



User Guide

ORiNOCO AP-2000 Access Point User Guide



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ORINOCO AP-2000 User's Guide

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Introduction

- [Document Conventions](#)
- [Introduction to Wireless Networking](#)
- [IEEE 802.11 Specifications](#)
- [Management and Monitoring Capabilities](#)

Document Conventions

- The term, **AP**, refers to an Access Point.
- The term, **802.11**, is used to describe features that apply to the 802.11a, 802.11b, and 802.11g wireless standards.
- A **Dual-radio AP** is an Access Point that includes two radios; it can support one or two IEEE radio standards (depending on the type of radios installed). The AP-2000 is a Dual-radio AP.
- An **802.11a AP** is an Access Point that supports the IEEE 802.11a standard.
- An **802.11b AP** is an Access Point that supports the IEEE 802.11b standard.
- An **802.11b/g AP** is an Access Point that supports the IEEE 802.11g standard.
- Blue underlined text indicates a link to a topic or Web address. If you are viewing this documentation on your computer, click the blue text to jump to the linked item.

NOTE

A Note indicates important information that helps you make better use of your computer.

CAUTION

A Caution indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

Introduction to Wireless Networking

An AP extends the capability of an existing Ethernet network to devices on a wireless network. Wireless devices can connect to a single Access Point, or they can move between multiple Access Points located within the same vicinity. As wireless clients move from one coverage cell to another, they maintain network connectivity.

To determine the best location for an Access Point, Proxim recommends conducting a Site Survey before placing the device in its final location. For information about how to conduct a Site Survey, contact your local reseller.

Before an Access Point can be configured for your specific networking requirements, it must first be initialized. See [Getting Started](#) for details.

Introduction

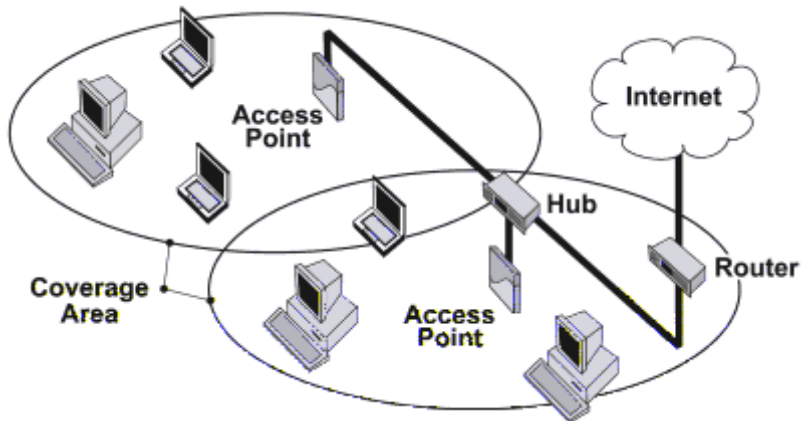


Figure 1-1 Typical wireless network access infrastructure

Once initialized, the network administrator can configure each unit according to the network's requirements. The AP functions as a wireless network access point to data networks. An AP network provides:

- Seamless client roaming
- Easy installation and operation
- Over-the-air encryption of data
- High speed network links

To be fully operational, the AP-2000 needs at least one wireless card installed.

Guidelines for Roaming

- An AP can only communicate with client devices that support its wireless standard. For example, an 802.11a client cannot communicate with an 802.11b AP and an 802.11b client cannot communicate with an 802.11a AP. However, both 802.11b and 802.11g clients can communicate with an 802.11b/g AP.
- All Access Points must have the same Network Name to support client roaming.
- All workstations with an 802.11 client adapter installed must use either a Network Name of "any" or the same Network Name as the Access Points that they will roam between. If an AP has Closed System enabled, a client must have the same Network Name as the Access Point to communicate (see [Interfaces](#)).
- All Access Points and clients must have the same security settings to communicate.
- The Access Points' cells must overlap to ensure that there are no gaps in coverage and to ensure that the roaming client will always have a connection available.
- The coverage area of an 802.11b or 802.11b/g AP is larger than the coverage area of an 802.11a AP. The 802.11b and 802.11b/g APs operate in the 2.4 GHz frequency band; the 802.11a AP operates in the 5 GHz band. Products that operate in the 2.4 GHz band offer greater range than products that operate in the 5 GHz band.
- An 802.11a or 802.11b/g AP operates at faster data rates than the 802.11b AP. 802.11a and 802.11g products operate at speeds of up to 54 Mbits/sec; 802.11b products operate at speeds of up to 11 Mbits/sec.
- All Access Points in the same vicinity should use a unique, independent Channel. By default, the AP automatically scans for available Channels during boot-up but you can also set the Channel manually (see [Interfaces](#) for details).
- Access Points that use the same Channel should be installed as far away from each other as possible to reduce potential interference.

Introduction

IEEE 802.11 Specifications

In 1997, the Institute of Electrical and Electronics Engineers (IEEE) adopted the 802.11 standard for wireless devices operating in the 2.4 GHz frequency band. This standard includes provisions for three radio technologies: direct sequence spread spectrum, frequency hopping spread spectrum, and infrared. Devices that comply with the 802.11 standard operate at a data rate of either 1 or 2 Megabits per second (Mbps).

In 1999, the IEEE modified the 802.11 standard to support direct sequence devices that can operate at speeds of up to 11 Mbps/sec. The IEEE ratified this standard as **802.11b**. 802.11b devices are backwards compatible with 2.4 GHz 802.11 direct sequence devices (that operate at 1 or 2 Mbps/sec). Available Frequency Channels vary by regulatory domain and/or country. See [802.11b Channel Frequencies](#) for details.

Also in 1999, the IEEE modified the 802.11 standard to support devices operating in the 5 GHz frequency band. This standard is referred to as **802.11a**. 802.11a devices are not compatible with 2.4 GHz 802.11 or 802.11b devices. 802.11a radios use a radio technology called Orthogonal Frequency Division Multiplexing (OFDM) to achieve data rates of up to 54 Mbps/sec. Available Frequency Channels vary by regulatory domain and/or country. See [802.11a Channel Frequencies](#) for details.

In 2003, the IEEE introduced the **802.11g** standard. 802.11g devices operate in the 2.4 GHz frequency band using OFDM to achieve data rates of up to 54 Mbps/sec. In addition, 802.11g devices are backwards compatible with 802.11b devices. Available Frequency Channels vary by regulatory domain and/or country. See [802.11g Channel Frequencies](#) for details.

Management and Monitoring Capabilities

There are several management and monitoring interfaces available to the network administrator to configure and manage an AP on the network:

- [HTTP/HTTPS Interface](#)
- [Command Line Interface](#)
- [SNMP Management](#)

HTTP/HTTPS Interface

The HTTP Interface (Web browser Interface) provides easy access to configuration settings and network statistics from any computer on the network. You can access the HTTP Interface over your LAN (switch, hub, etc.), over the Internet, or with a “crossover” Ethernet cable connected directly to your computer’s Ethernet Port.

HTTPS provides an HTTP connection over a Secure Socket Layer. HTTPS is one of two available secure management options on the AP; the other secure management option is SNMPv3. Enabling HTTPS allows the user to access the AP in a secure fashion using Secure Socket Layer (SSL) over port 443. The AP supports SSLv3 with a 128-bit encryption certificate maintained by the AP for secure communications between the AP and the HTTP client. All communications are encrypted using the server and the client-side certificate.

The AP comes pre-installed with all required SSL files: default certificate, private key and SSL Certificate Passphrase installed.

Command Line Interface

The Command Line Interface (CLI) is a text-based configuration utility that supports a set of keyboard commands and parameters to configure and manage an AP.

Users enter Command Statements, composed of CLI Commands and their associated parameters. Statements may be issued from the keyboard for real time control, or from scripts that automate configuration.

For example, when downloading a file, administrators enter the **download** CLI Command along with IP Address, file name, and file type parameters.

You access the CLI over a HyperTerminal serial connection or via Telnet. During initial configuration, you can use the CLI over a serial port connection to configure an Access Point’s IP address. When accessing the CLI via Telnet, you can communicate with the Access Point from over your LAN (switch, hub, etc.), from over the Internet, or with a “crossover” Ethernet cable connected directly to your computer’s Ethernet Port.

See [Using the Command Line Interface \(CLI\)](#) for more information on the CLI and for a list of CLI commands and parameters.

Introduction

SNMP Management

In addition to the HTTP and the CLI interfaces, you can also manage and configure an AP using the Simple Network Management Protocol (SNMP). Note that this requires an SNMP manager program, like HP Openview or Castlerock's SNMPc.

The AP supports several Management Information Base (MIB) files that describe the parameters that can be viewed and/or configured over SNMP:

- MIB-II (RFC 1213)
- Bridge MIB (RFC 1493)
- Ethernet-like MIB (RFC 1643)
- 802.11 MIB
- ORiNOCO Enterprise MIB

Proxim provides these MIB files on the CD included with each Access Point. You need to compile one or more of the above MIBs into your SNMP program's database before you can manage an Access Point using SNMP. Refer to the documentation that came with your SNMP manager for instructions on how to compile MIBs.

The Enterprise MIB defines the read and read-write objects that can be viewed or configured using SNMP. These objects correspond to most of the settings and statistics that are available with the other management interfaces. Refer to the Enterprise MIB for more information; the MIB can be opened with any text editor, such as Microsoft Word, Notepad, or WordPad.

SNMPv3 Secure Management

SNMPv3 is one of two available secure management options on the AP; the other secure management option is HTTPS (HTTP connection over Secure Socket Layer). SNMPv3 is based on the existing SNMP framework, but addresses security requirements for device and network management.

The security threats addressed by Secure Management are:

- *Modification of information:* An entity could alter an in-transit message generated by an authorized entity in such a way as to effect unauthorized management operations, including the setting of object values. The essence of this threat is that an unauthorized entity could change any management parameter, including those related to configuration, operations, and accounting
- *Masquerade:* Management operations that are not authorized for some entity may be attempted by that entity by assuming the identity of an authorized entity.
- *Message stream modification:* SNMP is designed to operate over a connectionless transport protocol. There is a threat that SNMP messages could be reordered, delayed, or replayed (duplicated) to effect unauthorized management operations. For example, a message to reboot a device could be copied and replayed later.
- *Disclosure:* An entity could observe exchanges between a manager and an agent and thereby learns the values of managed objects and learn of notifiable events. For example, the observation of a set command that changes passwords would enable an attacker to learn the new passwords.

To address the security threats listed above, SNMPv3 provides the following when secure management is enabled:

- **Authentication:** Provides data integrity and data origin authentication.
- **Privacy (a.k.a Encryption):** Protects against disclosure of message payload.
- **Access Control:** Controls and authorizes access to managed objects

The default SNMPv3 username is **administrator**, with SHA authentication, and DES privacy protocol.

NOTE

The remainder of this guide describes how to configure an AP using the HTTP Web interface or the CLI interface. For information on how to manage devices using SNMP, refer to the documentation that came with your SNMP program. Also, refer to the MIB files for information on the parameters available via SNMP.

Getting Started

- [Prerequisites](#)
- [Product Package](#)
- [System Requirements](#)
- [Hardware Installation](#)
- [Initialization](#)
- [Download the Latest Software](#)
- [Additional Hardware Features](#)

Prerequisites

Before installing an AP, you need to gather certain network information. The following section identifies the information you need.

⇒ NOTE

Passwords must be configured with at least 6 characters in length.

Network Name (SSID of the wireless cards)	You must assign the Access Point a Primary Network Name before wireless users can communicate with it. The clients also need the same Network Name. This is not the same as the System Name, which applies only to the Access Point. The network administrator typically provides the Network Name.
AP's IP Address	If you do not have a DHCP server on your network, then you need to assign the Access Point an IP address that is valid on your network.
HTTP Password	Each Access Point requires a read/write password to access the web interface. The default password is "public".
CLI Password	Each Access Point requires a read/write password to access the CLI interface. The default password is "public".
SNMP Read Password	Each Access Point requires a password to allow get requests from an SNMP manager. The default password is "public".
SNMP Read-Write Password	Each Access Point requires a password to allow get and set requests from an SNMP manager. The default password is "public". This password must be at least 6 characters in length.
SNMPv3 Authentication Password	If Secure Management is enabled, each Access Point requires a password for sending authenticated SNMPv3 messages. The default password is "public". The default SNMPv3 username is administrator , with SHA authentication, and DES privacy protocol.
SNMPv3 Privacy Password	If Secure Management is enabled, each Access Point requires a password when sending encrypted SNMPv3 data. The default password is "public".
Security Settings	You need to determine what security features you will enable on the Access Point.
Authentication Method	A primary authentication server may be configured; a backup authentication server is optional. The network administrator typically provides this information.
Authentication Server Shared Secret	This is a password shared between the Access Point and the RADIUS authentication server (so both passwords must be the same), and is typically provided by the network administrator.
Authentication Server Authentication Port	This is a port number (default is 1812) and is typically provided by the network administrator.
Client IP Address Pool Allocation Scheme	The Access Point can automatically provide IP addresses to clients as they sign on. The network administrator typically provides the IP Pool range.
DNS Server IP Address	The network administrator typically provides this IP Address.

Getting Started

Product Package

Each Dual-radio AP comes with the following:

- One ceiling or wall mounting plate
- Mounting hardware
- Metal faceplate for APs mounted in a plenum environment
- AP cover
- Processor module (with integrated Active Ethernet, if applicable)
- Power supply (not provided with Active Ethernet unit)
- AC power cord (not provided with Active Ethernet unit)
- 802.11b PC Card or 802.11b/g AP Card
- One Installation CD-ROM that contains the following:
 - Software Installation Wizard
 - ScanTool
 - Solarwinds TFTP software
 - HTML Help
 - this user's guide in PDF format
- One *Access Point Quick Start Guide*

If any of these items are missing or damaged, please contact your reseller or Technical Support (see [Technical Support](#) for contact information).

5 GHz Antenna Adapter or AP-2000 11a Upgrade Kit

The 5 GHz Antenna Adapter or 11a Upgrade Kit can be used in the Access Point. Because 802.11a requires an antenna adapter, only one 5 GHz radio can be installed in the AP. The second slot can be populated with an 802.11b or 802.11b/g card.

System Requirements

To begin using an AP, you must have the following minimum requirements:

- A 10Base-T Ethernet or 100Base-TX Fast Ethernet switch or hub
- At least one radio card designed for the AP: an 802.11b PC Card, 802.11b/g Card, 5 GHz Antenna Adapter Kit, or 11a Upgrade Kit
- At least one of the following IEEE 802.11-compliant devices:
 - An 802.11a client device if you have an 802.11a AP
 - An 802.11b or 802.11b/g client device if you have an 802.11b AP
 - An 802.11b/g client device if you have an 802.11b/g AP
 - An 802.11a/g client device if you have an 802.11a/g AP
- A computer that is connected to the same IP network as the AP and has one of the following Web browsers installed:
 - Microsoft Internet Explorer 6 with Service Pack 1 or later and patch Q323308
 - Netscape 6.1 or later(The computer is required to configure the AP using the HTTP interface.)

Getting Started

Hardware Installation

- AP-2000 with Active Ethernet
- AP-2000 with Power Supply
- 5 GHz or AP-2000 11a Upgrade Kit

AP-2000 with Active Ethernet

1. Slide the AP module onto the mounting bracket. Make sure it is properly seated.

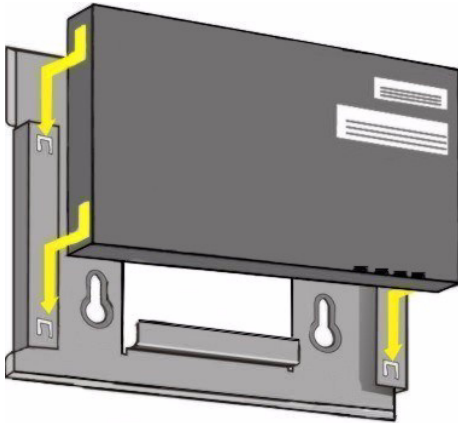


Figure 2-1 Insert Module into Mounting Bracket

2. Slide an 802.11b, 802.11b/g wireless card, or 802.11a card with antenna adapter (not included in the kit) into Slot A or B. **NOTE:** The 802.11a wireless card with antenna adapter will only fit in Slot A.
3. Slide an 802.11b or an 802.11b/g wireless card (included in the kit) into Slot A or B.

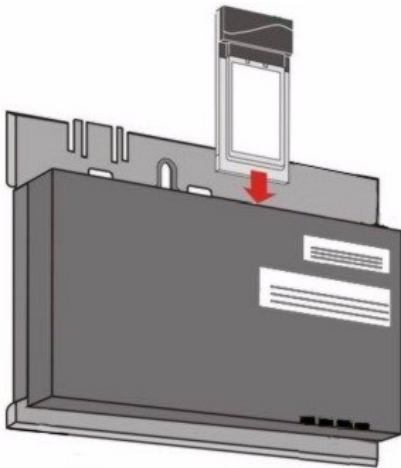


Figure 2-2 Slide a PC Card into the AP

4. Connect power to the unit from a DC injector device, such as the ORiNOCO 1-Port Active Ethernet DC Injector hub.
5. Wait for the LED indicators to turn green before proceeding.

