server; if this fails it attempts an update from the secondary server.

NOTE: *The access point also allows you to disable SNTP and set the system clock manually.*

Set Time Zone – SNTP uses Coordinated Universal Time (or UTC, formerly Greenwich Mean Time, or GMT) based on the time at the Earth’s prime meridian, zero degrees longitude. To display a time corresponding to your local time, you must indicate the number of hours your time zone is located before (east) or after (west) UTC.

Enable Daylight Saving – The access point provides a way to automatically adjust the system clock for Daylight Savings Time changes. To use this feature you must define the month and date to begin and to end the change from standard time. During this period the system clock is set back by one hour.

RADIO INTERFACE

The IEEE 802.11a and 802.11g interfaces include configuration options for radio signal characteristics and wireless security features. The configuration options are nearly identical, and are therefore both covered in this section of the manual.

The access point can operate in three modes, IEEE 802.11a only, 802.11b/g only, or a mixed 802.11a/b/g mode. Also note that 802.11g is backward compatible with 802.11b. These interfaces are configured independently under the following web pages:

- 802.11a Interface
- 802.11b/g Interface

Each radio supports up to four virtual access point (VAP) interfaces numbered 1to 4. Each VAP functions as a separate access point, and can be configured with its own Service Set Identification (SSID) and security settings. However, most radio signal parameters apply to all four VAP interfaces.

The VAPs function similar to a VLAN, with each VAP mapped to its own VLAN ID. Traffic to specific VAPs can be segregated based on user groups or application traffic.

***NOTE:** The 8760 Access Point ships from the factory enabled only for channels allowed in the US/Canada. If you live in an area where additional channels are allowed, go to the 3Com web site (http://www.3com.com) and download the latest software that will allow additional channels in your country.*

802.11A INTERFACE

The IEEE 802.11a interface operates within the 5 GHz band, at up to 54 Mbps in normal mode or up to 108 Mbps in Turbo mode.

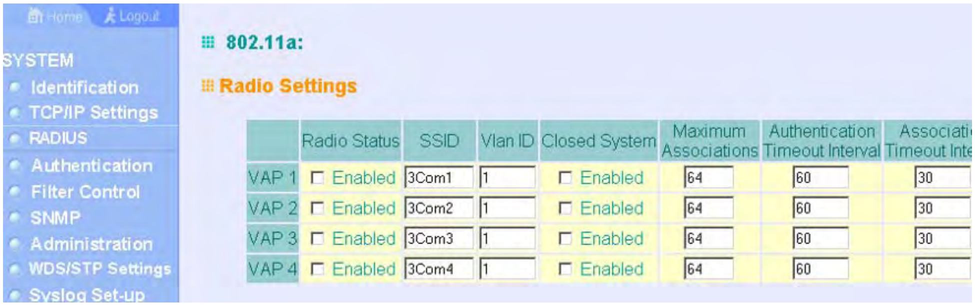
First configure the radio settings that apply to the individual VAPs (Virtual Access Point) and the common radio settings that apply to the overall system. After you have configured the radio settings, go to the Security page under the 802.11a Interface (See "Security" on page 62.), enable the radio service for any of the VAP interfaces, and then set an SSID to identify the wireless network service provided by each VAP. Remember that only clients with the same SSID can associate with a VAP.

***NOTE:** You must first select a country before the wireless interfaces are enabled.*

Configuring Radio Settings

To configure VAP radio settings, select the Radio Settings page.

Figure 28 Radio Settings A



	Radio Status	SSID	Vlan ID	Closed System	Maximum Associations	Authentication Timeout Interval	Associati Timeout Inte
VAP 1	☐ Enabled	3Com1	1	☐ Enabled	64	60	30
VAP 2	☐ Enabled	3Com2	1	☐ Enabled	64	60	30
VAP 3	☐ Enabled	3Com3	1	☐ Enabled	64	60	30
VAP 4	☐ Enabled	3Com4	1	☐ Enabled	64	60	30

Radio Status – Displays if the radio is enabled or disabled for this VAP.

***NOTE:** You must first enable VAP interface 1 before you can enable other VAP interfaces.*

SSID – The name of the basic service set provided by a VAP interface. Clients that want to connect to the network through the access point must set their SSID to the same as that of an access point VAP interface. (Default: 3Com1 to 3Com4 for 802.11a, 3Com5 to 3Com8 for 802.11b/g; Range: 1-32 characters)

Default VLAN ID – The VLAN ID assigned to wireless clients associated to the VAP interface that are not assigned to a specific VLAN by RADIUS server configuration. (Default: 1)

Closed System – When enabled, the VAP interface does not include its SSID in beacon messages. Nor does it respond to probe requests from clients that do not include a fixed SSID. (Default: Disable)

Maximum Associations – This command configures the maximum number of clients that can be associated with the access point at the same time.

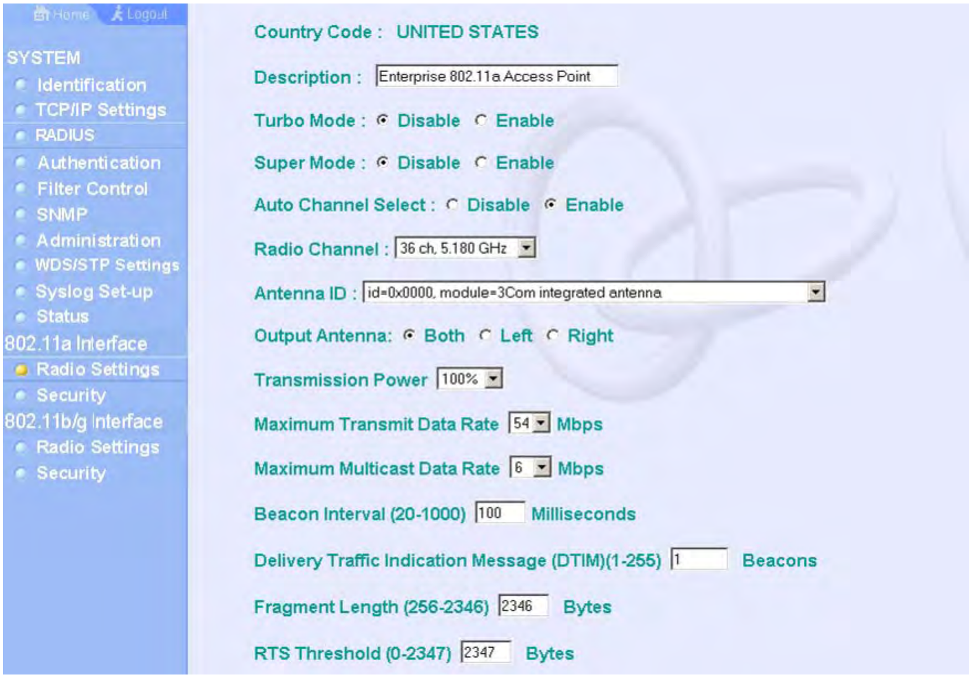
Authentication Timeout Interval – The time within which the client should finish authentication before authentication times out. (Range: 5-60 minutes; Default: 60 minutes)

Association Timeout Interval – The idle time interval (when no frames are sent) after which a client is disassociated from the VAP interface. (Range: 5-60 minutes; Default: 30 minutes)

Configuring Common Radio Settings

To configure common radio settings, select the Radio Settings page, and scroll down to below the VAP radio settings.