Getting Started

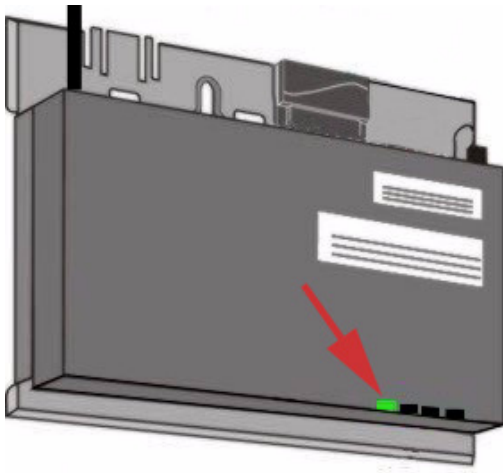


Figure 2-3 Connect an Ethernet cable from an AE hub to the AP

6. Conduct a Site Survey to determine the best location for your device.
7. Once you have chosen a final location for your unit, mount the wall bracket and the processor module and place the cover onto the unit as shown.

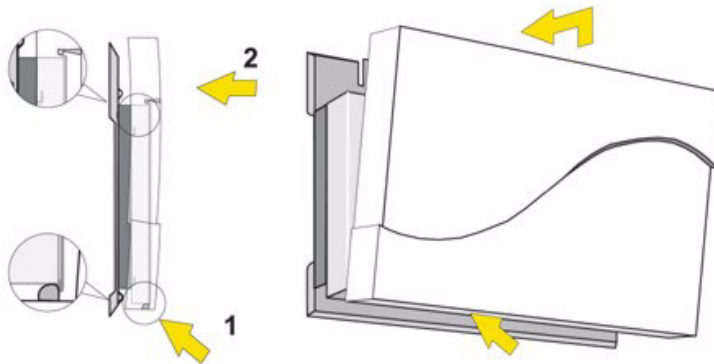


Figure 2-4 Wall mounting the AP

AP-2000 with Power Supply

1. Clip the power supply into the mounting bracket.
2. Plug the AC power cord into the power supply.

Getting Started

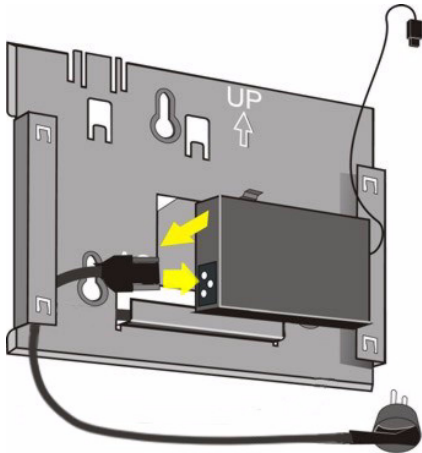


Figure 2-5 Install the power supply

3. Slide the AP module onto the mounting bracket. Make sure it is properly seated.
4. Plug the DC connector from the power supply into the top of the AP module.

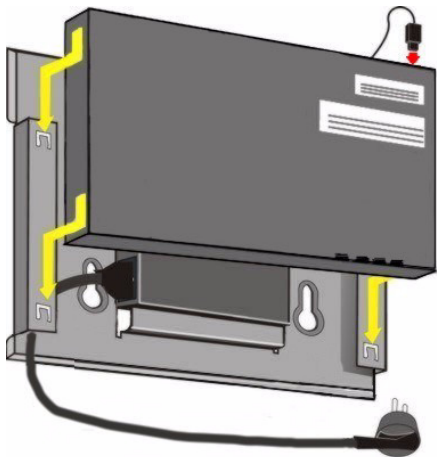
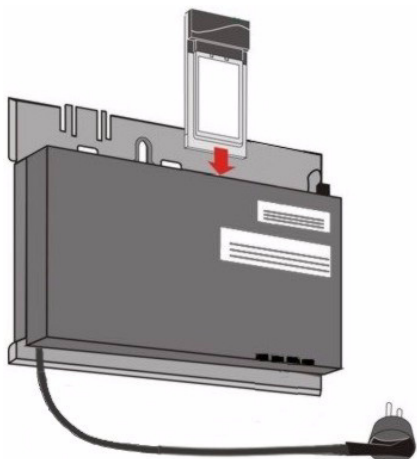


Figure 2-6 Insert module in mounting bracket and attach power connector



Getting Started

Figure 2-7 Slide a PC Card into the AP

5. Attach one end of an Ethernet cable to the AP's Ethernet port and the other end to a network hub or switch.
6. Connect the unit to a power source.
7. Wait for the power LED to turn green before proceeding.

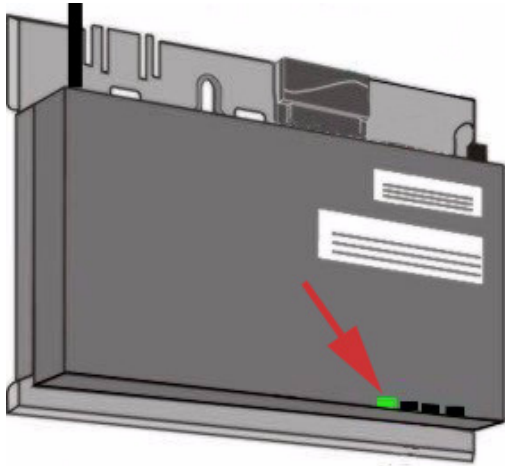


Figure 2-8 Power LED turns green when the unit is operational

8. Conduct a Site Survey to determine the best location for your device.
9. Once you have chosen a final location for your unit, mount the wall bracket and the processor module and place the cover onto the unit as shown.

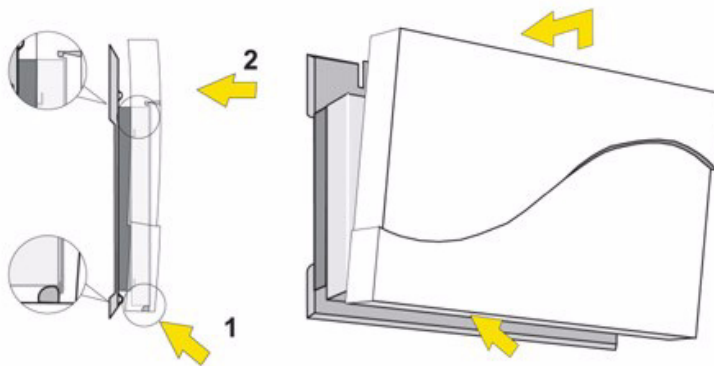


Figure 2-9 Wall mounting the AP

Getting Started

5 GHz or AP-2000 11a Upgrade Kit

If you are installing this kit on a new AP (one that has not been installed yet), skip to Step 4.

1. Remove the AP from your network by unplugging the power and Ethernet cables from the unit.
2. Remove the unit from its mounting location - keep the mounting bracket with the AP.
3. Remove the outer plastic cover.

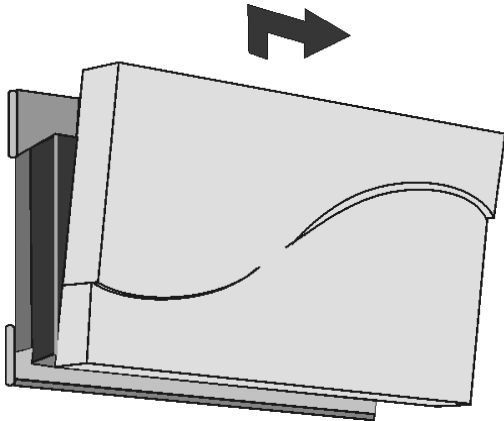


Figure 2-10 Remove the AP cover

⇒ NOTE

The AP-2000 Upgrade Kit may be installed only in slot A of the AP-2000.

4. Make sure card slot A is available. The power or Ethernet cable tie wrap may need to be cut and the cable repositioned to allow the antenna adapter to fit correctly.
5. Position the antenna adapter, card inward, facing the top of the unit (see diagram) and insert the 5 GHz card into the available card slot.

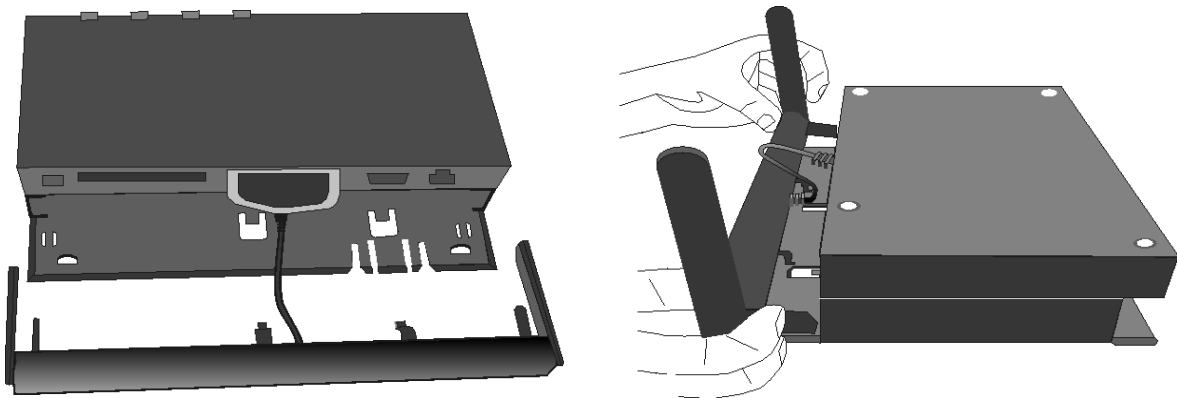


Figure 2-11 Insert Card and Antenna

Getting Started

6. Angle the antenna adapter slightly upwards, pinch the end tabs inwards and carefully slide the antenna adapter onto the mounting bracket.
7. Gently push forward while rotating the antenna downwards and clip the adapter into the small cutouts on the face of the mounting bracket.
8. Position the antenna for best reception:
 - at a 90° angle for flat surface mounts
 - at a 180° angle for wall mounts
9. Re-install the cover and mount the AP back in place.
10. Connect the power and Ethernet cables to the AP.

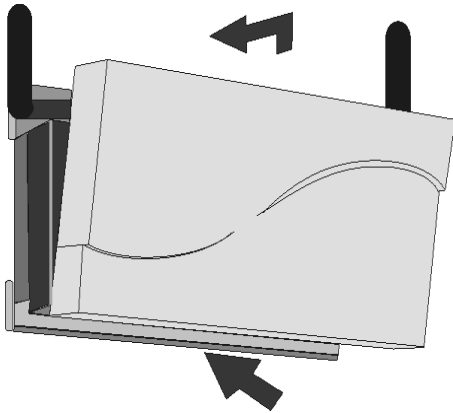


Figure 2-12 Replace cover

Getting Started

Initialization

Proxim provides two tools to simplify the initialization and configuration of an AP:

- [ScanTool](#)
- [Setup Wizard](#)

ScanTool is included on the Installation CD; the Setup Wizard launches automatically the first time you access the HTTP interface.

NOTE

These initialization instructions describe how to configure an AP over an Ethernet connection using ScanTool and the HTTP interface. If you want to configure the unit over the serial port, see [Setting IP Address using Serial Port](#) for information on how to access the CLI over a serial connection and [Using the Command Line Interface \(CLI\)](#) for a list of supported commands.

ScanTool

ScanTool is a software utility that is included on the installation CD-ROM. ScanTool allows you to find the IP address of an Access Point by referencing the MAC address in a Scan List, or to assign an IP address if one has not been assigned.

The tool automatically detects the Access Points installed on your network, regardless of IP address, and lets you configure each unit's IP settings. In addition, you can use ScanTool to download new software to an AP that does not have a valid software image installed (see [Client Connection Problems](#)).

To access the HTTP interface and configure the AP, the AP must be assigned an IP address that is valid on its Ethernet network. By default, the AP is configured to obtain an IP address automatically from a network Dynamic Host Configuration Protocol (DHCP) server during boot-up. If your network contains a DHCP server, you can run ScanTool to find out what IP address the AP has been assigned. If your network does not contain a DHCP server, the Access Point's IP address defaults to 10.0.0.1. In this case, you can use ScanTool to assign the AP a static IP address that is valid on your network.

ScanTool Instructions

Follow these steps to install ScanTool, initialize the Access Point, and perform initial configuration:

1. Locate the unit's Ethernet MAC address and write it down for future reference. The MAC address is printed on the product label. Each unit has a unique MAC address, which is assigned at the factory.
2. Confirm that the AP is connected to the same LAN subnet as the computer that you will use to configure the AP.
3. Power up, reboot, or reset the AP.
 - Result: The unit requests an IP Address from the network DHCP server.
4. Insert the Installation CD into the CD-ROM drive of the computer that you will use to configure the AP.
 - Result: The installation program will launch automatically.
5. Follow the on-screen instructions to install the Access Point software and documentation.

NOTE

The ORINOCO Installation program supports the following operating systems:

- Windows 98SE
 - Windows 2000
 - Windows NT
 - Windows ME
 - Windows XP
6. After the software has been installed, double-click the **ScanTool** icon on the Windows desktop to launch the program (if the program is not already running).
 - Result: ScanTool scans the subnet and displays all detected Access Points. The ScanTool's **Scan List** screen appears, as shown in the following example.

Getting Started

⇒ NOTE

If your computer has more than one network adapter installed, you will be prompted to select the adapter that you want ScanTool to use before the **Scan List** appears. If prompted, select an adapter and click **OK**. You can change your adapter setting at any time by clicking the **Select Adapter** button on the **Scan List** screen. Note that the **ScanTool Network Adapter Selection** screen will not appear if your computer only has one network adapter installed.

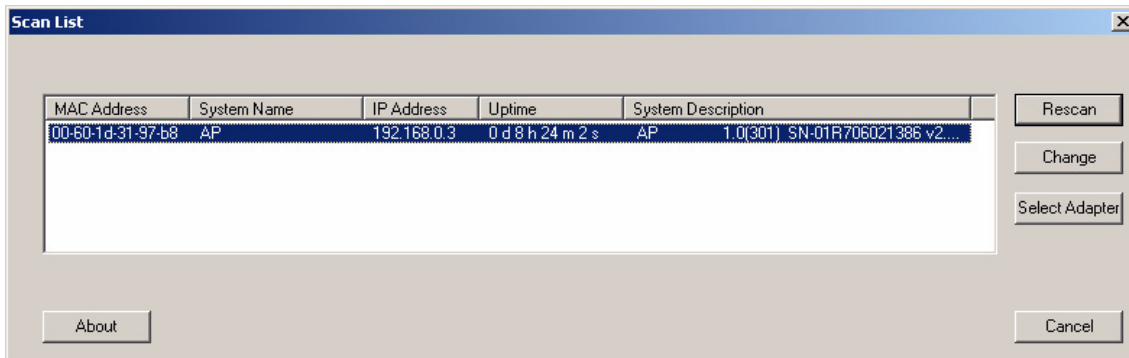


Figure 2-13 Scan List

7. Locate the MAC address of the AP you want to initialize within the Scan List.

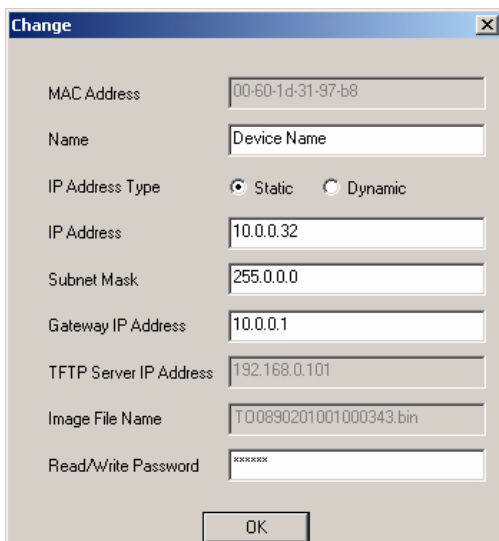
⇒ NOTE

If your Access Point does not show up in the Scan List, click the **Rescan** button to update the display. If the unit still does not appear in the list, see [Troubleshooting the AP-2000](#) for suggestions. Note that after rebooting an Access Point, it may take up to five minutes for the unit to appear in the Scan List.

8. Do one of the following:

- If the AP has been assigned an IP address by a DHCP server on the network, write down the IP address and click **Cancel** to close ScanTool. Proceed to [Setup Wizard](#) for information on how to access the HTTP interface using this IP address.
- If the AP has not been assigned an IP address (in other words, the unit is using its default IP address, 10.0.0.1), follow these steps to assign it a static IP address that is valid on your network:
 1. Highlight the entry for the AP you want to configure.
 2. Click the **Change** button.

— Result: the **Change** screen appears.



Getting Started

Figure 2-14 Scan Tool Change Screen

3. Set **IP Address Type** to **Static**.
4. Enter a static **IP Address** for the AP in the field provided. You must assign the unit a unique address that is valid on your IP subnet. Contact your network administrator if you need assistance selecting an IP address for the unit.
5. Enter your network's **Subnet Mask** in the field provided.
6. Enter your network's **Gateway IP Address** in the field provided.
7. Enter the SNMP Read/Write password in the **Read/Write Password** field (for new units, the default SNMP Read/Write password is "public").

⇒ NOTE

The TFTP Server IP Address and Image File Name fields are only available if ScanTool detects that the AP does not have a valid software image installed. See [Client Connection Problems](#).

8. Click **OK** to save your changes.
 - Result: The Access Point will reboot automatically and any changes you made will take effect.
9. When prompted, click **OK** a second time to return to the **Scan List** screen.
10. Click **Cancel** to close the ScanTool.
11. Proceed to [Setup Wizard](#) for information on how to access the HTTP interface.

Setup Wizard

The first time you connect to an AP's HTTP interface, the Setup Wizard launches automatically. The Setup Wizard provides step-by-step instructions for how to configure the Access Point's basic operating parameter, such as Network Name, IP parameters, system parameters, and management passwords.

Setup Wizard Instructions

Follow these steps to access the Access Point's HTTP interface and launch the Setup Wizard:

1. Open a Web browser on a network computer.
 - The HTTP interface supports the following Web browser:
 - Microsoft Internet Explorer 6 with Service Pack 1 or later
 - Netscape 6.1 or later
2. If necessary, disable the browser's Internet proxy settings. For Internet Explorer users, follow these steps:
 - Select **Tools > Internet Options**.
 - Click the **Connections** tab.
 - Click **LAN Settings**.
 - If necessary, remove the check mark from the **Use a proxy server** box.
 - Click **OK** twice to save your changes and return to Internet Explorer.
3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.
 - This is either the dynamic IP address assigned by a network DHCP server or the static IP address you manually configured. See [ScanTool](#) for information on how to determine the unit's IP address and manually configure a new IP address, if necessary.
 - Result: The **Enter Network Password** screen appears.
4. Enter the HTTP password in the **Password** field. Leave the **User Name** field blank. For new units, the default HTTP password is "public".
 - Result: The Setup Wizard will launch automatically.

Getting Started

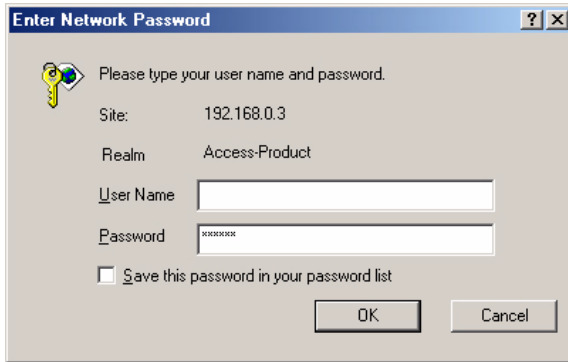


Figure 2-15 Enter Network Password

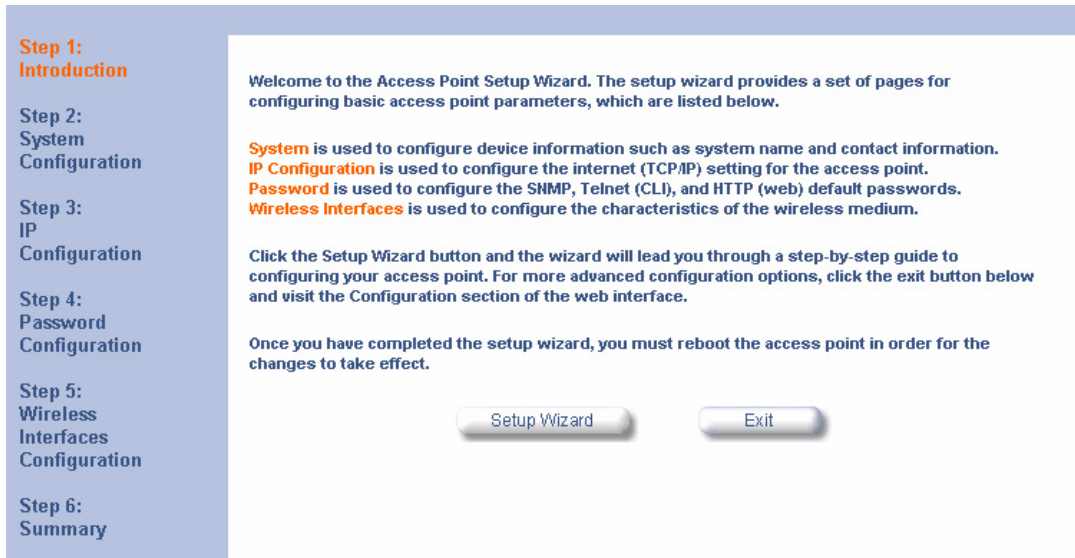


Figure 2-16 Setup Wizard

5. Click **Setup Wizard** to begin. If you want to configure the AP without using the Setup Wizard, click **Exit** and see [Performing Advanced Configuration](#).

The Setup Wizard supports the following navigation options:

- **Save & Next Button:** Each Setup Wizard screen has a **Save & Next** button. Click this button to submit any changes you made to the unit's parameters and continue to the next page. The instructions below describe how to navigate the Setup Wizard using the **Save & Next** buttons.
- **Navigation Panel:** The Setup Wizard provides a navigation panel on the left-hand side of the screen. Click the link that corresponds to the parameters you want to configure to be taken to that particular configuration screen. Note that clicking a link in the navigation panel will not submit any changes you made to the unit's configuration on the current page.
- **Exit:** The navigation panel also includes an **Exit** option. Click this link to close the Setup Wizard at any time.



CAUTION

If you exit from the Setup Wizard, any changes you submitted (by clicking the **Save & Next** button) up to that point will be saved to the unit but will not take effect until it is rebooted.

6. Configure the System Configuration settings and click **Save & Next**. See [System](#) for more information.
7. Configure the Access Point's Basic IP address settings, if necessary, and click **Save & Next**. See [Basic IP Parameters](#) for more information.

Getting Started

8. Assign the AP new passwords to prevent unauthorized access and click **Save & Next**. Each management interface has its own password:

- SNMP Read Password
- SNMP Read-Write Password
- SNMPv3 Authentication Password
- SNMPv3 Privacy Password
- CLI Password
- HTTP (Web) Password

By default, each of these passwords is set to “public”. See [Passwords](#) for more information.

9. Configure the basic wireless interface settings and click **Save & Next**.

- The following options are available for an 802.11a AP:
 - **Primary Network Name (SSID):** Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
 - **Additional Network Names (SSIDs):** The AP supports up to 16 SSIDs and VLANs per wireless interface (radio). Refer to the Advanced Configuration chapter for information on the detailed rules on configuring multiple SSIDs, VLANs, and security modes.
 - **Auto Channel Select:** By default, the AP scans the area for other Access Points and selects the best available communication channel, either a free channel (if available) or the channel with the least amount of interference. Remove the check mark to disable this option. Note that you cannot disable Auto Channel Select for 802.11a products in Europe (see [Dynamic Frequency Selection \(DFS\)](#) for details).
 - **Frequency Channel:** When Auto Channel Select is enabled, this field is read-only and displays the Access Point’s current operating channel. When Auto Channel Select is disabled, you can specify the Access Point’s channel. If you decide to manually set the unit’s channel, ensure that nearby devices do not use the same frequency. Available Channels vary based on regulatory domain. See [802.11a Channel Frequencies](#). Note that you cannot manually set the channel for 802.11a products in Europe (see [Dynamic Frequency Selection \(DFS\)](#) for details).
 - **Transmit Rate:** Use the drop-down menu to select a specific transmit rate for the AP. Choose between 6, 9, 12, 18, 24, 36, 48, 54 Mbits/s, and Auto Fallback. The Auto Fallback feature allows the AP to select the best transmit rate based on the cell size.
- The following options are available for an 802.11b AP:
 - **Primary Network Name (SSID):** Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
 - **Additional Network Names (SSIDs):** The AP supports up to 16 SSIDs and VLANs per wireless interface (radio). Refer to the Advanced Configuration chapter for information on the detailed rules on configuring multiple SSIDs, VLANs, and security modes.
 - **Auto Channel Select:** By default, the AP scans the area for other Access Points and selects the best available communication channel, either a free channel (if available) or the channel with the least amount of interference. Remove the check mark to disable this option. If you are setting up a Wireless Distribution System (WDS), it must be disabled. See [Wireless Distribution System \(WDS\)](#) for more information.
 - **Frequency Channel:** When Auto Channel Select is enabled, this field is read-only and displays the Access Point’s current operating channel. When Auto Channel Select is disabled, you can specify the Access Point’s operating channel. If you decide to manually set the unit’s channel, ensure that nearby devices do not use the same frequency (unless you are setting up a WDS). Available Channels vary based on regulatory domain. See [802.11b Channel Frequencies](#).
 - **Distance Between APs:** Set to **Large**, **Medium**, **Small**, **Microcell**, or **Minicell** depending on the site survey for your system. The distance value is related to the **Multicast Rate** (described next). In general, a larger distance between APs means that your clients operate a slower data rates (on average). This feature is available only if you are using an Orinoco Classic Gold card. See [Distance Between APs](#) for more information.
 - **Multicast Rate:** Sets the rate at which Multicast messages are sent. This value is related to the **Distance Between APs** parameter (described previously). The table below displays the possible Multicast Rates based on the Distance between APs. This feature is available only if you are using an Orinoco Classic Gold card. See [Multicast Rate](#) for more information.

Getting Started

Distance between APs	Multicast Rate
Large	1 and 2 Mbits/sec
Medium	1, 2, and 5.5 Mbits/sec
Small	1, 2, 5.5 and 11 Mbits/sec
Minicell	1, 2, 5.5 and 11 Mbits/sec
Microcell	1, 2, 5.5 and 11 Mbits/sec

- The following options are available for an 802.11b/g AP:
 - **Operational Mode:** An 802.11b/g wireless interface can be configured to operate in the following modes:
 - 802.11b mode only
 - 802.11g mode only
 - 802.11g-wifi mode
 - 802.11b/g mode (default)
 - **Primary Network Name (SSID):** Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
 - **Additional Network Names (SSIDs):** The AP supports up to 16 SSIDs and VLANs per wireless interface (radio). Refer to the Advanced Configuration chapter for information on the detailed rules on configuring multiple SSIDs, VLANs, and security modes.
 - **Auto Channel Select:** By default, the AP scans the area for other Access Points and selects the best available communication channel, either a free channel (if available) or the channel with the least amount of interference. Remove the check mark to disable this option.
 - **Frequency Channel:** When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating channel. When Auto Channel Select is disabled, you can specify the Access Point's channel. If you decide to manually set the unit's channel, ensure that nearby devices do not use the same frequency. Available Channels vary based on regulatory domain. See [802.11g Channel Frequencies](#).
 - **Transmit Rate:** Select a specific transmit rate for the AP. The values available depend on the Operational Mode. Auto Fallback is the default setting; it allows the AP to select the best transmit rate based on the cell size.
 - For 802.11b only -- Auto Fallback, 1, 2, 5.5, 11 Mbits/sec
 - For 802.11g only -- Auto Fallback, 6, 9, 12, 18, 24, 36, 48, 54 Mbits/sec
 - For 802.11b/g and 802.11g-wifi-- Auto Fallback, 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbits/sec

NOTE

Additional advanced settings are available in the **Wireless Interface Configuration** screen. See [Wireless A \(802.11a\)](#), [Wireless \(802.11b\)](#), or [Wireless \(802.11b/g\)](#) for details. See [SSID/VLAN/Security](#) for more information on security features.

10. Review the configuration summary. If you want to make any additional changes, use the navigation panel on the left-hand side of the screen to return to an earlier screen. After making a change, click **Save & Next** to save the change and proceed to the next screen.
11. When finished, click **Reboot** on the Summary screen to restart the AP and apply your changes.

Download the Latest Software

Proxim periodically releases updated software for the AP on its Web site at <http://www.proxim.com>. Proxim recommends that you check the Web site for the latest updates after you have installed and initialized the unit.

Three types of files can be downloaded to the AP from a TFTP server:

- image (AP software image or kernel)
- config (configuration file)
- UpgradeBSPBL (BSP/Bootloader firmware file)

Getting Started

Setup your TFTP Server

A Trivial File Transfer Protocol (TFTP) server allows you to transfer files across a network. You can upload files from the AP for backup or copying, and you can download the files for configuration and AP Image upgrades. The Solarwinds TFTP server software is located on the ORiNOCO AP Installation CD-ROM. You can also download the latest TFTP software from Solarwind's Web site at <http://www.solarwinds.net>.

NOTE

If a TFTP server is not available in the network, you can perform similar file transfer operations using the HTTP interface.

After the TFTP server is installed:

- Check to see that TFTP is configured to point to the directory containing the AP Image.
- Make sure you have the proper TFTP server IP address, the proper AP Image file name, and that the TFTP server is operational.
- **Make sure the TFTP server is configured to both Transmit and Receive files, with no automatic shutdown or time-out.**

Download Updates from your TFTP Server using the Web Interface

1. Download the latest software from <http://www.proxim.com>.
2. Copy the latest software updates to your TFTP server.
3. In the Web Interface, click the **Commands** button and select the **Update AP** tab.
4. Enter the IP address of your TFTP server in the field provided.
5. Enter the **File Name** (including the file extension). Enter the full directory path and file name. If the file is located in the default TFTP directory, you need enter only the file name.
6. Select the **File Type** from the drop-down menu (use *Img* for software updates).
7. Select **Update AP & Reboot** from the **File Operation** drop-down menu.
8. Click **Update**.
9. The Access Point will reboot automatically when the download is complete.

Getting Started

Download Updates from your TFTP Server using the CLI Interface

1. Download the latest software from <http://www.proxim.com>.
2. Copy the latest software updates to your TFTP server.
3. Open the CLI interface via Telnet or a serial connection.
4. Enter the CLI password when prompted.
5. Enter the command: **download <tftpaddr> <filename> img**
 - Result: The download will begin. Be patient while the image is downloaded to the Access Point.
6. When the download is complete, type **reboot 0** and press **Enter**.



NOTE

See [Using the Command Line Interface \(CLI\)](#) for more information.

Additional Hardware Features

- [Installing the AP in a Plenum](#)
- [Active Ethernet](#)
- [LED Indicators](#)

Installing the AP in a Plenum

In an office building, plenum is the space between the structural ceiling and the tile ceiling that is provided to help air circulate. Many companies also use the plenum to house communication equipment and cables. However, these products and cables must comply with certain safety requirements, such as Underwriter Labs (UL) Standard 2043: "Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces".

The AP has been certified under UL Standard 2043 and can be installed in the plenum only when the following conditions apply:

- The unit's plastic cover has been removed.
 - The power supply of the Access Point has been removed.
 - There are two 802.11b cards in the cards slots.
- OR
- There is one 802.11b card and the other card slot is protected with the metal faceplate provided in your kit.



NOTE

The 5GHz Antenna Adapter Kit or 11a Upgrade Kit is not approved in accordance with UL-2043 for use in a plenum. The Access Point using a power supply, should not be plenum mounted. Use Active Ethernet to power the units mounted in a plenum environment.

Installing/Removing the Metal Faceplate

When using only one card in the Access Point mounted in a plenum environment, remove the plastic cover. Place the top edge of the faceplate under the front ridge of the metal enclosure. Snap the faceplate in the empty card slot in the Access Point.



CAUTION

Do not drop the faceplate into the card slot in the AP.

To install a second radio card, the faceplate must be removed. Gently pry the faceplate off using the tab on the faceplate.

Getting Started

Active Ethernet

An Active Ethernet-enabled AP is equipped with an 802.3af-compliant Active Ethernet module. Active Ethernet (AE) delivers both data and power to the access point over a single Ethernet cable. If you choose to use Active Ethernet, there is no difference in operation; the only difference is in the power source.

- The Active Ethernet (AE) integrated module receives ~48 VDC over a standard Category 5 Ethernet cable.
- To use Active Ethernet, you must have an AE hub (also known as a power injector) connected to the network.
- The cable length between the AE hub and the Access Point should not exceed 100 meters (approximately 325 feet).
- The AE hub is not a repeater and does not amplify the Ethernet data signal.
- If connected to an AE hub and an AC power simultaneously, the Access Point draws power from Active Ethernet.
- Maximum power supplied to an Access Point is 11 Watts; the unit typically draws approximately 10 Watts.

Also see [Hardware Specifications](#).



NOTE

The AP's 802.3af-compliant Active Ethernet module is backwards compatible with all ORiNOCO Active Ethernet hubs that do not support the IEEE 802.3af standard.