Figure 29 Radio Settings A and B/G



Country Code : UNITED STATES

Description : Enterprise 802.11a Access Point

Turbo Mode : ● Disable ○ Enable

Super Mode : ● Disable ○ Enable

Auto Channel Select : ○ Disable ● Enable

Radio Channel : 36 ch, 5.180 GHz

Antenna ID : id=0x0000, module=3Com integrated antenna

Output Antenna: ● Both ○ Left ○ Right

Transmission Power 100%

Maximum Transmit Data Rate 54 Mbps

Maximum Multicast Data Rate 6 Mbps

Beacon Interval (20-1000) 100 Milliseconds

Delivery Traffic Indication Message (DTIM)(1-255) 1 Beacons

Fragment Length (256-2346) 2346 Bytes

RTS Threshold (0-2347) 2347 Bytes

Country Code – The current country code setting. This setting restricts operation of the access point to radio channels and transmit power levels permitted for wireless networks in the specified country.

Description – Adds a comment or description to the wireless interface. (Range: 1-80 characters)

Turbo Mode – The normal 802.11a wireless operation mode provides connections up to 54 Mbps. Turbo Mode is an enhanced mode (not regulated in IEEE 802.11a) that provides a higher data rate of up to 108 Mbps. Enabling Turbo Mode allows the access point to provide connections up to 108 Mbps. (Default: Disabled)

NOTE: *In normal mode, the access point provides a channel bandwidth of 20 MHz, and supports the maximum number of channels permitted by local regulations (e.g., 13 channels for the United States). In Turbo Mode, the channel bandwidth is increased to 40 MHz to support the increased data rate. However, this reduces the number of channels supported (e.g., 5 channels for the United States).*

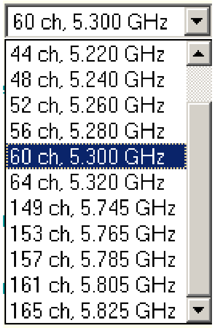
NOTE: *.Check your country's regulations to see if Turbo Mode is allowed.*

Super Mode – The Atheros proprietary Super A performance enhancements are supported by the access point. These enhancements include bursting, compression, and fast frames. Maximum throughput ranges between 40 to 60 Mbps for connections to Atheros-compatible clients. (Default: Disabled)

Auto Channel Select – Enables the access point to automatically select an unoccupied radio channel. (Default: Enabled)

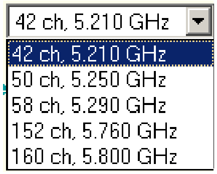
NOTE: *Check your country's regulations to see if Auto Channel can be disabled.*

Normal Mode



Radio Channel – The radio channel that the access point uses to communicate with wireless clients. When multiple access points are deployed in the same area, set the channel on neighboring access points at least four channels apart to avoid interference with each other. For example, in the United States you can deploy up to four access points in the same area (e.g., channels 36, 56, 149, 165). Also note that the channel for wireless clients is automatically set to the same as that used by the access point to which it is linked. (Default: Channel 60 for normal mode, and channel 42 for Turbo mode)

Turbo Mode



Antenna ID – Selects the antenna to be used by the access point; either the included diversity antennas or an optional external antenna. The optional external antennas that are certified for use with the access point are listed in the drop-down menu. Selecting the correct antenna ID ensures that the access point's radio transmissions are within regulatory power limits for the country of operation. (Default: 3Com Integrated Antenna)

NOTE: *The Antenna ID must be selected in conjunction with the Output Antenna to configure proper use of any of the antenna options.*

Output Antenna – Selects the use of both fixed antennas operating in diversity mode or a single antenna. (Default: Diversity)

- Both: The radio uses both antennas in a diversity system. Select this method when the Antenna ID is set to "3Com Integrated Antenna" to use the access point's integrated antennas.
- Right: The radio only uses the antenna on the right side (the side closest to the access point LEDs). Select this method when using an optional external antenna that is connected to the right antenna connector.
- Left: The radio only uses the antenna on the left side (the side farthest from the access point LEDs). Select this method when using an optional external antenna that is connected to the left antenna connector.

Transmit Power – Adjusts the power of the radio signals transmitted from the access point. The higher the transmission power, the farther the transmission range. Power selection is not just a trade off between coverage area and maximum supported clients. You also have to ensure that high-power signals do not interfere with the operation of other radio devices in the service area. (Options: 100%, 50%, 25%, 12%, minimum; Default: 100%)

NOTE: *When operating the access point using 5 GHz channels in a European Community country, the end user and installer are obligated to operate the device in accordance with European regulatory requirements for Transmit Power Control (TPC).*

Maximum Transmit Data Rate – The maximum data rate at which the access point transmits unicast packets on the wireless interface. The maximum transmission distance is affected by the data rate. The lower the data rate, the longer the transmission distance. (Options: 54, 48, 36, 24 Mbps; Default: 54 Mbps)

Maximum Multicast Data Rate – The maximum data rate at which the access point transmits multicast and broadcast packets on the wireless interface. (Options: 24, 12, 6 Mbps; Default: 6 Mbps)

Beacon Interval – The rate at which beacon signals are transmitted from the access point. The beacon signals allow wireless clients to maintain contact with the access point. They may also carry power-management information. (Range: 20-1000 TUs; Default: 100 TUs)

Delivery Traffic Indication Message (DTIM) – The rate at which stations in sleep mode must wake up to receive broadcast/multicast transmissions.

The DTIM interval indicates how often the MAC layer forwards broadcast/multicast traffic, which is necessary to wake up stations that are using Power Save mode. The default value of 1 indicates that the access point will save all broadcast/multicast frames for the Basic Service Set (BSS) and forward them after every beacon. Using smaller DTIM intervals delivers broadcast/multicast frames in a more timely manner, causing stations in Power Save mode to wake up more often and drain power faster. Using higher DTIM values reduces the power used by stations in Power Save mode, but delays the transmission of broadcast/multicast frames.
(Range: 1-255 beacons; Default: 1 beacon)

Fragment Length (256~2346)– Configures the minimum packet size that can be fragmented when passing through the access point. Fragmentation of the PDUs (Package Data Unit) can increase the reliability of transmissions because it increases the probability of a successful transmission due to smaller frame size. If there is significant interference present, or collisions due to high network utilization, try setting the fragment size to send smaller fragments. This will speed up the retransmission of smaller frames. However, it is more efficient to set the fragment size larger if very little or no interference is present because it requires overhead to send multiple frames. (Range: 256-2346 bytes; Default: 2346 bytes)

RTS Threshold – Sets the packet size threshold at which a Request to Send (RTS) signal must be sent to a receiving station prior to the sending station starting communications. The access point sends RTS frames to a receiving station to negotiate the sending of a data frame. After receiving an RTS frame, the station sends a CTS (clear to send) frame to notify the sending station that it can start sending data.

If the RTS threshold is set to 0, the access point always sends RTS signals. If set to 2347, the access point never sends RTS signals. If set to any other value, and the packet size equals or exceeds the RTS threshold, the RTS/CTS (Request to Send / Clear to Send) mechanism will be enabled.

The access points contending for the medium may not be aware of each other. The RTS/CTS mechanism can solve this “Hidden Node Problem.” (Range: 0-2347 bytes: Default: 2347 bytes)

802.11B/G INTERFACE

The IEEE 802.11g standard operates within the 2.4 GHz band at up to 54 Mbps. Also note that because the IEEE 802.11g standard is an extension of the IEEE 802.11b standard, it allows clients with 802.11b wireless network cards to associate to an 802.11g access point.

First configure the radio settings that apply to the individual VAPs (Virtual Access Point) and the common radio settings that apply to all of the 802.11g interfaces. After you have configured the radio settings, enable the radio service for any of the VAP interfaces, and then set an SSID to identify the wireless network service provided by each VAP. Remember that only clients with the same SSID can associate with a VAP.