LED Indicators

The AP has four LED indicators, which exhibit the following behavior:

Power	Ethernet	PC Card A	PC Card B	Indication
Green	Green flash with data activity	Green flash with data activity	Green flash with data activity	Normal Operation
Amber	Red	Amber	Amber	Rebooting/Power On Self Test (POST)
Amber	n/a (not applicable)	n/a	n/a	Missing or bad AP Image if amber after reboot
Red	Red	n/a	n/a	Power On Self Test (POST) running
n/a	n/a	Red	Red	PC Card incompatible on indicated interface
n/a	n/a	Red	Red	PC Card failure on indicated interface
Green	n/a	Amber	Amber	Indicated interface in Administrative State. An Amber color on a wireless interface LED indicates that the Wireless Interface Status for the particular wireless interface is "Shutdown" (refer to Wireless Service Status).
n/a	n/a	Off	Off	PC Card not present

Getting Started

Related Topics

The Setup Wizard helps you configure the basic AP settings required to get the unit up and running. The AP supports many other configuration and management options. The remainder of this user guide describes these options in detail.

- See [Performing Advanced Configuration](#) for information on configuration options that are available within the Access Point's HTTP interface.
- See [Monitoring the AP-2000](#) for information on the statistics displayed within the Access Point's HTTP interface.
- See [Performing Commands](#) for information on the commands supported by the Access Point's HTTP interface.
- See [Troubleshooting the AP-2000](#) for troubleshooting suggestions.
- See [Using the Command Line Interface \(CLI\)](#) for information on the CLI interface and for a list of CLI commands.

Viewing Status Information

- [Logging into the HTTP Interface](#)
- [System Status](#)

Logging into the HTTP Interface

Once the AP has a valid IP Address and an Ethernet connection, you may use your web browser to monitor the system status.

Follow these steps to monitor an AP's operating statistics using the HTTP interface:

1. Open a Web browser on a network computer.

⇒ NOTE

The HTTP interface supports the following Web browser:

- Microsoft Internet Explorer 6 with Service Pack 1 or later
 - Netscape 6.1 or later
2. If necessary, disable the Internet proxy settings. For Internet Explorer users, follow these steps:
 - Select **Tools > Internet Options...**
 - Click the **Connections** tab.
 - Click **LAN Settings...**
 - If necessary, remove the check mark from the **Use a proxy server** box.
 - Click **OK** twice to save your changes and return to Internet Explorer.
 3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.
 - Result: The **Enter Network Password** screen appears.
 4. Enter the HTTP password in the **Password** field and click **OK**. Leave the **User Name** field blank. (By default, the HTTP password is "public").
 - Result: The **System Status** screen appears.



Figure 3-1 Enter Network Password Screen

Viewing Status Information

System Status

System Status is the first screen to appear each time you connect to the HTTP interface. You can also return to this screen by clicking the **Status** button.

The screenshot shows the 'System Status' screen with a left-hand navigation menu containing buttons for Status, Configure, Monitor, Commands, Help, and Exit. The main content area is titled 'System Status' and displays the following information:

System Status v2.5.2(839) SN-02UT37570239 v2.0.10

IP Address	192.168.0.4	Contact Name	Contact Name
System Name	DeviceName	Contact Phone	Contact Phone Number
System Location	System Location	Contact Email	name@Organization.com
Up Time (DD:HH:MM:SS)	00:00:42:29	Object ID	1.3.6.1.4.1.11898.2.4.6

System Alarms

This table displays information on the alarms (SNMP Traps) generated by the access point. They should be deleted once they are reviewed and resolved. The alarm severity levels are: Critical, Major, Minor, and Informational.

	Description	Severity	Time Stamp
<input type="checkbox"/>	AP Cold Started.	Informational	0 days 0 hrs 0 m 19 s
<input type="checkbox"/>	Link Up.	Informational	0 days 0 hrs 0 m 19 s
<input type="checkbox"/>	Link Up.	Informational	0 days 0 hrs 0 m 19 s
<input type="checkbox"/>	Link Up.	Informational	0 days 0 hrs 0 m 19 s
<input type="checkbox"/>	Link Up.	Informational	0 days 0 hrs 0 m 19 s
<input type="checkbox"/>	AP Warm Started.	Informational	0 days 0 hrs 0 m 25 s

Buttons for 'Select All', 'Deselect All', and 'Delete' are located below the table.

Figure 3-2 System Status Screen

Each section of the **System Status** screen provides the following information:

- **System Status:** This area provides system level information, including the unit's IP address and contact information. See [System](#) for information on these settings.
- **System Alarms:** System traps (if any) appear in this area. Each trap identifies a specific severity level: Critical, Major, Minor, and Informational. See [Alarms](#) for a list of possible alarms.

Performing Advanced Configuration

- [Configuring the AP Using the HTTP/HTTPS Interface](#)
- **System:** Configure specific system information such as system name and contact information.
- **Network:** Configure IP settings, DNS client, DHCP server, and Link Integrity.
- **Interfaces:** Configure the Access Point's interfaces: Wireless and Ethernet. Also describes configuring a [Wireless Distribution System \(WDS\)](#).
- **Management:** Configure the Access Point's management Passwords, IP Access Table, and Services such as configuring secure or restricted access to the AP via SNMPv3, HTTPS, or CLI. Configure Secure Management, SSL, Secure Shell (SSH), and RADIUS Based Access Management. [Set up Automatic Configuration for Static IP](#).
- **Filtering:** Configure Ethernet Protocol filters, Static MAC Address filters, Advanced filters, and Port filters.
- **Alarms:** Configure the Alarm (SNMP Trap) Groups, the Alarm Host Table, and the Syslog features.
- **Bridge:** Configure the Spanning Tree Protocol, Storm Threshold protection, Intra BSS traffic, and Packet Forwarding.
- **RADIUS Profiles:** Configure RADIUS features such as RADIUS Access Control and Accounting.
- **SSID/VLAN/Security:** Configure security features such as MAC Access Control, WPA, WEP Encryption, and 802.1x. Configure up to 16 VLAN and SSID pairs per wireless interface, and assign Security and RADIUS Profiles for each pair.

Configuring the AP Using the HTTP/HTTPS Interface

Follow these steps to configure an Access Point's operating settings using the HTTP/HTTPS interface:

1. Open a Web browser on a network computer.

NOTE

The HTTP interface supports the following Web browser:

- Microsoft Internet Explorer 6 with Service Pack 1 or later
 - Netscape 6.1 or later
2. If necessary, disable the Internet proxy settings. For Internet Explorer users, follow these steps:
 - Select **Tools > Internet Options...**
 - Click the **Connections** tab.
 - Click **LAN Settings...**
 - If necessary, remove the check mark from the **Use a proxy server** box.
 - Click **OK** twice to save your changes and return to Internet Explorer.
 3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.
 - Result: The **Enter Network Password** screen appears.
 4. Enter the HTTP password in the **Password** field and click **OK**. Leave the **User Name** field blank. (By default, the HTTP password is "public").
 - Result: The **System Status** screen appears.

Performing Advanced Configuration



Figure 4-1 Enter Network Password Screen

5. Click the **Configure** button located on the left-hand side of the screen.

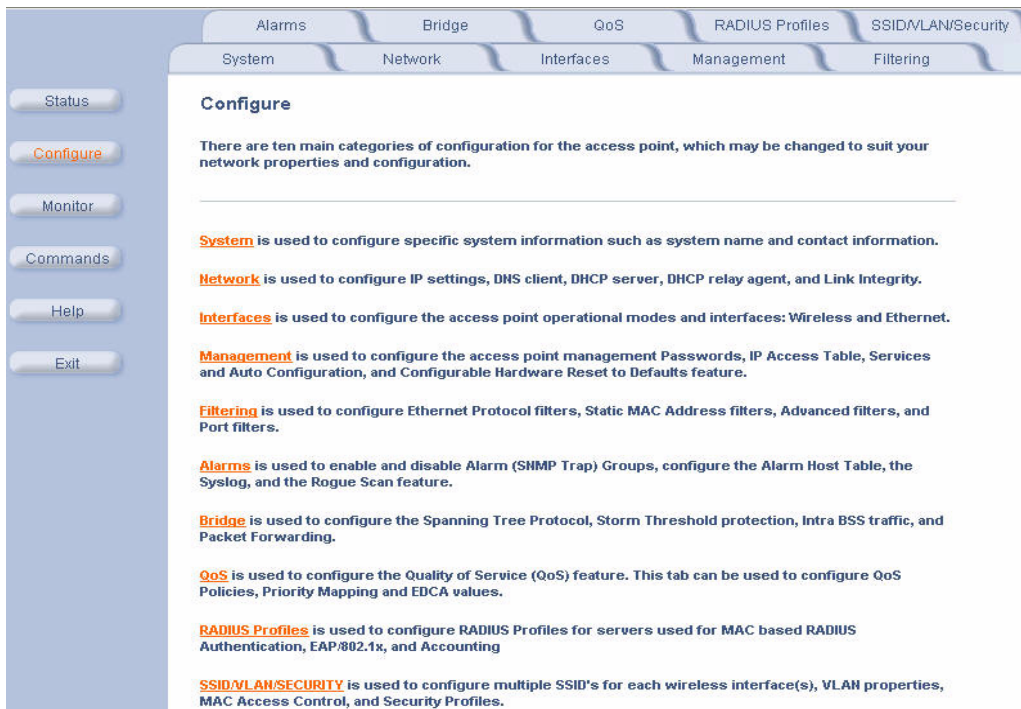


Figure 4-2 Configure Main Screen

6. Click the tab that corresponds to the parameter you want to configure. For example, click **Network** to configure the Access Point's TCP/IP settings. The parameters contained in each of the configuration categories are described later in this chapter.
7. Configure the Access Point's parameters as necessary. After changing a configuration value, click **OK** to save the change.
8. Reboot the Access Point for all of the changes to take effect.

Performing Advanced Configuration

System

You can configure and view the following parameters within the **System Configuration** screen:

- **Name:** The name assigned to the AP. System name must be between 1-31 characters. Refer to the [Dynamic DNS Support](#) and [Access Point System Naming Convention](#) sections for rules on naming the AP.
- **Location:** The location where the AP is installed. Location must be between 1-255 characters.
- **Contact Name:** The name of the person responsible for the AP. Name must be between 1-255 characters.
- **Contact Email:** The email address of the person responsible for the AP. Email must be between 1-255 characters.
- **Contact Phone:** The telephone number of the person responsible for the AP. Phone must be between 1-255 characters.
- **Object ID:** This is a read-only field that displays the Access Point's MIB definition; this information is useful if you are managing the AP using SNMP.
- **Ethernet MAC Address:** This is a read-only field that displays the unique MAC (Media Access Control) address for the Access Point's Ethernet interface. The MAC address is assigned at the factory.
- **Descriptor:** This is a read-only field that reports the Access Point's name, serial number, current image software version, and current bootloader software version.
- **Up Time:** This is a read-only field that displays how long the Access Point has been running since its last reboot.

Dynamic DNS Support

DNS is a distributed database mapping the user readable names and IP addresses (and more) of every registered system on the Internet. Dynamic DNS is a lightweight mechanism which allows for modification of the DNS data of host systems whose IP addresses change dynamically. Dynamic DNS is usually used in conjunction with DHCP for assigning meaningful names to host systems whose IP addresses change dynamically.

Access Points provide DDNS support by adding the host name (option 12) in DHCP Client messages, which is used by the DHCP server to dynamically update the DNS server.

Access Point System Naming Convention

The Access Point's system name is used as its host name. In order to prevent Access Points with default configurations from registering similar host names in DNS, the default system name of the Access Point is uniquely generated. Access Points generate unique system names by appending the last 3 bytes of the Access Point's MAC address to the default system name.

The system name must be compliant with the encoding rules for host name as per DNS RFC 1123. The DNS host name encoding rules are:

- Characters have to be alphanumeric or hyphen.
- The name cannot start or end with a hyphen.
- The name cannot start with a digit.
- The number of characters has to be 63 or less. (Currently the system name length is limited to 32 bytes).

Image upgrades could cause the system to boot with an older system name format that is not DNS compliant. To prevent problems with dynamic DNS after an image upgrade, the system name will automatically be converted to a DNS compliant system name.

The rules of conversion of older system names are:

- If the length is greater than 63 then the string is truncated. (This will not happen since the system name is anyway limited to 31 bytes)
- All invalid characters at the beginning or end of the string are replaced with the character 'X'.
- All other invalid characters are replaced with hyphens.

Performing Advanced Configuration

Network

The Network tab contains three sub-tabs.

- [IP Configuration](#)
- [DHCP Server](#)
- [Link Integrity](#)

IP Configuration

You can configure and view the following parameters within the **IP Configuration** screen:



NOTE

You must reboot the Access Point in order for any changes to the Basic IP or DNS Client parameters take effect.

Basic IP Parameters

- **IP Address Assignment Type:** Set this parameter to **Dynamic** to configure the Access Point as a Dynamic Host Configuration Protocol (DHCP) client; the Access Point will obtain IP settings from a network DHCP server automatically during boot-up. If you do not have a DHCP server or if you want to manually configure the Access Point's IP settings, set this parameter to **Static**.
- **IP Address:** The Access Point's IP address. When IP Address Assignment Type is set to Dynamic, this field is read-only and reports the unit's current IP address. The Access Point will default to 10.0.0.1 if it cannot obtain an address from a DHCP server.
- **Subnet Mask:** The Access Point's subnet mask. When IP Address Assignment Type is set to Dynamic, this field is read-only and reports the unit's current subnet mask. The subnet mask will default to 255.0.0.0 if the unit cannot obtain one from a DHCP server.
- **Gateway IP Address:** The IP address of the Access Point's gateway. When IP Address Assignment Type is set to Dynamic, this field is read-only and reports the IP address of the unit's gateway. The gateway IP address will default to 10.0.0.2 if the unit cannot obtain an address from a DHCP server.

DNS Client

If you prefer to use host names to identify network servers rather than IP addresses, you can configure the AP to act as a Domain Name Service (DNS) client. When this feature is enabled, the Access Point contacts the network's DNS server to translate a host name to the appropriate network IP address. You can use this DNS Client functionality to identify RADIUS servers by host name. See [RADIUS Profiles](#) for details.

- **Enable DNS Client:** Place a check mark in the box provided to enable DNS client functionality. Note that this option must be enabled before you can configure the other DNS Client parameters.
- **DNS Primary Server IP Address:** The IP address of the network's primary DNS server.
- **DNS Secondary Server IP Address:** The IP address of a second DNS server on the network. The Access Point will attempt to contact the secondary server if the primary server is unavailable.
- **DNS Client Default Domain Name:** The default domain name for the Access Point's network (for example, "proxim.com"). Contact your network administrator if you need assistance setting this parameter.

Advanced

- **Default TTL (Time to Live):** Time to Live (TTL) is a field in an IP packet that specifies how long in seconds the packet can remain active on the network. The Access Point uses the default TTL for packets it generates for which the transport layer protocol does not specify a TTL value. This parameter supports a range from 0 to 65535. By default, TTL is 64.

Performing Advanced Configuration

DHCP Server

If your network does not have a DHCP Server, you can configure the AP as a DHCP server to assign dynamic IP addresses to Ethernet nodes and wireless clients.



CAUTION

Make sure there are no other DHCP servers on the network and do not enable the DHCP server without checking with your network administrator first, as it could bring down the whole network. Also, the AP must be configured with a static IP address before enabling this feature.

When the DHCP Server functionality is enabled, you can create one or more IP address pools from which to assign addresses to network devices.

The DHCP server in the access point allows for dynamic IP address assignment to both wireless clients and wired hosts.

Note: The DHCP server can only be enabled after at least one entry has been added to the DHCP server IP pool table. Changes to these parameters require access point reboot in order to take effect.

Enable DHCP Server

Subnet Mask 255.255.255.0

Gateway IP Address 192.168.0.100

Primary DNS IP Address 192.168.0.1

Secondary DNS IP Address 192.168.0.2

Number of IP Pool Table Entries 1

OK Cancel

IP Pool Table

Add Edit

Start IP	End IP	Default Lease	Maximum Lease	Comment	Status
192.168.0.101	192.168.0.110	86400	86400		Enable

Figure 4-3 DHCP Server Configuration Screen

Performing Advanced Configuration

You can configure and view the following parameters within the **DHCP Server Configuration** screen:

- **Enable DHCP Server:** Place a check mark in the box provided to enable DHCP Server functionality.

⇒ NOTE

You cannot enable the DHCP Server functionality unless there is at least one IP Pool Table Entry configured.

- **Subnet Mask:** This field is read-only and reports the Access Point's current subnet mask. DHCP clients that receive dynamic addresses from the AP will be assigned this same subnet mask.
- **Gateway IP Address:** The AP will assign the specified address to its DHCP clients.
- **Primary DNS IP Address:** The AP will assign the specified address to its DHCP clients.
- **Secondary DNS IP Address:** The AP will assign the specified address to its DHCP clients.
- **Number of IP Pool Table Entries:** This is a read-only field that reports the number of IP address pools currently configured.
- **IP Pool Table Entry:** This entry specifies a range of IP addresses that the AP can assign to its wireless clients. The maximum number of entries allowed is 20. Click **Add** to create a new entry. Click **Edit** to change an existing entry. Each entry contains the following field:
 - **Start IP Address**
 - **End IP Address**
 - **Default Lease Time (optional):** The default time value for clients to retain the assigned IP address. DHCP automatically renews IP Addresses without client notification. This parameter supports a range between 3600 and 86400 seconds. The default is 86400 seconds.
 - **Maximum Lease Time (optional):** The maximum time value for clients to retain the assigned IP address. DHCP automatically renews IP Addresses without client notification. This parameter supports a range between 3600 and 86400 seconds. The default is 86400 seconds.
 - **Comment (optional)**
 - **Status:** IP Pools are enabled upon entry in the table. You can also disable or delete entries by changing this field's value.