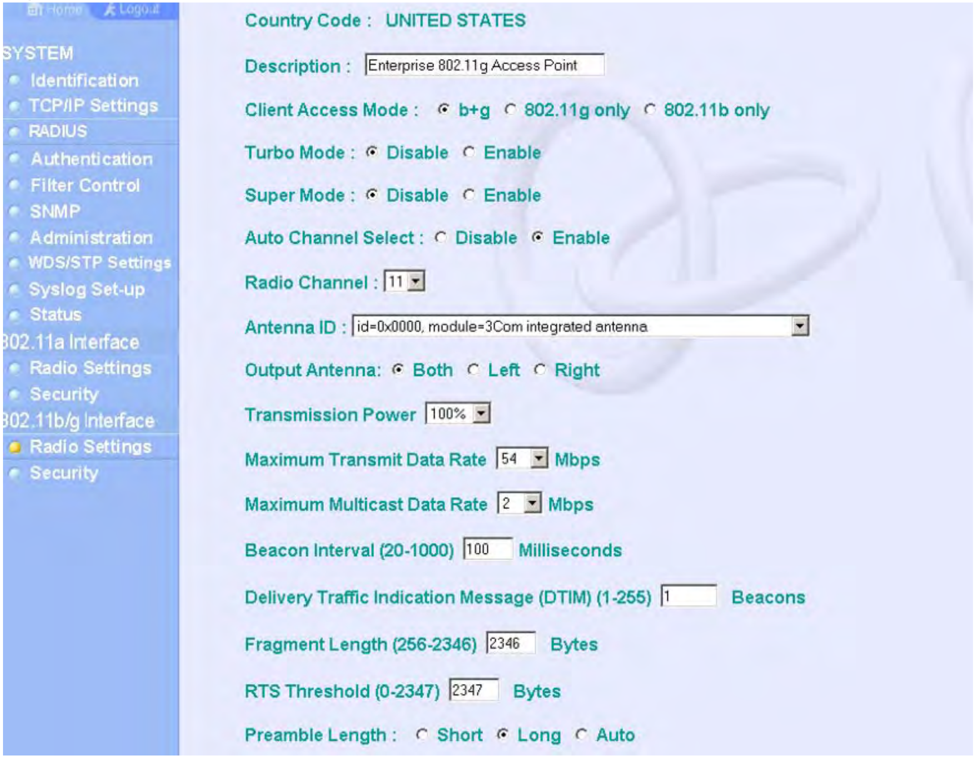
***NOTE:** You must first select a country of operation before interfaces can be enabled.*

Most of the 802.11g commands are identical to those used by the 802.11a interface. For information on the these commands, refer to the following sections:

- "Configuring Radio Settings" on page 49
- "Configuring Rogue AP Detection" on page 73
- "Configuring Common Radio Settings" on page 51
- "Configuring Wi-Fi Multimedia" on page 80

Only the radio settings specific to the 802.11g interface are included in this section. To configure the 802.11g radio settings, select the Radio Settings page.

Figure 30 Radio Settings B/G



Country Code : UNITED STATES

Description : Enterprise 802.11g Access Point

Client Access Mode : ● b+g ○ 802.11g only ○ 802.11b only

Turbo Mode : ● Disable ○ Enable

Super Mode : ● Disable ○ Enable

Auto Channel Select : ○ Disable ● Enable

Radio Channel : 11

Antenna ID : id=0x0000, module=3Com integrated antenna

Output Antenna: ● Both ○ Left ○ Right

Transmission Power 100%

Maximum Transmit Data Rate 54 Mbps

Maximum Multicast Data Rate 2 Mbps

Beacon Interval (20-1000) 100 Milliseconds

Delivery Traffic Indication Message (DTIM) (1-255) 1 Beacons

Fragment Length (256-2346) 2346 Bytes

RTS Threshold (0-2347) 2347 Bytes

Preamble Length : ○ Short ● Long ○ Auto

Client Access Mode – Selects the operating mode for the 802.11g wireless interface. (Default: 802.11b+g)

- 802.11b+g: Both 802.11b and 802.11g clients can communicate with the access point (up to 54 Mbps).
- 802.11b only: Both 802.11b and 802.11g clients can communicate with the access point, but 802.11g clients can only transfer data at 802.11b standard rates (up to 11 Mbps).
- 802.11g only: Only 802.11g clients can communicate with the access point (up to 54 Mbps).

Turbo Mode – The normal 802.11g wireless operation mode provides connections up to 54 Mbps. Turbo Mode is an enhanced proprietary mode (Atheros 802.11g Turbo) that provides a higher data rate of up to 108 Mbps. Enabling Turbo mode allows the access point to provide connections up to 108 Mbps to Atheros-compatible clients.

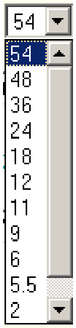
***NOTE:** In normal mode, the access point supports the maximum number of channels permitted by local regulations (e.g., 11 channels for the United States). In Turbo mode, channel bonding is used to provide the increased data rate. However, this reduces the number of channels available to one (Channel 6).*

Super Mode – The Atheros proprietary Super G performance enhancements are supported by the access point. These enhancements include bursting, compression, fast frames and dynamic turbo. Maximum throughput ranges between 40 to 60 Mbps for connections to Atheros-compatible clients. (Default: Disabled)

Radio Channel – The radio channel that the access point uses to communicate with wireless clients. When multiple access points are deployed in the same area, set the channel on neighboring access points at least five channels apart to avoid interference with each other. For example, in the United States you can deploy up to three access points in the same area (e.g., channels 1, 6, 11). Also note that the channel for wireless clients is automatically set to the same as that used by the access point to which it is linked. (Range: 1-11; Default: 1)

Auto Channel Select – Enables the access point to automatically select an unoccupied radio channel. (Default: Enabled)

Maximum Transmit Data Rate – The maximum data rate at which the access point transmits unicast packets on the wireless interface. The maximum transmission distance is affected by the data rate. The lower the data rate, the longer the transmission distance. (Default: 54 Mbps)



Preamble Length – Sets the length of the signal preamble that is used at the start of a data transmission. (Default: Long)

- Short: Sets the preamble to short (96 microseconds). Using a short preamble can increase data throughput.
- Long: Sets the preamble to long (192 microseconds). Using a long preamble ensures the access point can support all 802.11b and 802.11g clients.
- Auto: Sets the preamble according to the capability of clients that are currently asscociated. Uses a short preamble (96 microseconds) if all associated clients can support it, otherwise a long preamble is used. The access point can increase data throughput when using a short preamble, but will only use a short preamble if it determines that all associated clients support it.

CONFIGURING WI-FI MULTIMEDIA

Wireless networks offer an equal opportunity for all devices to transmit data from any type of application. Although this is acceptable for most applications, multimedia applications (with audio and video) are particularly sensitive to the delay and throughput variations that result from this equal opportunity wireless access method. For multimedia applications to run well over a wireless network, a Quality of Service (QoS) mechanism is required to prioritize traffic types and provide an enhanced opportunityî wireless access method.

The access point implements QoS using the Wi-Fi Multimedia (WMM) standard. Using WMM, the access point is able to prioritize traffic and optimize performance when multiple applications compete for wireless network bandwidth at the same time. WMM employs techniques that are a subset of the developing IEEE 802.11e QoS standard and it enables the access point to inter operate with both WMMenabled clients and other devices that may lack any WMM functionality.

Access Categories – WMM defines four access categories (ACs): voice, video, best effort, and background. These categories correspond to traffic priority levels and are mapped to IEEE 802.1D priority tags. The direct mapping of the four ACs to 802.1D priorities is specifically intended to facilitate inter operability with other wired network QoS policies. While the four ACs are specified for specific types of traffic, WMM allows the priority levels to be configured to match any network-wide QoS policy. WMM also specifies a protocol that access points can use to communicate the configured traffic priority levels to QoS-enabled wireless clients.

Table 3 WMM Access Categories

WMM Access Categories			
Access Category	WMM Designation	Description	802.1D Tags
AC_VO (AC3)	Voice	Highest priority, minimum delay. Time-sensitive data such as VoIP (Voice over IP) calls.	7, 6
AC_VI (AC2)	Video	High priority, minimum delay. Time-sensitive data such as streaming video.	5, 4

WMM Access Categories

Access Category	WMM Designation	Description	802.1D Tags
AC_BE (AC0)	Best Effort	Normal priority, medium delay and throughput. Data only affected by long delays. Data from applications or devices that lack QoS capabilities.	0, 3
AC_BK (AC1)	Background	Lowest priority. Data with no delay or throughput requirements, such as bulk data transfers.	2, 1

WMM Operation – WMM uses traffic priority based on the four ACs; Voice, Video, Best Effort, and Background. The higher the AC priority, the higher the probability that data is transmitted.

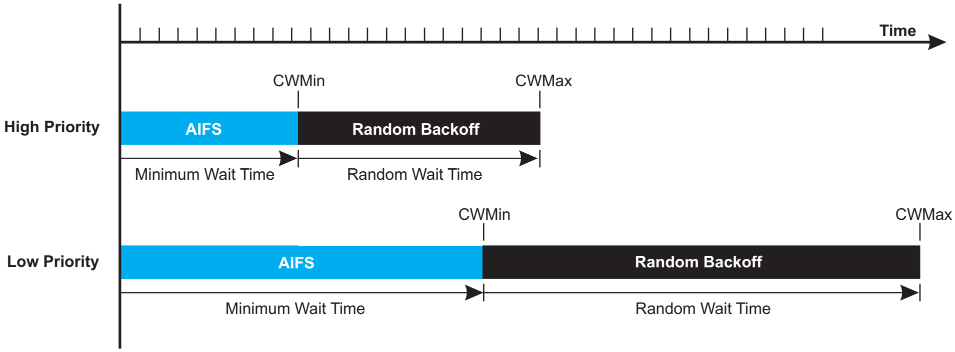
When the access point forwards traffic, WMM adds data packets to four independent transmit queues, one for each AC, depending on the 802.1D priority tag of the packet. Data packets without a priority tag are always added to the Best Effort AC queue. From the four queues, an internal “virtual” collision resolution mechanism first selects data with the highest priority to be granted a transmit opportunity. Then the same collision resolution mechanism is used externally to determine which device has access to the wireless medium.

For each AC queue, the collision resolution mechanism is dependent on two timing parameters:

- AIFSN (Arbitration Inter-Frame Space Number), a number used to calculate the minimum time between data frames
- CW (Contention Window), a number used to calculate a random backoff time

After a collision detection, a backoff wait time is calculated. The total wait time is the sum of a minimum wait time (Arbitration Inter-Frame Space, or AIFS) determined from the AIFSN, and a random backoff time calculated from a value selected from zero to the CW. The CW value varies within a configurable range. It starts at CWMin and doubles after every collision up to a maximum value, CWMax. After a successful transmission, the CW value is reset to its CWMin value.

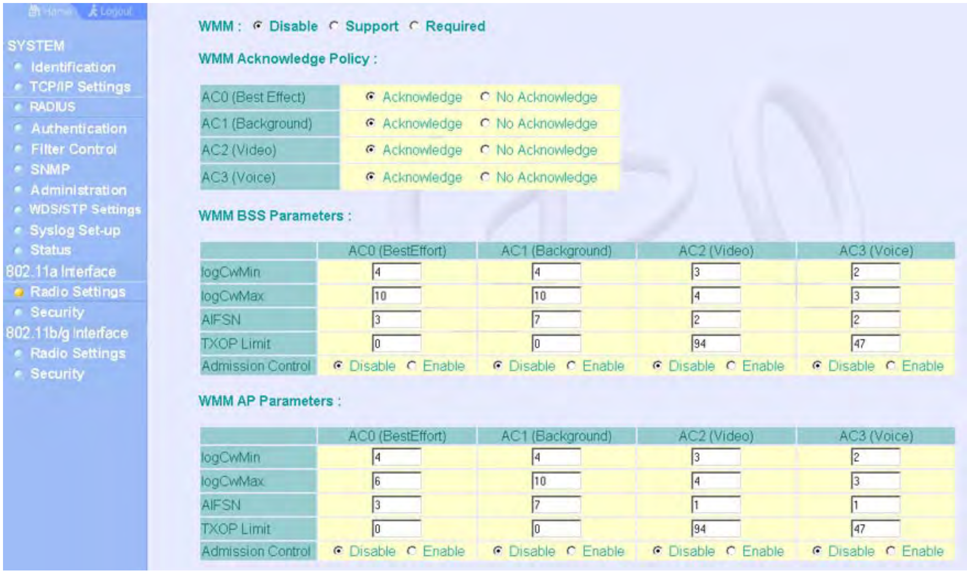
Figure 31 WMM Backoff Times



For high-priority traffic, the AIFSN and CW values are smaller. The smaller values equate to less backoff and wait time, and therefore more transmit opportunities.

To configure WMM, select the Radio Settings page, and scroll down to the WMM configuration settings.

Figure 32 WMM Configuration



WMM : ● Disable ○ Support ○ Required

WMM Acknowledge Policy :

AC0 (Best Effect)	● Acknowledge	○ No Acknowledge
AC1 (Background)	● Acknowledge	○ No Acknowledge
AC2 (Video)	● Acknowledge	○ No Acknowledge
AC3 (Voice)	● Acknowledge	○ No Acknowledge

WMM BSS Parameters :

	AC0 (BestEffort)	AC1 (Background)	AC2 (Video)	AC3 (Voice)
logCwMin	4	4	3	2
logCwMax	10	10	4	3
AIFSN	3	7	2	2
TXOP Limit	0	0	94	47
Admission Control	● Disable ○ Enable	● Disable ○ Enable	● Disable ○ Enable	● Disable ○ Enable

WMM AP Parameters :

	AC0 (BestEffort)	AC1 (Background)	AC2 (Video)	AC3 (Voice)
logCwMin	4	4	3	2
logCwMax	6	10	4	3
AIFSN	3	7	1	1
TXOP Limit	0	0	94	47
Admission Control	● Disable ○ Enable	● Disable ○ Enable	● Disable ○ Enable	● Disable ○ Enable

WMM – Sets the WMM operational mode on the access point. When enabled, the parameters for each AC queue will be employed on the access point and QoS capabilities are advertised to WMM-enabled clients. (Default: Support)

- Disable: WMM is disabled.

- Support: WMM will be used for any associated device that supports this feature.
  Devices that do not support this feature may still associate with the access point.
- Required: WMM must be supported on any device trying to associated with the access point. Devices that do not support this feature will not be allowed to associate with the access point.

WMM Acknowledge Policy – By default, all wireless data transmissions require the sender to wait for an acknowledgement from the receiver. WMM allows the acknowledgement wait time to be turned off for each Access Category (AC). Although this increases data throughput, it can also result in a high number of errors when traffic levels are heavy. (Default: Acknowledge)

WMM BSS Parameters – These parameters apply to the wireless clients.