⇒ NOTE

You must reboot the Access Point before changes to any of these DHCP server parameters take effect.

Link Integrity

The Link Integrity feature checks the link between the AP and the nodes on the Ethernet backbone. These nodes are listed by IP address in the Link Integrity IP Address Table. The AP periodically pings the nodes listed within the table. If the AP loses network connectivity (that is, the ping attempts fail), the AP disables its wireless interface until the connection is restored. This forces the unit's wireless clients to switch to another Access Point that still has a network connection. Note that this feature does not affect WDS links (if applicable).

You can configure and view the following parameters within the **Link Integrity Configuration** screen:

- **Enable Link Integrity:** Place a check mark in the box provided to enable Link Integrity.
- **Poll Interval (milliseconds):** The interval between link integrity checks. Range is 500 - 15000 ms in increments of 500 ms; default is 500 ms.
- **Poll Retransmissions:** The number of times a poll should be retransmitted before the link is considered down. Range is 0 to 255; default is 5.
- **Target IP Address Entry:** This entry specifies the IP address of a host on the network that the AP will periodically poll to confirm connectivity. The table can hold up to five entries. By default, all five entries are set to 0.0.0.0. Click **Edit** to update one or more entries. Each entry contains the following field:
 - **Target IP Address**
 - **Comment (optional)**
 - **Status:** Set this field to **Enable** to specify that the Access Point should poll this device. You can also disable an entry by changing this field's value to **Disable**.

Performing Advanced Configuration

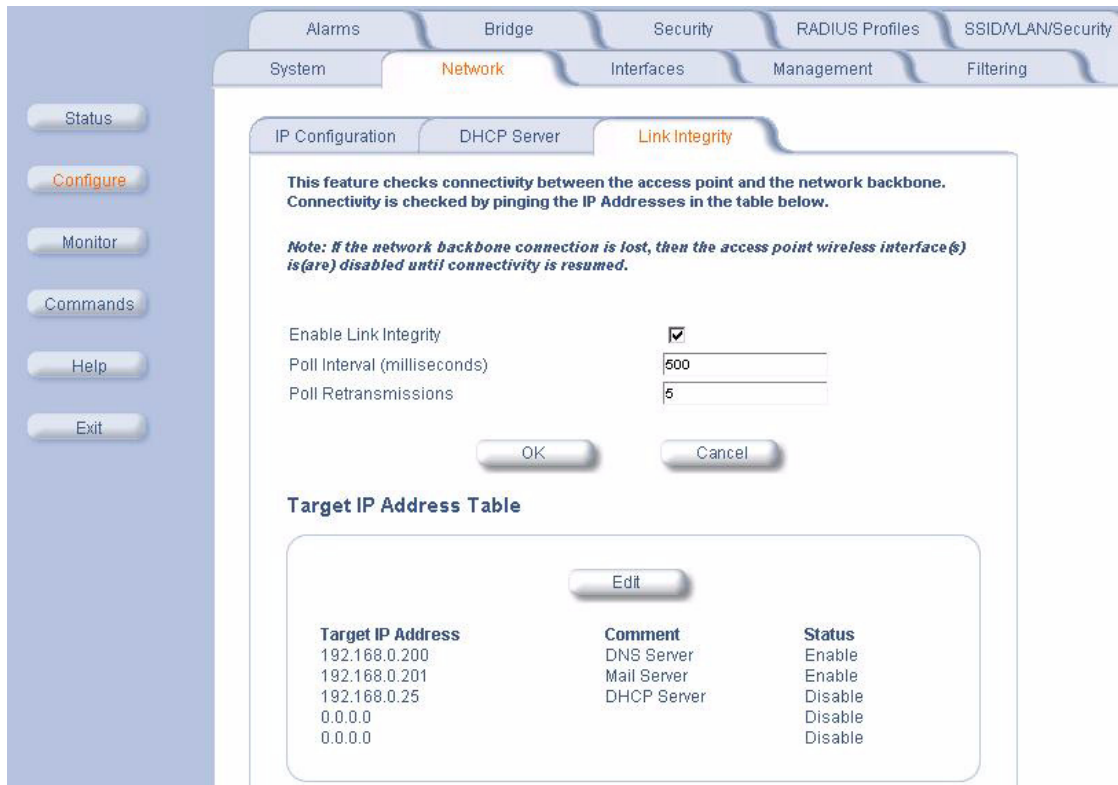


Figure 4-4 Link Integrity Configuration Screen

Interfaces

The Interfaces tab contains the following sub-tabs:

- [Operational Mode](#)
- [8Wireless-A and Wireless-B](#)
- [Ethernet](#)

From these sub-tabs, you configure the Access Point's operational mode, wireless interface settings and Ethernet settings. You may also configure a [Wireless Distribution System \(WDS\)](#) for AP-to-AP communications.

For the wireless interface configuration, refer to the wireless parameters below that correspond to your radio type.

- [Wireless A \(802.11a\)](#)
- [Wireless \(802.11b\)](#)
- [Wireless \(802.11b/g\)](#)

Performing Advanced Configuration

Operational Mode

Operational Mode Selection

You can configure and view the following parameters within the **Operational Mode** screen.

- **Operational Mode:** the mode of communication between the wireless clients and the Access Point:
 - 802.11b only
 - 802.11g only
 - 802.11bg
 - 802.11a
 - 802.11g-wifi
- 9. Select the transmit power level for interface B from the Wireless-B: Transmit Power Level drop-down menu.

Wireless-A and Wireless-B

Wireless A (802.11a)

You can configure and view the following parameters within the **Wireless Interface Configuration** screen for an 802.11a AP:

NOTE

You must reboot the Access Point before any changes to these parameters take effect.

- **Physical Interface Type:** For an 802.11a AP, this field reports: "802.11a (OFDM 5 GHz)." OFDM stands for Orthogonal Frequency Division Multiplexing; this is the name for the radio technology used by 802.11a devices.
- **MAC Address:** This is a read-only field that displays the unique MAC (Media Access Control) address for the Access Point's wireless interface. The MAC address is assigned at the factory.
- **Regulatory Domain:** Reports the regulatory domain for which the AP is certified. Not all features or channels are available in all countries. The available regulatory domains include:
 - FCC - U.S./Canada, Mexico, and Australia
 - ETSI - Europe and the United Kingdom
 - TELEC: Japan
 - SG: Singapore
 - ASIA: China, Hong Kong, and South Korea
 - TW: Taiwan
- **Network Name (SSID):** Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
- **Auto Channel Select:** The AP scans the area for other Access Points and selects a free or relatively unused communication channel. This helps prevent interference problems and increases network performance. By default this feature is enabled. See [802.11a Channel Frequencies](#) for a list of Channels.

NOTE

You cannot disable Auto Channel Select for 802.11a products in Europe (see [Dynamic Frequency Selection \(DFS\)](#) for details).

- **Frequency Channel:** When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating Channel. When Auto Channel Select is disabled, you can specify the Access Point's channel. If you decide to manually set the unit's Channel, ensure that nearby devices do not use the same frequency. Available Channels vary based on regulatory domain. See [802.11a Channel Frequencies](#). Note that you cannot manually set the channel for 802.11a products in Europe (see [Dynamic Frequency Selection \(DFS\)](#) for details).
- **Transmit Rate:** Use the drop-down menu to select a specific transmit rate for the AP. Choose a particular rate available for protocol being used or Auto Fallback. Auto Fallback is the default setting; it allows the AP unit to select the best transmit rate based on the cell size.
- **DTIM Period:** The Deferred Traffic Indicator Map (DTIM) is used with clients that have power management enabled. DTIM should be left at 1, the default value, if any clients have power management enabled. This parameter supports a range between 1 and 255.

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- **RTS/CTS Medium Reservation:** This parameter affects message flow control and should not be changed under normal circumstances. Range is 0 to 2347. When set to a value between 0 and 2347, the Access Point uses the RTS/CTS mechanism for packets that are the specified size or greater. When set to 2347 (the default setting), RTS/CTS is disabled. See [RTS/CTS Medium Reservation](#) for more information.
- **Closed System:** Check this box to allow only clients configured with the Access Point's specific Network Name to associate with the Access Point. When enabled, a client configured with the Network Name "ANY" cannot connect to the AP. This option is disabled by default. See [Broadcast SSID and Closed System](#) for more information.
- **Wireless Service Status:** Select **shutdown** to shutdown the wireless service on a wireless interface, or **resume** to resume wireless service. See [Wireless Service Status](#) for more information.

Dynamic Frequency Selection (DFS)

802.11a APs sold in Europe use a technique called Dynamic Frequency Selection (DFS) to automatically select an operating channel. During boot-up, the AP scans the available frequency and selects a channel that is free of interference. If the AP subsequently detects interference on its channel, it automatically reboots and selects another channel that is free of interference.

DFS only applies to 802.11a APs used in Europe (i.e., units whose regulatory domain is set to ETSI). The European Telecommunications Standard Institute (ETSI) requires that 802.11a devices use DFS to prevent interference with radar systems and other devices that already occupy the 5 GHz band.

If you are using an 802.11a AP in Europe, keep in mind the following:

- DFS is not a configurable parameter. It is always enabled and cannot be disabled.
- You cannot manually select the device's operating channel; you must let DFS select the channel.
- You cannot configure the **Auto Channel Select** option. Within the HTTP interface, this option always appears enabled.

RTS/CTS Medium Reservation

The 802.11 standard supports optional RTS/CTS communication based on packet size. Without RTS/CTS, a sending radio listens to see if another radio is already using the medium before transmitting a data packet. If the medium is free, the sending radio transmits its packet. However, there is no guarantee that another radio is not transmitting a packet at the same time, causing a collision. This typically occurs when there are hidden nodes (clients that can communicate with the Access Point but are out of range of each other) in very large cells.

When RTS/CTS occurs, the sending radio first transmits a Request to Send (RTS) packet to confirm that the medium is clear. When the receiving radio successfully receives the RTS packet, it transmits back a Clear to Send (CTS) packet to the sending radio. When the sending radio receives the CTS packet, it sends the data packet to the receiving radio. The RTS and CTS packets contain a reservation time to notify other radios (including hidden nodes) that the medium is in use for a specified period. This helps to minimize collisions. While RTS/CTS adds overhead to the radio network, it is particularly useful for large packets that take longer to resend after a collision occurs.

RTS/CTS Medium Reservation is an advanced parameter and supports a range between 0 and 2347 bytes. When set to 2347 (the default setting), the RTS/CTS mechanism is disabled. When set to 0, the RTS/CTS mechanism is used for all packets. When set to a value between 0 and 2347, the Access Point uses the RTS/CTS mechanism for packets that are the specified size or greater. You should not need to enable this parameter for most networks unless you suspect that the wireless cell contains hidden nodes.

Wireless Service Status

The user can shutdown (or resume) the wireless service on the wireless interface of the AP through the CLI, HTTP, or SNMP interface. When the wireless service on a wireless interface is shutdown, the AP will:

- Stop the AP services to wireless clients connected on that wireless interface by disassociating them
- Disable the associated BSS ports on that interface
- Disable the transmission and reception of frames on that interface
- Indicate the wireless service shutdown status of the wireless interface through LED and traps
- Enable Ethernet interface so that it can receive a wireless service resume command through CLI/HTTP/SNMP interface

NOTE

WSS disables only BSS ports; WDS ports are still operational.

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In shutdown state, AP will not transmit and receive frames from the wireless interface and will stop transmitting periodic beacons. Moreover, none of the frames received from the Ethernet interface will be forwarded to that wireless interface.

Wireless service on a wireless interface of the AP can be resumed through CLI/HTTP/SNMP management interface. When wireless service on a wireless interface is resumed, the AP will:

- Enable the transmission and reception of frames on that wireless interface
- Enable the associated BSS port on that interface
- Start the AP services to wireless clients
- Indicate the wireless service resume status of the wireless interface through LED and traps

After wireless service resumes, the AP resumes beaconing, transmitting and receiving frames to/from the wireless interface and bridging the frames between the Ethernet and the wireless interface.

Traps Generated During Wireless Service Shutdown (and Resume)

The following traps are generated during wireless service shutdown and resume, and are also sent to any configured Syslog server.

When the wireless service is shutdown on a wireless interface, the AP generates a trap called *oriTrapWirelessServiceShutdown*.

When the wireless service is resumed on a wireless interface, the AP generate a trap called *oriTrapWirelessServiceResumed*.

NOTE

Wireless service can be shutdown/resumed on each wireless interface individually.

Wireless Interface Activity LED and Wireless Service Shutdown

When the wireless service is shutdown on a wireless interface, the Wireless Interface Activity LED for that interface changes to an amber color.

When wireless service is resumed on a wireless interface, the Wireless Interface Activity LED for that interface maintains an OFF state while there is no wireless link activity and changes to green color when there is wireless link activity.

Wireless (802.11b)

You can configure and view the following parameters within the **Wireless Interface Configuration** screen for an 802.11b AP:

NOTE

You must reboot the Access Point before any changes to these parameters take effect.

- **Physical Interface Type:** For 802.11b AP, this field reports: "802.11b (DSSS 2.4 GHz)." DSSS stands for Direct Sequence Spread Spectrum; this is the name for the radio technology used by 802.11b devices.
- **MAC Address:** This is a read-only field that displays the unique MAC (Media Access Control) address for the Access Point's wireless interface. The MAC address is assigned at the factory.
- **Regulatory Domain:** Reports the regulatory domain for which the AP is certified. Not all features or channels are available in all countries. The available regulatory domains include:
 - FCC - U.S./Canada, Mexico, and Australia
 - ETSI - Most of Europe, including the United Kingdom, Ireland, Singapore, and Hong Kong
 - TELEC: Japan
 - IL - Israel
- **Network Name (SSID):** Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
- **Auto Channel Select:** The AP scans the area for other Access Points and selects a free or relatively unused communication channel. This helps prevent interference problems and increases network performance. By default this feature is enabled; see [802.11b Channel Frequencies](#) for a list of Channels. However, if you are setting up a Wireless Distribution System (WDS), it must be disabled. See [Wireless Distribution System \(WDS\)](#) for more information.

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- **Frequency Channel:** When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating channel. When Auto Channel Select is disabled, you can specify the Access Point's operating channel. If you decide to manually set the unit's channel, ensure that nearby devices do not use the same frequency (unless you are setting up a WDS). Available Channels vary based on regulatory domain. See [802.11b Channel Frequencies](#).
- **Distance Between APs:** Set to **Large**, **Medium**, **Small**, **Microcell**, or **Minicell** depending on the site survey for your system. By default, this parameter is set to **Large**. The distance value is related to the **Multicast Rate** (described next). In general, a larger distance between APs means that your clients operate a slower data rates (on average). This feature is available only if you are using an Orinoco Classic Gold card. See [Distance Between APs](#) for more information.
- **Multicast Rate:** Sets the rate at which Multicast messages are sent. This value is related to the Distance Between APs parameter (described previously). The table below displays the possible Multicast Rates based on the Distance between APs setting. By default, this parameter is set to 2 Mbits/sec. This feature is available only if you are using an Orinoco Classic Gold card. See [Multicast Rate](#) for more information.

Distance between APs	Multicast Rate
Large	1 and 2 Mbits/sec
Medium	1, 2, and 5.5 Mbits/sec
Small	1, 2, 5.5 and 11 Mbits/sec
Minicell	1, 2, 5.5 and 11 Mbits/sec
Microcell	1, 2, 5.5 and 11 Mbits/sec

- **DTIM Period:** The Deferred Traffic Indicator Map (DTIM) is used with clients that have power management enabled. DTIM should be left at 1, the default value, if any clients have power management enabled. This parameter supports a range between 1 and 255.
- **RTS/CTS Medium Reservation:** This parameter affects message flow control and should not be changed under normal circumstances. Range is 0 to 2347. When set to a value between 0 and 2347, the Access Point uses the RTS/CTS mechanism for packets that are the specified size or greater. When set to 2347 (the default setting), RTS/CTS is disabled. See [RTS/CTS Medium Reservation](#) for more information.
- **Interference Robustness:** Enable this option if other electrical devices in the 2.4 GHz frequency band (such as a microwave oven or a cordless phone) may be interfering with the wireless signal. The AP will automatically fragment large packets into multiple smaller packets when interference is detected to increase the likelihood that the messages will be received in the presence of interference. The receiving radio reassembles the original packet once all fragments have been received. This feature is available only if you are using an Orinoco Classic Gold card. This option is disabled by default.
- **Closed System:** Check this box to allow only clients configured with the Access Point's specific Network Name to associate with the Access Point. When enabled, a client configured with the Network Name "ANY" cannot connect to the AP. This option is disabled by default. See [Broadcast SSID and Closed System](#) for more information.
- **Wireless Service Status:** Select **shutdown** to shutdown the wireless service on a wireless interface, or **resume** to resume wireless service. See [Wireless Service Status](#) for more information.
- **Load Balancing:** Enable this option so clients can evaluate which Access Point to associate with, based on current AP loads. This feature is enabled by default; it helps distribute the wireless load between APs. This feature is not available if you are using an ORiNOCO ComboCard or a non-ORiNOCO client with the AP.
- **Medium Density Distribution:** When enabled, the Access Point automatically notifies wireless clients of its **Distance Between APs**, **Interference Robustness**, and **RTS/CTS Medium Reservation** settings. This feature is enabled by default and allows clients to automatically adopt the values used by its current Access Point (even if these values differ from the client's default values or from the values supported by other Access Points). Note that this feature is available only if you are using an Orinoco Classic Gold card. Proxim recommends that you leave this parameter enabled, particularly if you have ORiNOCO clients on your wireless network (leaving this parameter enabled should not adversely affect the performance of any ORiNOCO ComboCards or non-ORiNOCO cards on your network).

Distance Between APs

Distance Between APs defines how far apart (physically) your AP devices are located, which in turn determines the size of your cell. Cells of different sizes have different capacities and, therefore, suit different applications. For instance, a typical office has many stations that require high bandwidth for complex, high-speed data processing. In contrast, a typical warehouse has a few forklifts requiring low bandwidth for simple transactions.

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➤ NOTE

This feature is available only if you are using an Orinoco Classic Gold card.

Cell capacities are compared in the following table, which shows that small cells suit most offices and large cells suit most warehouses:

Small Cell	Large Cell
Physically accommodates few stations	Physically accommodates many stations
High cell bandwidth per station	Lower cell bandwidth per station
High transmit rate	Lower transmit rate

Coverage

The number of Access Points in a set area determines the network coverage for that area. A large number of Access Points covering a small area is a high-density cell. A few Access Points, or even a single unit, covering the same small area would result in a low-density cell, even though in both cases the actual area did not change — only the number of Access Points covering the area changed.

In a typical office, a high density area consists of a number of Access Points installed every 20 feet and each Access Point generates a small radio cell with a diameter of about 10 feet. In contrast, a typical warehouse might have a low density area consisting of large cells (with a diameter of about 90 feet) and Access Points installed every 200 feet.

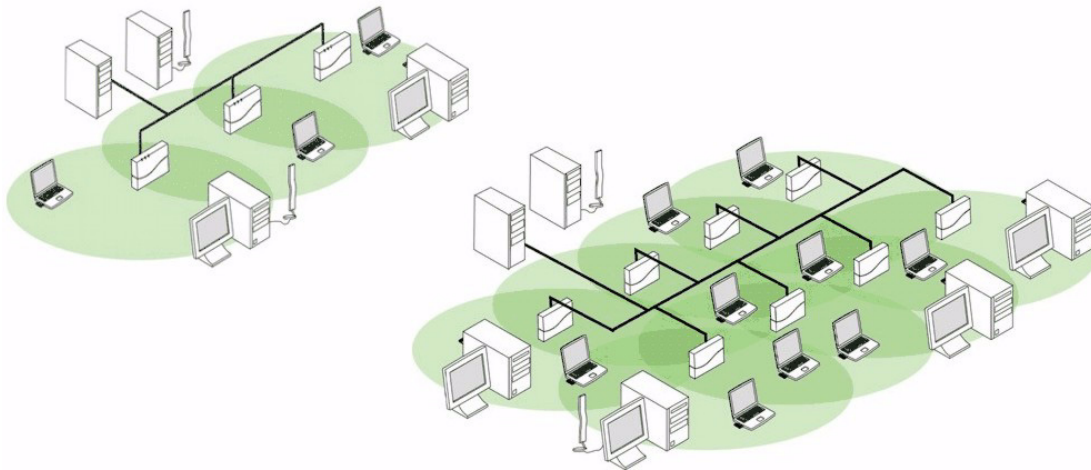


Figure 4-5 Low Density vs. Ultra High Density Network

The Distance Between Cells parameter supports five values: Large, Medium, Small, Minicell, and Microcell.

! CAUTION

The distance between APs should not be approximated. It is calculated by means of a manual Site Survey, in which an AP is set up and clients are tested throughout the area to determine signal strength and coverage, and local limits such as physical interference are investigated. From these measurements the appropriate cell size and density is determined, and the optimum distance between APs is calculated to suit your particular business requirements. Contact your reseller for information on how to conduct a Site Survey.

Multicast Rate

The multicast rate determines the rate at which broadcast and multicast packets are transmitted by the Access Point to the wireless network. Stations that are closer to the Access Point can receive multicast packets at a faster data rate than stations that are farther away from the AP. Therefore, you should set the Multicast Rate based on the size of the Access Point's cell. For example, if the Access Point's cell is very small (e.g., Distance Between APs is set to Microcell), you can expect that all stations should be able to successfully receive multicast packets at 11 MBits/sec so you can set Multicast Rate to 11 Mbits/sec. However, if the Access Point's cell is large, you need to accommodate

Performing Advanced Configuration

stations that may not be able to receive multicast packets at the higher rates; in this case, you should set Multicast Rate to 1 or 2 Mbits/sec.

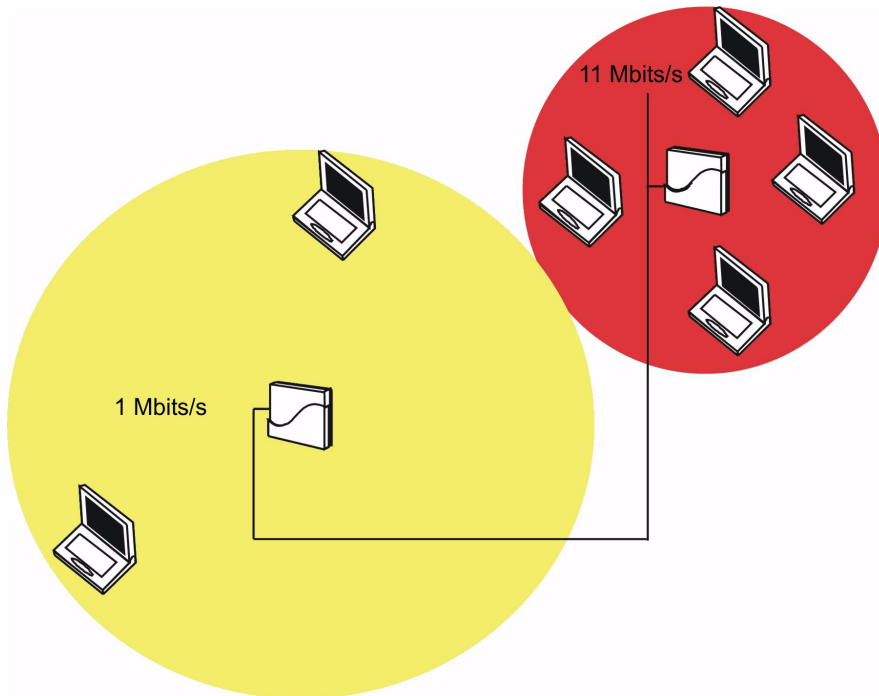


Figure 4-6 1 Mbits/s and 11 Mbits/s Multicast Rates

⇒ NOTE

There is an inter-dependent relationship between the Distance between APs and the Multicast Rate. In general, larger systems operate at a lower average transmit rate. The variation between Multicast Rate and Distance Between APs is presented in the following table:

	1.0 Mbit/s	2.0 Mbits/s	5.5 Mbits/s	11 Mbits/s
Large	yes	yes		
Medium	yes	yes	yes	
Small	yes	yes	yes	yes
Minicell	yes	yes	yes	yes
Microcell	yes	yes	yes	yes

The Distance Between APs **must be set before** the Multicast Rate, because when you select the Distance Between APs, the appropriate range of Multicast values automatically populates the drop-down menu. This feature is not available if you are using an ORiNOCO ComboCard or a non-ORiNOCO client with the AP.

Wireless (802.11b/g)

You can configure the following radio parameters for an 802.11b/g AP:

⇒ NOTE

You must reboot the Access Point before any changes to these parameters take effect.

- **Operational Mode:** An 802.11b/g wireless interface can be configured to operate in the following modes:
 - **802.11b mode only:** The radio uses the 802.11b standard only.
 - **802.11g mode only:** The radio is optimized to communicate with 802.11g devices. This setting will provide the best results if this radio interface will only communicate with 802.11g devices.

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- **802.11b/g mode:** This is the default mode. Use this mode if you want to support a mix of 802.11b and 802.11g devices.
- **802.11g-wifi:** This mode was developed for Wi-Fi compliance testing purposes. It is similar to 802.11g only mode.

In general, you should use either 802.11g only mode (if you want to support 802.11g devices only) or 802.11b/g mode to support a mix of 802.11b and 802.11g devices.

- **Physical Interface Type:** Depending on the Operational Mode, this field reports:
 - For 802.11b mode only: "802.11b (CCK/DSSS 2.4 GHz)"
 - For 802.11g and 802.11g-wifi modes: "802.11g (OFDM/DSSS 2.4 GHz)"
 - For 802.11b/g mode: "802.11b/g (ERP-CCK/DSSS/OFDM 2.4 GHz)"

OFDM stands for Orthogonal Frequency Division Multiplexing; this is the name for the radio technology used by 802.11a devices. DSSS stands for Direct Sequence Spread Spectrum; this is the name for the radio technology used by 802.11b devices.
- **MAC Address:** This is a read-only field that displays the unique MAC (Media Access Control) address for the Access Point's wireless interface. The MAC address is assigned at the factory.
- **Regulatory Domain:** Reports the regulatory domain for which the AP is certified. Not all features or channels are available in all countries. The available regulatory domains include:
 - FCC - U.S./Canada, Mexico, and Australia
 - ETSI - Europe, including the United Kingdom, China, and South Korea
 - TELEC - Japan
 - IL - Israel
- **Network Name (SSID):** Enter a Network Name (between 1 and 32 characters long) for the wireless network. You must configure each wireless client to use this name as well.
- **Auto Channel Select:** The AP scans the area for other Access Points and selects a free or relatively unused communication channel. This helps prevent interference problems and increases network performance. By default this feature is enabled; see [802.11g Channel Frequencies](#) for a list of Channels.
- **Frequency Channel:** When Auto Channel Select is enabled, this field is read-only and displays the Access Point's current operating channel. When Auto Channel Select is disabled, you can specify the Access Point's operating channel. If you decide to manually set the unit's channel, ensure that nearby devices do not use the same frequency (unless you are setting up a WDS). Available Channels vary based on regulatory domain. See [802.11g Channel Frequencies](#).
- **Transmit Rate:** Select a specific transmit rate for the AP. The values available depend on the Operational Mode. Auto Fallback is the default setting; it allows the AP to select the best transmit rate based on the cell size.
 - For 802.11b only -- Auto Fallback, 1, 2, 5.5, 11 Mbits/sec
 - For 802.11g only -- Auto Fallback, 6, 9, 12, 18, 24, 36, 48, 54 Mbits/sec
 - For 802.11b/g and 802.11g-wifi -- Auto Fallback, 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbits/sec
- **DTIM Period:** The Deferred Traffic Indicator Map (DTIM) is used with clients that have power management enabled. DTIM should be left at 1, the default value, if any clients have power management enabled. This parameter supports a range between 1 and 255.
- **RTS/CTS Medium Reservation:** This parameter affects message flow control and should not be changed under normal circumstances. Range is 0 to 2347. When set to a value between 0 and 2347, the Access Point uses the RTS/CTS mechanism for packets that are the specified size or greater. When set to 2347 (the default setting), RTS/CTS is disabled. See [RTS/CTS Medium Reservation](#) for more information.
- **Closed System:** Check this box to allow only clients configured with the Access Point's specific Network Name to associate with the Access Point. When enabled, a client configured with the Network Name "ANY" cannot connect to the AP. This option is disabled by default. See [Broadcast SSID and Closed System](#) for more information.

Wireless Distribution System (WDS)

A Wireless Distribution System (WDS) creates a link between two 802.11a, 802.11b, or 802.11b/g APs over their radio interfaces. This link relays traffic from one AP that does not have Ethernet connectivity to a second AP that has Ethernet connectivity. WDS allows you to configure up to six (6) point-to-point links between Access Points.

In the [WDS Example](#) below, AP 1 and AP 2 communicate over a WDS link (represented by the blue line). This link provides Client 1 with access to network resources even though AP 1 is not directly connected to the Ethernet network. Packets destined for or sent by the client are relayed between the Access Points over the WDS link.

Performing Advanced Configuration

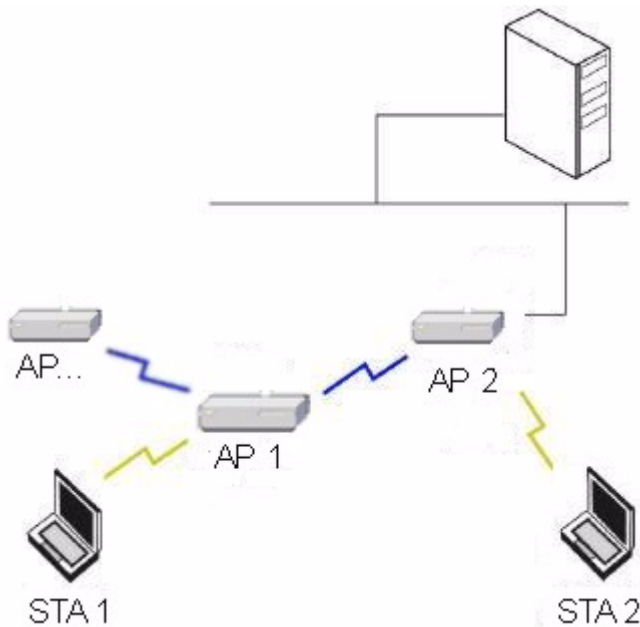


Figure 4-7 WDS Example

Bridging WDS

Each WDS link is mapped to a logical WDS port on the AP. WDS ports behave like Ethernet ports rather than like standard wireless interfaces: on a BSS port, an Access Point learns by association and from frames; on a WDS or Ethernet port, an Access Point learns from frames only. When setting up a WDS, keep in mind the following:

- The WDS link shares the communication bandwidth with the clients. Therefore, while the maximum data rate for the Access Point's cell is still 11 Mb, client throughput will decrease when the WDS link is active.
- If there is no partner MAC address configured in the WDS table, the WDS port remains disabled.
- Each WDS port on a single AP should have a unique partner MAC address. Do not enter the same MAC address twice in an AP's WDS port list.
- Each Access Point that is a member of the WDS must have the same Channel setting to communicate with each other.
- Each Access Point that is a member of the WDS must have the same network domain.
- Each Access Point that is a member of the WDS must have the same WEP Encryption settings. WDS does not use 802.1x. Therefore, if you want to encrypt the WDS link, you must configure each Access Point to use WEP encryption, and each Access Point must have the same Encryption Key(s). See [SSID/VLAN/Security](#).
- If your network does not support spanning tree, be careful to avoid creating network loops between APs. For example, creating a WDS link between two Access Points connected to the same Ethernet network will create a network loop (if spanning tree is disabled). For more information, refer to the [Spanning Tree](#) section.

WDS Setup Procedure

⇒ NOTE

You must disable Auto Channel Select to create a WDS. Each Access Point that is a member of the WDS must have the same Channel setting to communicate with each other.

⇒ NOTE

For radio cards that belong to the ETSI regulatory domain, ACS is enabled by default, and cannot be disabled. Therefore, it is not possible to set up a WDS link. This only applies to ETSI 802.11a wireless radios.

To setup a wireless backbone follow the steps below for each AP that you wish to include in the Wireless Distribution System.

Performing Advanced Configuration

1. Confirm that Auto Channel Select is disabled.
2. Write down the MAC Address of the radio that you wish to include in the Wireless Distribution System.
3. Click on **Interfaces > Wireless-A or Wireless-B**.
4. Scroll down to the Wireless Distribution System heading.
5. Click the **Edit** button to update the Wireless Distribution System (WDS) Table (see [Figure 4-8](#)).

Wireless Distribution System (WDS)

WDS can be used to establish point-to-point (i.e. wireless backhaul) connections with other access points. This table is used to configure WDS partner access points.

Port Index	Partner MAC Address	Status
1	00:02:2D:12:34:56	Disable
2	00:00:00:00:00:00	Disable
3	00:00:00:00:00:00	Disable
4	00:00:00:00:00:00	Disable
5	00:00:00:00:00:00	Disable
6	00:00:00:00:00:00	Disable

Figure 4-8 WDS Edit Entry Screen

The WDS Configuration screen will be displayed (see [Figure 4-9](#)).

System
Network
Interfaces
Management
Filtering

WDS Slot A Table Configuration- Add Entries

This page is used to configure the Wireless Distribution System (WDS) links or partners. You can configure up to six WDS links and the security to be used for those links.

Warning: Connectivity requires that the encryption key for the WDS links between access points be identical.

Note: Changes to these parameters require access point reboot in order to take effect.