WMM AP Parameters – These parameters apply to the access point.

logCWMin (Minimum Contention Window) – The initial upper limit of the random backoff wait time before wireless medium access can be attempted. The initial wait time is a random value between zero and the CWMin value. Specify the CWMin value in the range 0-15 microseconds. Note that the CWMin value must be equal or less than the CWMax value.

logCWMax (Maximum Contention Window) – The maximum upper limit of the random backoff wait time before wireless medium access can be attempted. The contention window is doubled after each detected collision up to the CWMax value. Specify the CWMax value in the range 0-15 microseconds. Note that the CWMax value must be greater or equal to the CWMin value.

AIFS (Arbitration Inter-Frame Space) – The minimum amount of wait time before the next data transmission attempt. Specify the AIFS value in the range 0-15 microseconds.

TXOP Limit (Transmit Opportunity Limit) – The maximum time an AC transmit queue has access to the wireless medium. When an AC queue is granted a transmit opportunity, it can transmit data for a time up to the TxOpLimit. This data bursting greatly improves the efficiency for high data-rate traffic. Specify a value in the range 0-65535 microseconds.

Admission Control – The admission control mode for the access category. When enabled, clients are blocked from using the access category. (Default: Disabled)

Key Type – See Wired Equivalent Privacy (WEP).

SECURITY

The access point is configured by default as an "open system," which broadcasts a beacon signal including the configured SSID. Wireless clients with an SSID setting of "any" can read the SSID from the beacon and automatically set their SSID to allow immediate connection to the nearest access point.

To improve wireless network security, you have to implement two main functions:

- Authentication: It must be verified that clients attempting to connect to the network are authorized users.
- Traffic Encryption: Data passing between the access point and clients must be protected from interception and eavesdropping.

For a more secure network, the access point can implement one or a combination of the following security mechanisms:

Wired Equivalent Privacy (WEP)	page 4-62
IEEE 802.1x	page 4-69
Wireless MAC address filtering	page 4-24
Wi-Fi Protected Access (WPA or WPA2)	page 4-69

Both WEP and WPA security settings are configurable separately for each virtual access point (VAP) interface. MAC address filtering, and RADIUS server settings are global and apply to all VAP interfaces.

The security mechanisms that may be employed depend on the level of security required, the network and management resources available, and the software support provided on wireless clients.

A summary of wireless security considerations is listed in the following table.

Table 4 Wireless Security Considerations

Security Mechanism	Client Support	Implementation Considerations
WEP	Built-in support on all 802.11a and 802.11g devices	• Provides only weak security • Requires manual key management
WEP over 802.1X	Requires 802.1X client support in system or by add-in software (support provided in Windows 2000 SP3 or later and Windows XP)	• Provides dynamic key rotation for improved WEP security • Requires configured RADIUS server • 802.1X EAP type may require management of digital certificates for clients and server
MAC Address Filtering	Uses the MAC address of client network card	• Provides only weak user authentication • Management of authorized MAC addresses • Can be combined with other methods for improved security • Optionally configured RADIUS server

Security Mechanism	Client Support	Implementation Considerations
WPA over 802.1X Mode	Requires WPA-enabled system and network card driver (native support provided in Windows XP)	• Provides robust security in WPA-only mode (i.e., WPA clients only) • Offers support for legacy WEP clients, but with increased security risk (i.e., WEP authentication keys disabled) • Requires configured RADIUS server • 802.1X EAP type may require management of digital certificates for clients and server
WPA PSK Mode	Requires WPA-enabled system and network card driver (native support provided in Windows XP)	• Provides good security in small networks • Requires manual management of pre-shared key
WPA2 with 802.1X	Requires WPA-enabled system and network card driver (native support provided in Windows XP)	• Provides the strongest security in WPA2-only mode • Provides robust security in mixed mode for WPA and WPA2 clients • Offers fast roaming for time-sensitive client applications • Requires configured RADIUS server • 802.1X EAP type may require management of digital certificates for clients and server • Clients may require hardware upgrade to be WPA2 compliant
WPA2 PSK Mode	Requires WPA-enabled system and network card driver (native support provided in Windows XP)	• Provides robust security in small networks • Requires manual management of pre-shared key • Clients may require hardware upgrade to be WPA2 compliant

***NOTE:** You must enable data encryption through the web in order to enable all types of encryption (WEP, TKIP, or AES) in the access point.*

The access point can simultaneously support clients using various different security mechanisms. The configuration for these security combinations are outlined in the following table. Note that MAC address authentication can be configured independently to work with all security mechanisms and is indicated separately in the table. Required RADIUS server support is also listed.

Table 5 Security Considerations

Client Security Combination	Configuration Summary[a]	MAC Authentication[b]	RADIUS Server
No encryption and no authentication	Authentication: Open System Encryption: Disable 802.1x: Disable	Local, RADIUS, or Disabled	Yes[3]
Static WEP only (with or without shared key authentication)	Enter 1 to 4 WEP keys Select a WEP transmit key for the interface Authentication: Shared Key or Open System Encryption: Enable 802.1x: Disable	Local, RADIUS, or Disabled	Yes[c]

Client Security Combination	Configuration Summary[a]	MAC Authentication[b]	RADIUS Server
Dynamic WEP (802.1x) only	Authentication: Open System Encryption: Enable 802.1x: Required Set 802.1x key refresh and reauthentication rates	Local, RADIUS, or Disabled	Yes[c]
802.1x WPA only	Authentication: WPA Encryption: Enable WPA Configuration: Required Cipher Suite: TKIP 802.1x: Required Set 802.1x key refresh and reauthentication rates	Local only	Yes
WPA Pre-Shared Key only	Authentication: WPA-PSK Encryption: Enable WPA Configuration: Required Cipher Configuration: TKIP 802.1x: Disable WPA Pre-shared Key Type: Hexadecimal or Alphanumeric Enter a WPA Pre-shared key	Local only	No
Static and dynamic (802.1x) WEP keys	Enter 1 to 4 WEP keys Select a WEP transmit key Authentication: Open System Encryption: Enable 802.1x: Supported Set 802.1x key refresh and reauthentication rates	Local, RADIUS, or Disabled	Yes
Dynamic WEP and 802.1x WPA	Authentication: WPA Encryption: Enable WPA Configuration: Supported Cipher Suite: WEP 802.1x: Required Set 802.1x key refresh and reauthentication rates	Local or Disabled	Yes
Static and dynamic (802.1x) WEP keys and 802.1x WPA	Enter 1 to 4 WEP keys Select a WEP transmit key Authentication: WPA Encryption: Enable WPA Configuration: Supported Cipher Suite: WEP 802.1x: Supported Set 802.1x key refresh and reauthentication rates	Local or Disabled	Yes
802.1x WPA2 only	Authentication: WPA2 Encryption: Enable WPA Configuration: Required Cipher Suite: AES-CCMP 802.1x: Required Set 802.1x key refresh and reauthentication rates	Local or Disabled	Yes
WPA2 Pre-Shared Key only	Authentication: WPA2-PSK Encryption: Enable WPA Configuration: Required Cipher Suite: AES-CCMP 802.1x: Disable WPA Pre-shared Key Type: Hexadecimal or Alphanumeric Enter a WPA Pre-shared key	Local or Disabled	No

Client Security Combination	Configuration Summary[a]	MAC Authentication[b]	RADIUS Server
802.1x WPA-WPA2 Mixed Mode	Authentication: WPA-WPA2-mixed Encryption: Enable WPA Configuration: Required Cipher Suite: TKIP 802.1x: Required Set 802.1x key refresh and reauthentication rates	Local or Disabled	Yes
WPA-WPA2 Mixed Mode Pre-Shared Key	Authentication: WPA-WPA2-PSK-mixed Encryption: Enable WPA Configuration: Required Cipher Suite: TKIP 802.1x: Disable WPA Pre-shared Key Type: Hexadecimal or Alphanumeric Enter a WPA Pre-shared key	Local or Disabled	No

[a] The configuration summary does not include the set up for MAC authentication (see page 4-22) or RADIUS server (see page 4-20).