WDS Security

Enable WDS Security Mode

Encryption Key 0

WDS partner access points

Port Index	1	
Partner MAC Address	<input type="text" value="00:00:00:00:00:00"/>	
Status	<input type="text" value="Disable"/>	<input type="button" value="v"/>
Port Index	2	

Figure 4-9 WDS Configuration Screen

6. If desired, enable security by checking the **Enable WDS Security Mode** box.

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7. If security mode is enabled, enter a value for Encryption Key 0.
8. Click **OK**.
9. Enter the MAC Address that you wrote down in Step 2 in one of the **Partner MAC Address** field of the Wireless Distribution Setup window.
10. Set the **Status** of the device to **Enable**.
11. Click **OK**.
12. Reboot the AP.

Ethernet

Select the desired speed and transmission mode from the drop-down menu. Half-duplex means that only one side can transmit at a time and full-duplex allows both sides to transmit. When set to auto-duplex, the AP negotiates with its switch or hub to automatically select the highest throughput option supported by both sides.

For best results, Proxim recommends that you configure the Ethernet setting to match the speed and transmission mode of the device the Access Point is connected to (such as a hub or switch). If in doubt, leave this setting at its default, **auto-speed-auto-duplex**. Choose between:

- 10 Mbit/s - half duplex, full duplex, or auto duplex
- 100 Mbit/s - half duplex or full duplex
- auto speed - half duplex or auto duplex

Performing Advanced Configuration

Management

The Management tab contains five sub-tabs.

- [Passwords](#)
- [IP Access Table](#)
- [Services](#)
- [Automatic Configuration \(AutoConfig\)](#)
- [Hardware Configuration Reset \(CHRP\)](#)

Passwords

The following passwords are configurable:

- **SNMP Read Community Password:** The password for read access to the AP using SNMP. Enter a password in both the **Password** field and the **Confirm** field. This password must be between 6 and 32 characters. The default password is "public".
- **SNMP Read/Write Community Password:** The password for read and write access to the AP using SNMP. Enter a password in both the **Password** field and the **Confirm** field. This password must be between 6 and 32 characters. The default password is "public".
- **SNMPv3 Authentication Password:** The password used when sending authenticated SNMPv3 messages. Enter a password in both the **Password** field and the **Confirm** field. This password must be between 6 and 32 characters, but a length of at least 8 characters is recommended. The default password is "public". Secure Management (Services tab) must be enabled to configure SNMPv3.

The default SNMPv3 username is **administrator**, with SHA authentication, and DES privacy protocol.

- **SNMPv3 Privacy Password:** The password used when sending encrypted SNMPv3 data. Enter a password in both the **Password** field and the **Confirm** field. This password must be between 6 and 32 characters, but a length of at least 8 characters is recommended. The default password is "public". Secure Management (Services tab) must be enabled to configure SNMPv3.
- **Telnet (CLI) Password:** The password for the CLI interface (via serial or Telnet). Enter a password in both the **Password** field and the **Confirm** field. This password must be between 6 and 32 characters. The default password is "public".
- **HTTP (Web) Password:** The password for the Web browser HTTP interface. Enter a password in both the **Password** field and the **Confirm** field. This password must be between 6 and 32 characters. The default password is "public".

NOTE

For security purposes Proxim recommends changing ALL PASSWORDS from the default "public" immediately, to restrict access to your network devices to authorized personnel. If you lose or forget your password settings, you can always perform the [Reset to Factory Default Procedure](#).

IP Access Table

The Management IP Access table limits in-band management access to the IP addresses or range of IP addresses specified in the table. This feature applies to all management options (SNMP, HTTP, and CLI) except for CLI management over the serial port. To configure this table, click **Add** and set the following parameters:

- **IP Address:** Enter the IP Address for the management station.
- **IP Mask:** Enter a mask that will act as a filter to limit access to a range of IP Addresses based on the IP Address you already entered.
 - The IP mask 255.255.255.255 would authorize the single station defined by the IP Address to configure the Access Point. The AP would ignore commands from any other IP address. In contrast, the IP mask 255.255.255.0 would allow any device that shares the first three octets of the IP address to configure the AP. For example, if you enter an IP address of 10.20.30.1 with a 255.255.255.0 subnet mask, any IP address between 10.20.30.1 and 10.20.30.254 will have access to the AP's management interfaces.
- **Comment:** Enter an optional comment, such as the station name.

To edit or delete an entry, click **Edit**. Edit the information, or select **Enable**, **Disable**, or **Delete** from the **Status** pull-down menu.

Performing Advanced Configuration

Services

You can configure the following management services:



NOTE

You must reboot the Access Point if you change the HTTP Port or Telnet Port.

Secure Management

Secure Management allows the use of encrypted and authenticated communication protocols such as SNMPv3, and Secure Socket Link (SSL), to manage the Access Point.

- **Secure Management Status:** Enables the further configuration of HTTPS Access, and SNMPv3. After enabling Secure Management, you can choose to configure HTTPS (SSL) access on the Services tab, and configure SNMPv3 passwords on the Passwords tab.

SNMP Settings

- **SNMP Interface Bitmask:** Configure the interface or interfaces (**Ethernet, Wireless-Slot A, Wireless-Slot B, All Interfaces**) from which you will manage the AP via SNMP. Select **Disabled** to prevent a user from accessing the AP via SNMP.

HTTP Access

- **HTTP Interface Bitmap:** Configure the interface or interfaces (**Ethernet, Wireless-Slot A, Wireless-Slot B, All Interfaces**) from which you will manage the AP via the Web interface. For example, to allow Web configuration via the Ethernet network only, set **HTTP Interface Bitmap** to **Ethernet**. Select **Disabled** to prevent a user from accessing the AP from the Web interface.
- **HTTP Port:** Configure the HTTP port from which you will manage the AP via the Web interface. By default, the HTTP port is 80. You must reboot the Access Point if you change the HTTP Port.
- **HTTP Setup Wizard:** The Setup Wizard appears automatically the first time you access the HTTP interface. If you exited out of the Setup Wizard and want to relaunch it, enable this option, click **OK**, and then close your browser or reboot the AP. The Setup Wizard will appear the next time you access the HTTP interface.

HTTPS Access

- **HTTPS (Secure Web Status):** The user can access the AP in a secure fashion using Secure Socket Layer (SSL) over port 443. The AP comes pre-installed with all required SSL files: default certificate and private key installed. Check this box to enable SSL on the AP.
- **SSL Certificate Passphrase:** After enabling SSL, the only configurable parameter is the SSL passphrase. The default SSL passphrase is **proxim**.

The AP supports SSLv3 with a 128-bit encryption certificate maintained by the AP for secure communications between the AP and the HTTP client. All communications are encrypted using the server and the client-side certificate.

If you decide to upload a new certificate and private key (using TFTP or HTTP File Transfer), you need to change the SSL Certificate Passphrase for the new SSL files.



NOTE

SSL requires Internet Explorer version 6, 128 bit encryption, Service Pack 1, and patch Q323308.



NOTE

You need to reboot the AP after enabling or disabling SSL for the changes to take effect.

Accessing the AP through the HTTPS interface

- The user should use a SSL intelligent browser to access the AP through the HTTPS interface. After configuring SSL, access the AP using **https://** followed by the AP's management IP address.

Performing Advanced Configuration

Alarms	Bridge	QoS	RADIUS Profiles	SSID/VLAN/Security
System	Network	Interfaces	Management	Filtering
Passwords	IP Access Table	Services	AutoConfig	CHRD

This tab is used to configure Secure Management, SHMP, Telnet (CLI), and HTTP (web) parameters.

Secure Management option allows the use of encrypted and authenticated communication protocols such as SNMPv3, and Secure Socket Link (SSL), to manage the Access Point. When Secure Management is turned on, the scope and access for the traditional non-secure means to manage the Access Point is automatically curtailed.

Note: Changes to the parameters in this page except Radius Based Management Access Parameters and Secure Shell parameters (SSH Enable/Disable and SSH Key Status) require access point reboot in order to take effect.

Warning! Generation of SSH keys may take up to 3-4 minutes and the Access Point may not respond during that time.

SSH keys can be generated by setting the SSH Host Key Status to create or by enabling SSH when no keys are present .

If Secure Management is enabled when SSH is not enabled, the key generation will happen after the next reboot.

Secure Management Status:

SNMP Interface Bitmask:

HTTP Interface Bitmask:
 HTTP Port:
 HTTP Wizard Status:
 HTTPS (Secure Web) Status:
 SSL Certificate Passphrase:

Telnet Interface Bitmask:
 Telnet Port Number:
 Telnet Login Idle Timeout (seconds):
 Telnet Session Idle Timeout (seconds):
 SSH (Secure Shell) Status:
 SSH Host Key Status:
 SSH Host Key FingerPrint:

Serial Baud Rate:
 Serial Flow Control:
 Serial Data Bits:
 Serial Parity:
 Serial Stop Bits:

HTTP RADIUS Access Control Status:
 Telnet RADIUS Access Control Status:
 Radius Profile for Management Access Control:
 Local User Status:
 Local User Password (6-32 characters):
 Confirm Password:

Figure 4-10 Management Services Configuration Screen

Performing Advanced Configuration

Telnet Configuration Settings

- **Telnet Interface Bitmask:** Select the interface (**Ethernet, Wireless-Slot A, Wireless-Slot B, All Interfaces**) from which you can manage the AP via telnet. This parameter can also be used to **Disable** telnet management.
- **Telnet Port:** The default port number for Telnet applications is 23. However, you can use this field if you want to change the Telnet port for security reasons (but your Telnet application also must support the new port number you select). You must reboot the Access Point if you change the Telnet Port.
- **Login Idle Timeout (seconds):** Enter the number of seconds the system will wait for a login attempt. The AP terminates the session when it times out. The range is 1 to 300 seconds; the default is 30 seconds.
- **Session Idle Timeout (seconds):** Enter the number of seconds the system will wait during a session while there is no activity. The AP will terminate the session on timeout. The range is 1 to 36000 seconds; the default is 900 seconds.

Secure Shell (SSH) Settings

The AP supports SSH version 2, for secure remote CLI (Telnet) sessions. SSH provides strong authentication and encryption of session data.

The SSH server (AP) has **host keys** - a pair of asymmetric keys - a **private key** that resides on the AP and a **public key** that is distributed to clients that need to connect to the AP. As the client has knowledge of the server host keys, the client can verify that it is communicating with the correct SSH server. The client authentication can be performed in two ways:

- Using asymmetric keys. This method requires all the client keys to be installed on the AP.
- Using a username/password pair to authenticate the user over a secure channel created using SSH.

SSH Session Setup

An SSH session is setup through the following process:

- The SSH server public key is transferred to the client using out-of-band or in-band mechanisms.
- The SSH client verifies the correctness of the server using the server's public key.
- The user/client authenticates to the server.
- An encrypted data session starts. The maximum number of SSH sessions is limited to two. If there is no activity for a specified amount of time (the Telnet Session Timeout parameter), the AP will timeout the connection.

SSH Clients

The following SSH clients have been verified to interoperate with the AP's server. The following table lists the clients, version number, and the website of the client.

Clients	Version	Website
OpenSSH	V3.4-2	http://www.openssh.com
Putty	Rel 0.53b	http://www.chiark.greenend.org.uk
Zoc	5.00	http://www.emtec.com
Axessh	V2.5	http://www.labf.com

For key generation, OpenSSH client has been verified.

Configuring SSH

Perform the following procedure to enable or disable SSH and set the SSH host key:

1. Click **Configure -> Management -> Services**.
2. To enable SSH, select "Enable" from the **Enable SSH (Secure Shell)** drop down menu.

NOTE

When Secure Management is enabled on the AP, SSH will be enabled by default and cannot be disabled.

3. Select the **SSH Host Key Status** from the drop-down menu.

Host keys must either be generated externally and uploaded to the AP (see [Uploading Externally Generated Host Keys](#)), generated manually, or auto-generated at the time of SSH initialization if SSH is enabled and no host keys are present. There is no key present in an AP that is in a factory default state.

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To manually generate or delete host keys on the AP:

- Select **Create** to generate a new pair of host keys.
- Select **Delete** to remove the host keys from the AP. If no host keys are present, the AP will not allow connections using SSH. When host keys are created or deleted, the AP updates the fingerprint information displayed on the Management -> Services page.



WARNING

SSH Host key creation may take 3 to 4 minutes during which time the AP may not respond.

Uploading Externally Generated Host Keys

Perform the following procedure to upload externally generated host keys to the AP. You must upload both the SSH public key and SSH private key for SSH to work.

1. Verify that the host keys have been externally generated. The OpenSSH client has been verified to interoperate with AP's SSH server.
2. Click **Commands** -> **Update AP** -> **via HTTP** (or via TFTP).

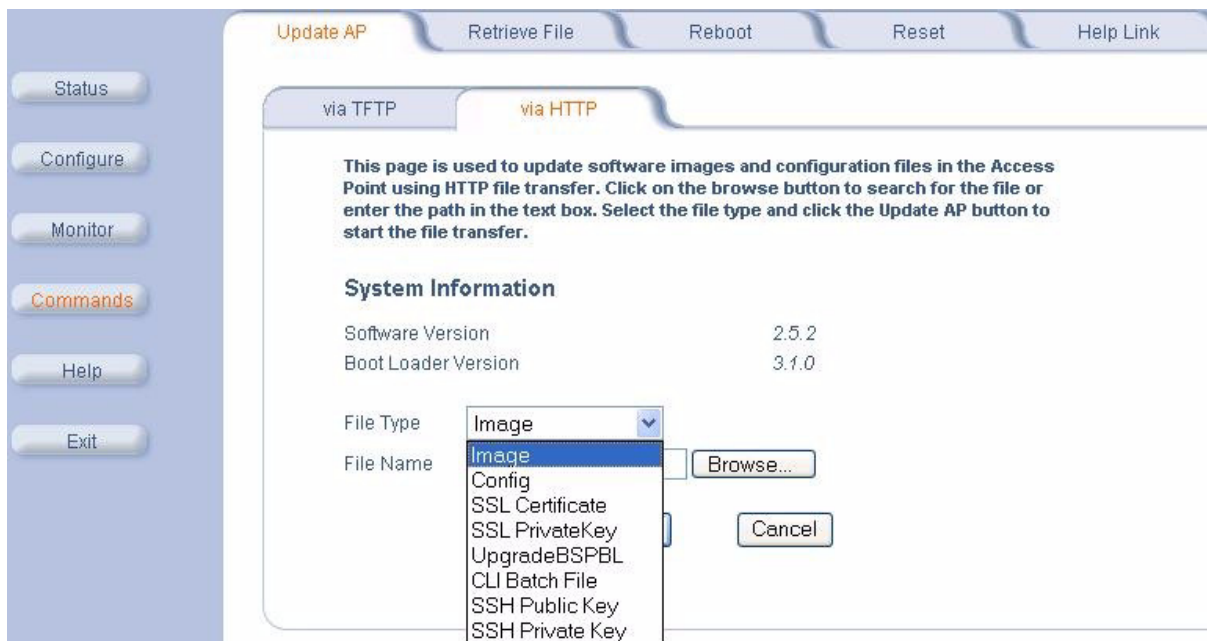


Figure 4-11 Uploading an Externally Generated SSH Public Key and SSH Private Key

3. Select "SSH Public Key" from the File Type drop-down menu.
4. Click **Browse**, select the SSH Public Key file on your local machine.
5. Click **Open**.
6. To initiate the file transfer, click the **Update AP** button.
7. Select "SSH Private Key" from the File Type drop-down menu.
8. Click **Browse**, select the SSH Private Key on your local machine.
9. Click **Open**.
10. To initiate the file transfer, click the **Update AP** button.

The fingerprint of the new SSH public key will be displayed in the **Management** -> **Services** page.

Performing Advanced Configuration

Serial Configuration Settings

The serial port interface on the AP is enabled at all times. See [Setting IP Address using Serial Port](#) for information on how to access the CLI interface via the serial port. You can configure and view following parameters:

- **Serial Baud Rate:** Select the serial port speed (bits per second). Choose between 2400, 4800, 9600, 19200, 38400, or 57600; the default Baud Rate is 9600.
- **Serial Flow Control:** Select either **None** (default) or **Xon/Xoff** (software controlled) data flow control.

⇒ NOTE

To avoid potential problems when communicating with the AP through the serial port, Proxim recommends that you leave the Flow Control setting at None (the default value).

- **Serial Data Bits:** This is a read-only field and displays the number of data bits used in serial communication (8 data bits by default).
- **Serial Parity:** This is a read-only field and displays the number of parity bits used in serial communication (no parity bits by default).
- **Serial Stop Bits:** This is a read-only field that displays the number of stop bits used in serial communication (1 stop bit by default).

⇒ NOTE

The serial port bit configuration is commonly referred to as **8N1**.

RADIUS Based Management Access

User management of APs can be centralized by using a RADIUS server to store user credentials. The AP cross-checks credentials using RADIUS protocol and the RADIUS server accepts or rejects the user.