[b] The configuration of RADIUS MAC authentication together with 802.1x WPA or WPA Pre-shared Key is not supported.

[c] RADIUS server required only when RADIUS MAC authentication is configured.

NOTE: *If you choose to configure RADIUS MAC authentication together with 802.1X, the RADIUS MAC address authentication occurs prior to 802.1X authentication. Only when RADIUS MAC authentication succeeds is 802.1X authentication performed. When RADIUS MAC authentication fails, 802.1X authentication is not performed.*

WIRED EQUIVALENT PRIVACY (WEP)

WEP provides a basic level of security, preventing unauthorized access to the network, and encrypting data transmitted between wireless clients and the access point. WEP uses static shared keys (fixed-length hexadecimal or alphanumeric strings) that are manually distributed to all clients that want to use the network.

WEP is the security protocol initially specified in the IEEE 802.11 standard for wireless communications. Unfortunately, WEP has been found to be seriously flawed and cannot be recommended for a high level of network security. For more robust wireless security, the access point provides Wi-Fi Protected Access (WPA) for improved data encryption and user authentication.

Setting up shared keys enables the basic IEEE 802.11 Wired Equivalent Privacy (WEP) on the access point to prevent unauthorized access to the network.

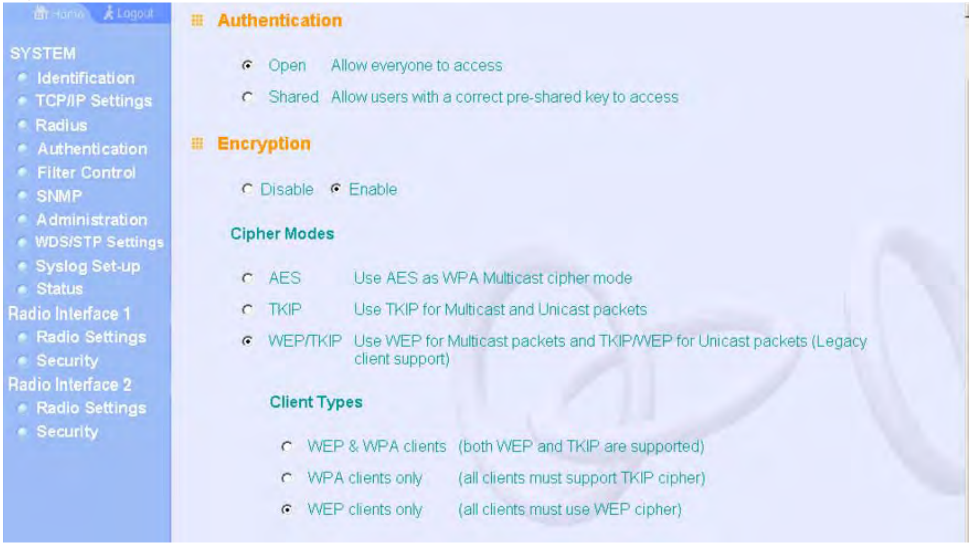
If you choose to use WEP shared keys instead of an open system, be sure to define at least one static WEP key for user authentication and data encryption. Also, be sure that the WEP shared keys are the same for each client in the wireless network.

Note that all clients share the same keys, which are used for user authentication and data encryption. Up to four keys can be specified. These four keys are used for all VAP interfaces on the same radio.

To set up WEP shared keys, click Radio Settings under 802.11a or 802.11b/g, then select Authentication 'Shared'. To use all other than WEP shared keys, select Authentication 'Open.'

The following example presumes that you have selected to opt for other methods of encryption than WEP.

Figure 33 Authentication and Encryption



Authentication

● Open Allow everyone to access

○ Shared Allow users with a correct pre-shared key to access

Encryption

○ Disable ● Enable

Cipher Modes

○ AES Use AES as WPA Multicast cipher mode

○ TKIP Use TKIP for Multicast and Unicast packets

● WEP/TKIP Use WEP for Multicast packets and TKIP/WEP for Unicast packets (Legacy client support)

Client Types

○ WEP & WPA clients (both WEP and TKIP are supported)

○ WPA clients only (all clients must support TKIP cipher)

● WEP clients only (all clients must use WEP cipher)

Authentication – Sets the access point to communicate as an open system that accepts network access attempts from any client, or with clients using pre-configured static shared keys. (Default: Open System)

- Open System: If you don't set up any other security mechanism on the access point, the network has no protection and is open to all users. This is the default setting.
- Shared Key: Sets the access point to use WEP shared keys. If this option is selected, you must configure at least one key on the access point and all clients.

NOTE: *To use 802.1X on wireless clients requires a network card driver and 802.1X client software that supports the EAP authentication type that you want to use. Windows 2000 SP3 or later and Windows XP provide 802.1X client support. Windows XP also provides native WPA support. Other systems require additional client software to support 802.1X and WPA.*

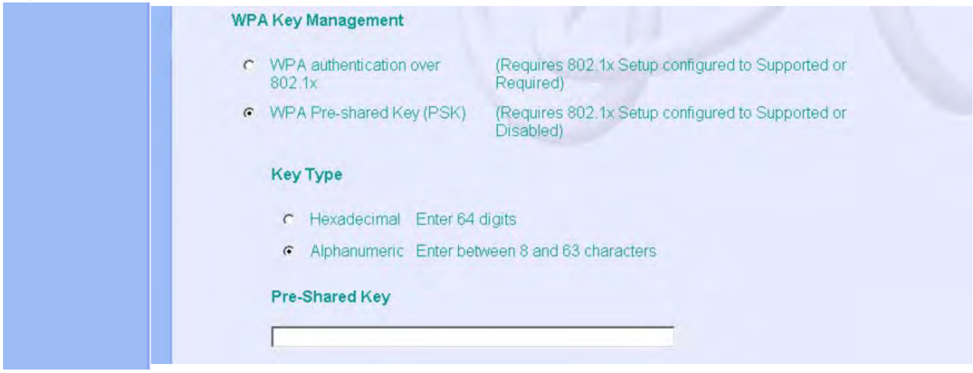
Encryption – Enable or disable the access point to use data encryption (WEP, TKIP, or AES). If this option is selected when using static WEP keys, you must configure at least one key on the access point and all clients. (Default: Disabled)

NOTE: *You must enable data encryption through the web or CLI in order to enable all types of encryption (WEP, TKIP, or AES) in the access point.*

Cipher Modes – Selects an encryption method for the global key used for multicast and broadcast traffic, which is supported by all wireless clients.

- AES: AES-CCMP is used as the multicast encryption cipher. AES-CCMP is the standard encryption cipher required for WPA2.
- TKIP: TKIP is used as the multicast encryption cipher.
- WEP/TKIP: WEP is used as the multicast encryption cipher. You should select WEP only when both WPA and WEP clients are supported.

Figure 34 WPA Key Management



WPA Key Management

○ WPA authentication over 802.1x (Requires 802.1x Setup configured to Supported or Required)

● WPA Pre-shared Key (PSK) (Requires 802.1x Setup configured to Supported or Disabled)

Key Type

○ Hexadecimal Enter 64 digits

● Alphanumeric Enter between 8 and 63 characters

Pre-Shared Key

WPA Key Management – Specifies the type of WPA encryption to use:

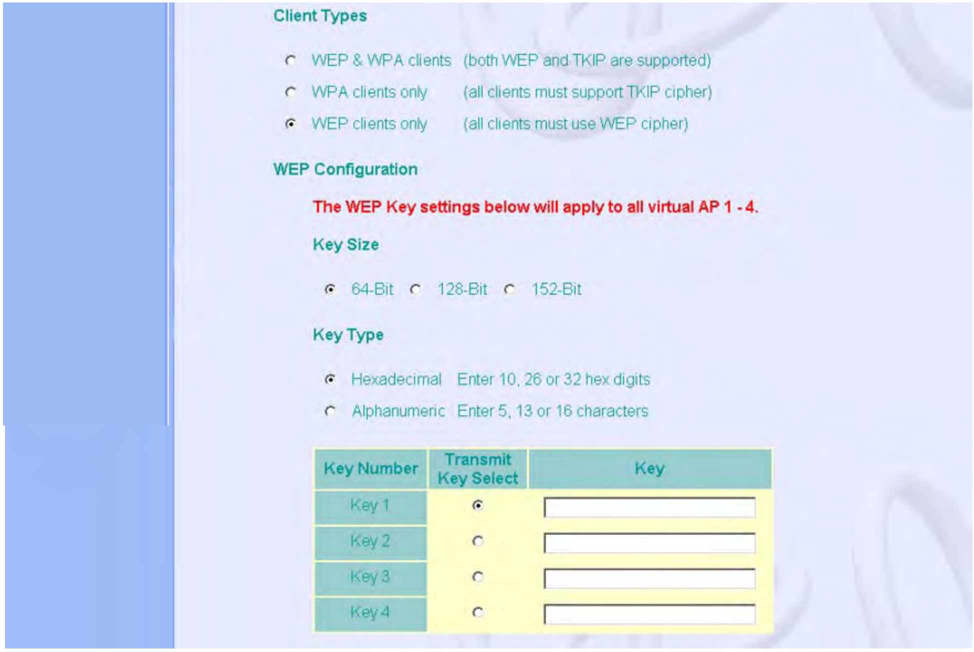
- *WPA authentication over 802.1x* – Requires the use of 802.1x authentication.
- *WPA Pre-shared Key (PSK)* – Requires that 802.1x authentication be disabled.

Key Type – Select the preferred method of entering WEP encryption keys on the access point and enter up to four keys:

- *Hexadecimal:* Enter keys as 10 hexadecimal digits (0-9 and A-F) for 64 bit keys, 26 hexadecimal digits for 128 bit keys, or 32 hexadecimal digits for 152 bit keys (802.11a radio only). This is the default setting.

- *Alphanumeric:* Enter keys as 5 alphanumeric characters for 64 bit keys, 13 alphanumeric characters for 128 bit keys, or 16 alphanumeric characters for 152 bit keys (802.11a radio only).
- *Key* – Selects the key number to use for encryption for each VAP interface. If the clients have all four keys configured to the same values, you can change the encryption key to any of the four settings without having to update the client keys. (Default: Key 1)

Figure 35 WEP Keys



Client Types

○ WEP & WPA clients (both WEP and TKIP are supported)
○ WPA clients only (all clients must support TKIP cipher)
● WEP clients only (all clients must use WEP cipher)

WEP Configuration

The WEP Key settings below will apply to all virtual AP 1 - 4.

Key Size

● 64-Bit ○ 128-Bit ○ 152-Bit

Key Type

● Hexadecimal Enter 10, 26 or 32 hex digits
○ Alphanumeric Enter 5, 13 or 16 characters

Key Number	Transmit Key Select	Key
Key 1	●	
Key 2	○	
Key 3	○	
Key 4	○	

Client Types – Specifies the type of client to encrypt:

- *WEP and WPA clients* – Both WEP and TKIP encryption are supported.
- *WPA clients only* – All clients must support TKIP.
- *WEP clients only* – All clients must support WEP.

WEP Configuration – Under open authentication it is still possible to configure WEP keys.

- *Key Size* – 64 Bit, 128 Bit, or 152 Bit key length. Note that the same size of encryption key must be supported on all wireless clients. (Default: None)
- *Key Type* – Select the preferred method of entering WEP encryption keys on the access point and enter up to four keys:
  - *Hexadecimal:* Enter keys as 10 hexadecimal digits (0-9 and A-F) for 64 bit

keys, 26 hexadecimal digits for 128 bit keys, or 32 hexadecimal digits for 152 bit keys (802.11a radio only). This is the default setting.

- *Alphanumeric:* Enter keys as 5 alphanumeric characters for 64 bit keys, 13 alphanumeric characters for 128 bit keys, or 16 alphanumeric characters for 152 bit keys (802.11a radio only).

Key – Selects the key number to use for encryption for each VAP interface. If the clients have all four keys configured to the same values, you can change the encryption key to any of the four settings without having to update the client keys. (Default: Key 1)

NOTE: *Key index and type must match that configured on the clients.*

NOTE: *In a mixed-mode environment with clients using static WEP keys and WPA, select WEP transmit key index 2, 3, or 4. The access point uses transmit key index 1 for the generation of dynamic keys.*

Wi-Fi Protected Access (WPA)

WPA employs a combination of several technologies to provide an enhanced security solution for 802.11 wireless networks.

The access point supports the following WPA components and features:

IEEE 802.1X and the Extensible Authentication Protocol (EAP): WPA employs 802.1X as its basic framework for user authentication and dynamic key management. The 802.1X client and RADIUS server should use an appropriate EAP type—such as EAP-TLS (Transport Layer Security), EAP-TTLS (Tunneled TLS), or PEAP (Protected EAP)—for strongest authentication. Working together, these protocols provide “mutual authentication” between a client, the access point, and a RADIUS server that prevents users from accidentally joining a rogue network. Only when a RADIUS server has authenticated a user’s credentials will encryption keys be sent to the access point and client.

NOTE: *To implement WPA on wireless clients requires a WPA-enabled network card driver and 802.1X client software that supports the EAP authentication type that you want to use. Windows XP provides native WPA support, other systems require additional software.*

Temporal Key Integrity Protocol (TKIP): WPA specifies TKIP as the data encryption method to replace WEP. TKIP avoids the problems of WEP static keys by dynamically changing data encryption keys. Basically, TKIP starts with a master (temporal) key for each user session and then mathematically generates other

keys to encrypt each data packet. TKIP provides further data encryption enhancements by including a message integrity check for each packet and a re-keying mechanism, which periodically changes the master key.
WPA Pre-Shared Key Mode (WPA-PSK, WPA2-PSK): For enterprise deployment, WPA requires a RADIUS authentication server to be configured on the wired network. However, for small office networks that may not have the resources to configure and maintain a RADIUS server, WPA provides a simple operating mode that uses just a pre-shared password for network access. The Pre-Shared Key mode uses a common password for user authentication that is manually entered on the access point and all wireless clients. The PSK mode uses the same TKIP packet encryption and key management as WPA in the enterprise, providing a robust and manageable alternative for small networks.

Mixed WPA and WEP Client Support: WPA enables the access point to indicate its supported encryption and authentication mechanisms to clients using its beacon signal. WPA-compatible clients can likewise respond to indicate their WPA support. This enables the access point to determine which clients are using WPA security and which are using legacy WEP. The access point uses TKIP unicast data encryption keys for WPA clients and WEP unicast keys for WEP clients. The global encryption key for multicast and broadcast traffic must be the same for all clients, therefore it restricts encryption to a WEP key.

When access is opened to both WPA and WEP clients, no authentication is provided for the WEP clients through shared keys. To support authentication for WEP clients in this mixed mode configuration, you can use either MAC authentication or 802.1X authentication.

WPA2 – WPA was introduced as an interim solution for the vulnerability of WEP pending the ratification of the IEEE 802.11i wireless security standard. In effect, the WPA security features are a subset of the 802.11i standard. WPA2 includes the now ratified 802.11i standard, but also offers backward compatibility with WPA. Therefore, WPA2 includes the same 802.1X and PSK modes of operation and support for TKIP encryption. The main differences and enhancements in WPA2 can be summarized as follows:

- **Advanced Encryption Standard (AES)**: WPA2 uses AES Counter-Mode encryption with Cipher Block Chaining Message Authentication Code (CBC-MAC) for message integrity. The AES Counter-Mode/CBCMAC Protocol (AES-CCMP) provides extremely robust data confidentiality using a 128-bit key. The AES-CCMP encryption cipher is specified as a standard requirement for WPA2. However, the computational intensive operations of AES-CCMP requires hardware support on client devices. Therefore to implement WPA2 in the network, wireless clients must be upgraded to WPA2-compliant hardware.

- **WPA2 Mixed-Mode**: WPA2 defines a transitional mode of operation for networks moving from WPA security to WPA2. WPA2 Mixed Mode allows both WPA and WPA2 clients to associate to a common SSID interface. In mixed mode, the unicast encryption cipher (TKIP or AES-CCMP) is negotiated for each client. The access point advertises its supported encryption ciphers in beacon frames and probe responses. WPA and WPA2 clients select the cipher they support and return the choice in the association request to the access point. For mixed-mode operation, the cipher used for broadcast frames is always TKIP. WEP encryption is not allowed.
- **Key Caching**: WPA2 provides fast roaming for authenticated clients by retaining keys and other security information in a cache, so that if a client roams away from an access point and then returns, re-authentication is not required. When a WPA2 client is first authenticated, it receives a Pairwise Master Key (PMK) that is used to generate other keys for unicast data encryption. This key and other client information form a Security Association that the access point names and holds in a cache.
- **Preauthentication**: Each time a client roams to another access point it has to be fully re-authenticated. This authentication process is time consuming and can disrupt applications running over the network. WPA2 includes a mechanism, known as pre-authentication, that allows clients to roam to a new access point and be quickly associated. The first time a client is authenticated to a wireless network it has to be fully authenticated. When the client is about to roam to another access point in the network, the access point sends pre-authentication messages to the new access point that include the client's security association information. Then when the client sends an association request to the new access point, the client is known to be already authenticated, so it proceeds directly to key exchange and association.

The configuration settings for WPA are summarized below:

Table 6 WPA Configuration Settings

WPA and WPA2 pre-shared key only	WPA and WPA2 over 802.1X
Encryption: Enabled	Encryption: Enabled
Authentication Setup: WPA-PSK, WPA2-PSK, or WPA-WPA2-mixed	Authentication Setup: WPA, WPA2, WPA-WPA2-mixed
Cipher Suite: WEP/TKIP/AES-CCMP	Cipher Suite: WEP/TKIP/AES-CCMP
WPA Pre-shared Key Type: Hex/ASCII	(requires RADIUS server to be specified)

1: You must enable data encryption in order to enable all types of encryption in the access point.

2: Select TKIP when any WPA clients do not support AES. Select AES only if all clients support AES.

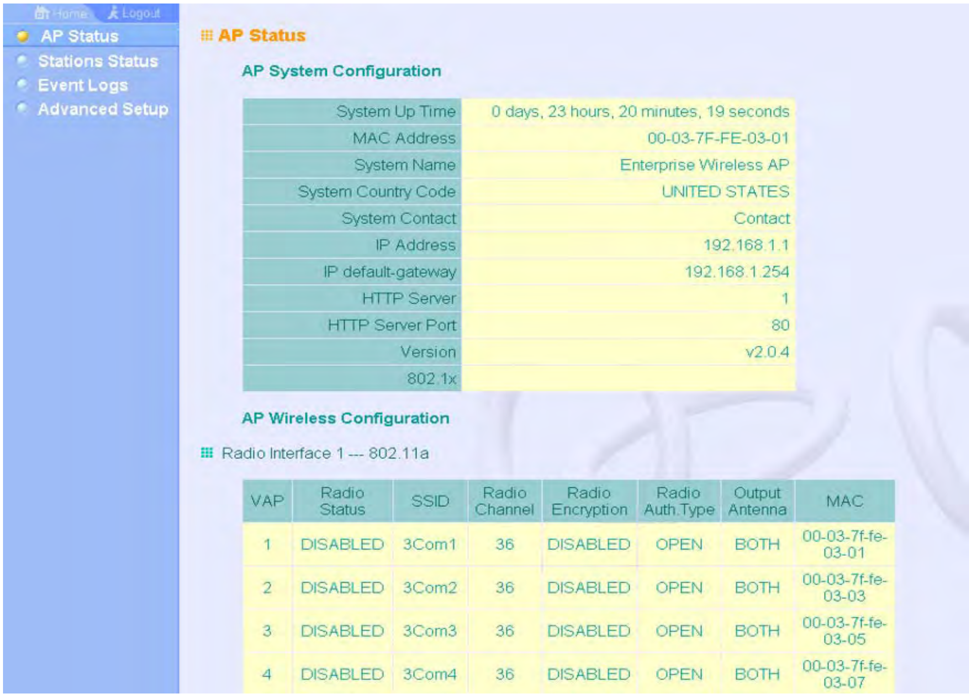
Status Information

The Status page includes information on the following items:

Access Point Status

The AP Status window displays basic system configuration settings, as well as the settings for the wireless interface.

Figure 36 AP Status



AP Status

AP System Configuration

System Up Time	0 days, 23 hours, 20 minutes, 19 seconds
MAC Address	00-03-7F-FE-03-01
System Name	Enterprise Wireless AP
System Country Code	UNITED STATES
System Contact	Contact
IP Address	192.168.1.1
IP default-gateway	192.168.1.254
HTTP Server	1
HTTP Server Port	80
Version	v2.0.4
802.1x	

AP Wireless Configuration

Radio Interface 1 --- 802.11a

VAP	Radio Status	SSID	Radio Channel	Radio Encryption	Radio Auth.Type	Output Antenna	MAC
1	DISABLED	3Com1	36	DISABLED	OPEN	BOTH	00-03-7f-fe-03-01
2	DISABLED	3Com2	36	DISABLED	OPEN	BOTH	00-03-7f-fe-03-03
3	DISABLED	3Com3	36	DISABLED	OPEN	BOTH	00-03-7f-fe-03-05
4	DISABLED	3Com4	36	DISABLED	OPEN	BOTH	00-03-7f-fe-03-07

AP System Configuration – The AP System Configuration table displays the basic system configuration settings:

- System Up Time: Length of time the management agent has been up.
- MAC Address: The physical layer address for the Ethernet port.
- System Name: Name assigned to this system.
- System Country Code: The country for which the device has been set for use.
- System Contact: Administrator responsible for the system.
- IP Address: IP address of the management interface for this device.
- IP Default Gateway: IP address of the gateway router between this device and management stations that exist on other network segments.