HTTP/HTTPS and Telnet/SSH users can be managed with RADIUS. Serial CLI and SNMP cannot be managed by RADIUS. Two types of users can be supported using centralized RADIUS management:

- **Super User:** The super user has access to all functionality of a management interface. A super user is configured in the RADIUS server by setting the filter ID attribute (returned in the RADIUS Accept packet) for the user to a value of "super user" (not case sensitive). A user is considered a super user if the value of the **filter-id** attribute returned in the RADIUS Accept packet for the user is "super user" (not case sensitive).
- **Limited User:** A limited user has access to only a limited set of functionality on a management interface. All users who are not super users are considered limited users. However, a limited user is configured in the RADIUS server by setting the **filter-id** attribute (returned in the RADIUS Accept packet) to "limited user" (not case sensitive). Limited users do not have access to the following configuration capabilities:
 - Update/retrieve files to and from APs
 - Reset the AP to factory defaults
 - Reboot the AP
 - Change management properties related to RADIUS, management modes, and management passwords.

When RADIUS Based Management is enabled, a **local user** can be configured to provide Telnet, SSH, and HTTP(S) access to the AP when RADIUS servers fail. The local user has super user capabilities. When secure management is enabled, the local user can only login using secure means (i.e., SSH or SSL). When the local user option is disabled the only access to the AP when RADIUS servers are down will be through serial CLI or SNMP.

The Radius Based Management Access parameters allows you to enable HTTP or Telnet Radius Management Access, to configure a RADIUS Profile for management access control, and to enable or disable local user access, and configure the local user password. You can configure and view the following parameters:

- **HTTP RADIUS Access Control Status:** Enable RADIUS management of HTTP/HTTPS users.
- **Telnet RADIUS Access Control Status:** Enable RADIUS management of Telnet/SSH users.
- **RADIUS Profile for Management Access Control:** Specifies the RADIUS Profile to be used for RADIUS Based Management Access.
- **Local User Status:** Enables or disables the local user when RADIUS Based Management is enabled. The default local user ID is root.
- **Local User Password and Confirm Password:** The default local user password is public. "Root" cannot be configured as a valid user for Radius based management access when local user access is enabled.

Performing Advanced Configuration

Automatic Configuration (AutoConfig)

The Automatic Configuration feature which allows an AP to be automatically configured by downloading a specific configuration file from a TFTP server during the boot up process.

Automatic Configuration is disabled by default. The configuration process for Automatic Configuration varies depending on whether the AP is configured for dynamic or static IP.

When an AP is configured for dynamic IP, the Configuration filename and the TFTP server IP address are contained in the DHCP response when the AP gets its IP address dynamically from the DHCP server. When configured for static IP, these parameters are instead configured in the AP interface.

After setting up automatic configuration you must reboot the AP. When the AP reboots it receives the new configuration information and must reboot one additional time. If Syslog is configured, a Syslog message will appear indicating the success or failure of the Automatic Configuration.

Auto Configuration and the CLI Batch File

The Auto Configuration feature allows download of the TLV (tag, length, value) format configuration file or the CLI Batch file. The AP detects whether the file uploaded is TLV format or a CLI Batch file. If the AP detects a CLI Batch file (a file with extension .cli), the AP executes the file immediately.

The AP will reboot after executing the CLI Batch file. Auto Configuration will not result in repeated reboots if the CLI Batch file contains rebootable parameters.

For more information, refer to [CLI Batch File](#).

Set up Automatic Configuration for Static IP

Perform the following procedure to enable and set up Automatic Configuration when you have a static IP address for the TFTP server.

1. Click **Configure > Management > AutoConfig**.
The [Automatic Configuration Screen](#) appears.
2. Check **Enable Auto Configuration**.
3. Enter the **Configuration Filename**.
4. Enter the IP address of the TFTP server in the **TFTP Server Address** field.

NOTE

The default filename is "config". The default TFTP IP address is "10.0.0.2" for AP-2000.

5. Click **OK** to save the changes.
6. Reboot the AP. When the AP reboots it receives the new configuration information and must reboot one additional time. If a Syslog server was configured, the following messages can be observed on the Syslog server:
 - AutoConfig for Static IP
 - TFTP server address and configuration filename
 - AutoConfig Successful

Performing Advanced Configuration

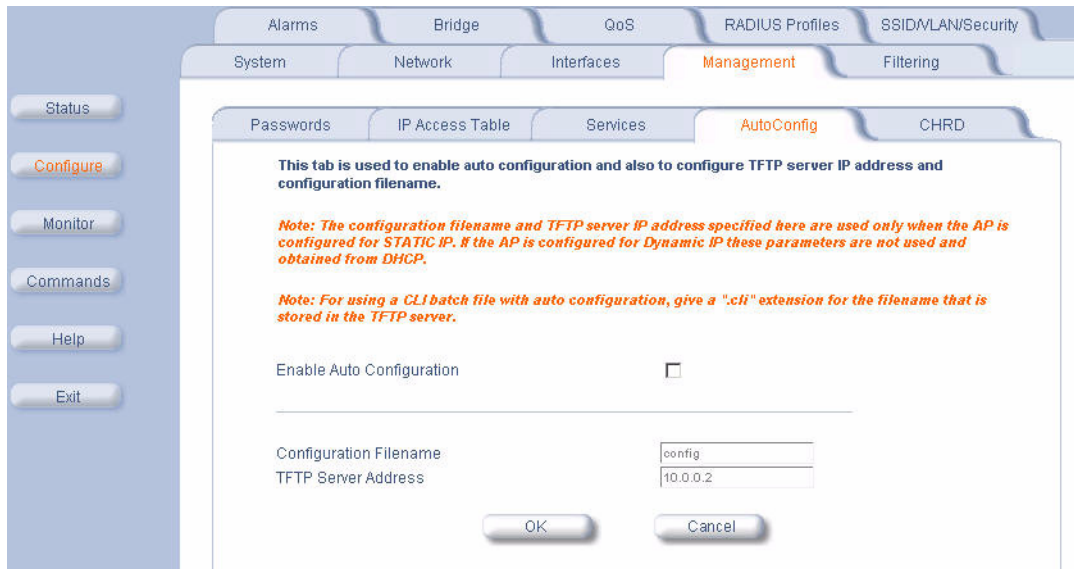


Figure 4-12 Automatic Configuration Screen

Set up Automatic Configuration for Dynamic IP

Perform the following procedure to enable and set up Automatic Configuration when you have a dynamic IP address for the TFTP server via DHCP.

The Configuration filename and the TFTP server IP address are contained in the DHCP response when the AP gets its IP address dynamically from the DHCP server. A Syslog server address is also contained in the DHCP response, allowing the AP to send Auto Configuration success and failure messages to a Syslog server.

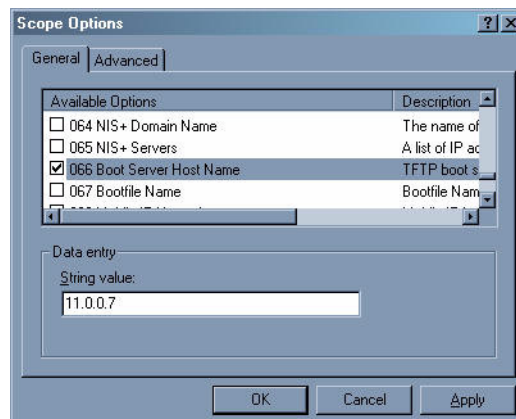
⇒ NOTE

The configuration filename and TFTP server IP address are configured only when the AP is configured for Static IP. If the AP is configured for Dynamic IP these parameters are not used and obtained from DHCP.

1. Click **Configure > Management > AutoConfig**.
The [Automatic Configuration Screen](#) appears.
2. Check **Enable Auto Configuration**.

When the AP is Configured with Dynamic IP, the DHCP server should be configured with the TFTP Server IP address ("Boot Server Host Name", option 66) and Configuration file ("Bootfile name", option 67) as follows (note that this example uses a Windows 2000 server):

3. **Select DHCP Server > DHCP Option > Scope**.
The DHCP Options: Scope Screen appears.



Performing Advanced Configuration

Figure 4-13 DHCP Options: Setting the Boot Server Host Name

4. Add the Boot Server Host Name and Boot Filename parameters to the Active Options list.
5. Set the value of the Boot Server Host Name Parameter to the host name or IP Address of the TFTP server. For example: 11.0.0.7.

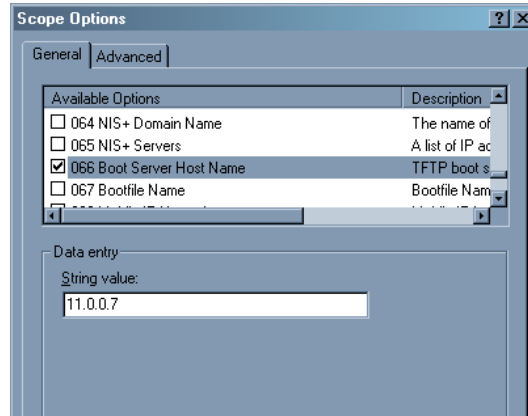


Figure 4-14 DHCP Options: Setting the Boot Server Host Name

6. Set the value of the Bootfile Name parameter to the Configuration filename. For example: AP-Config
7. If using Syslog, set the Log server IP address (option 7, Log Servers).
8. Reboot the AP. When the AP reboots it receives the new configuration information and must reboot one additional time. If a Syslog server was configured, the following messages can be observed on the Syslog server:
 - AutoConfig for Dynamic IP
 - TFTP server address and configuration filename
 - AutoConfig Successful

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Hardware Configuration Reset (CHRP)

Hardware Configuration Reset Status is a parameter that defines the hardware configuration reset behavior of the AP (i.e., what effect pressing the reload button has on an AP operating in normal operating mode).

If a user loses or forgets the AP's HTTP/Telnet/SNMP password, the reset button on the AP provides a way to reset the AP to default configuration values to gain access to the AP. However, in AP deployments where physical access to the AP is not protected, an unauthorized person could reset the AP to factory defaults and thus gain control of the AP. The user can disable the hardware configuration reset functionality to prevent unauthorized access.

The hardware configuration reset feature operates as follows:

- When hardware configuration reset is enabled, the user can press the hardware reload button for 10 seconds when the AP is in normal operational mode in order to delete the AP configuration.
- When hardware configuration reset is disabled, pressing the reload button when the AP is in normal operational mode does not have any effect on the AP.
- The hardware configuration reset parameter does not have any effect on the functionality of the reload button to delete the AP image during AP boot loaded execution.
- The default hardware configuration reset status is enabled. When disabling hardware configuration reset, the user is recommended to configure a configuration reset password. A configuration reset option appears on the serial port during boot up, before the AP reads its configuration and initializes.
- Whenever the AP is reset to factory default configuration, hardware configuration reset status is enabled and the configuration reset password is set to the default, "public".
- If secure mode is enabled in the AP, only secure (SSL, SNMPv3, SSH) users can modify the values of the Hardware Configuration Reset Status and the configuration reset password.

Configuration Reset via Serial Port During Bootup

If hardware configuration reset is disabled, the user gets prompted by a configuration reset option to reset the AP to factory defaults during boot up from the serial interface. By pressing a key sequence (ctrl-R), the user gets prompted to enter a configuration reset password before the configuration is reset.

NOTE

It is important to safely store the configuration reset password. If a user forgets the configuration reset password, the user will be unable to reset the AP to factory default configuration if the AP becomes inaccessible and the hardware configuration reset functionality is disabled.

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Configuring Hardware Configuration Reset

Perform the following procedure to configure Hardware Configuration Reset and to set the Configuration Reset Password.

1. Click **Configure** -> **Management** -> **CHRD**.
2. Check (enable) or uncheck (disable) the **Enable Hardware Configuration Reset** checkbox.
3. Change the default Configuration Reset Password in the "Configuration Reset Password" and "Confirm" fields.

➤ NOTE

It is important to safely store the configuration reset password. If a user forgets the configuration reset password, the user will be unable to reset the AP to factory default configuration if the AP becomes inaccessible and the hardware configuration reset functionality is disabled.

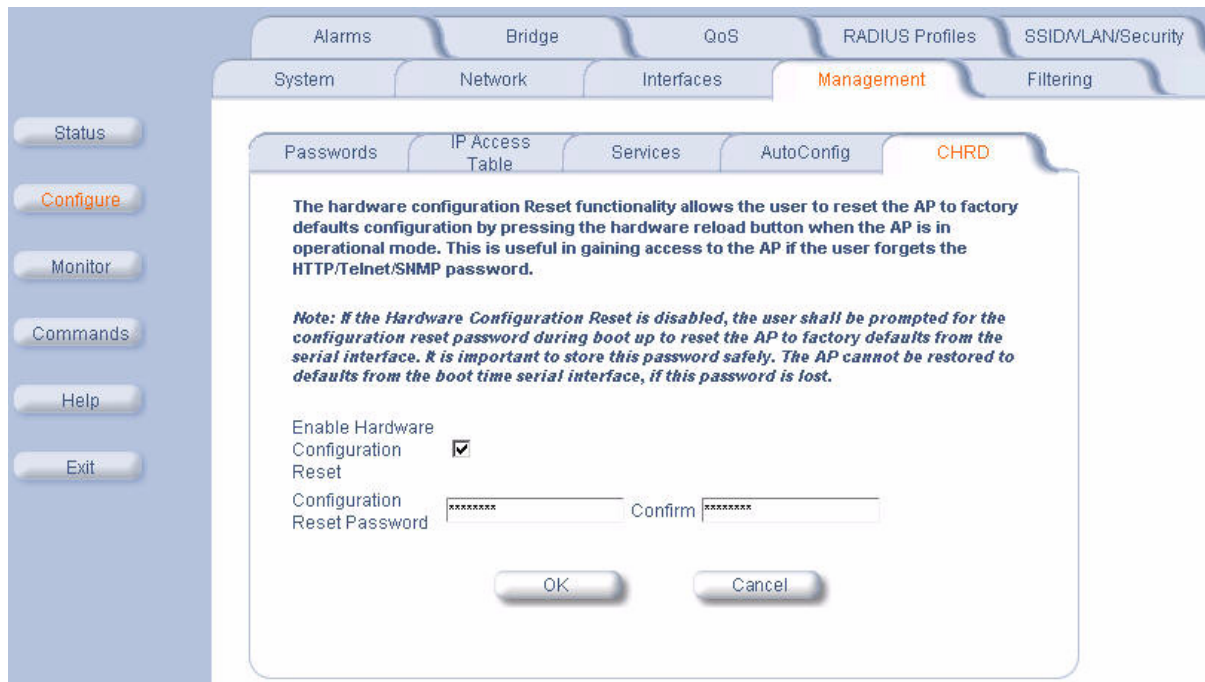


Figure 4-15 Hardware Configuration Reset

Procedure to Reset Configuration via the Serial Interface

1. During boot up, observe the message output on the serial interface.

The AP prompts the user with the message: "Press ctrl-R in 3 seconds to choose configuration reset option."

2. Enter ctrl-R within 3 seconds after being prompted.

The AP prompts the user with "Press ctrl-Z to continue with normal boot up or enter password to reset configuration." If the user enters ctrl-Z, the AP continues to boot with the stored configuration.

3. Enter the configuration reset password. The default configuration reset password is "public".

When the correct configuration reset password is entered, the AP gets reset to factory defaults and displays the message "AP has been reset to Factory Default Settings." The AP continues to boot up. If an incorrect configuration reset password is entered, the AP shows an error message and reprompts the user. If the incorrect password is entered three times in a row, the AP proceeds to boot up.

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Filtering

The Access Point's Packet Filtering features help control the amount of traffic exchanged between the wired and wireless networks. There are four sub-tabs under the Filtering tab:

- [Ethernet Protocol](#)
- [Static MAC](#)
- [Advanced](#)
- [TCP/UDP Port](#)

Ethernet Protocol

The Ethernet Protocol Filter blocks or forwards packets based on the Ethernet protocols they support.

Follow these steps to configure the Ethernet Protocol Filter:

1. Select the interface or interfaces that will implement the filter from the **Ethernet Protocol Filtering** drop-down menu.
 - **Ethernet:** Packets are examined at the Ethernet interface
 - **Wireless - Slot A:** Packets are examined at the Wireless A interface
 - **Wireless - Slot B:** Packets are examined at the Wireless B interface
 - **All Interfaces:** Packets are examined at both interfaces
 - **Disabled:** The filter is not used
2. Select the **Filter Operation Type**.
 - If set to **Passthru**, only the enabled Ethernet Protocols listed in the Filter Table will pass through the bridge.
 - If set to **Block**, the bridge will block enabled Ethernet Protocols listed in the Filter Table.
3. Configure the **Ethernet Protocol Filter Table**. This table is pre-populated with existing Ethernet Protocol Filters, however, you may enter additional filters by specifying the appropriate parameters.
 - To add an entry, click **Add**, and then specify the **Protocol Number** and a **Protocol Name**.
 - **Protocol Number:** Enter the protocol number. See <http://www.iana.org/assignments/ethernet-numbers> for a list of protocol numbers.
 - **Protocol Name:** Enter related information, typically the protocol name.
 - To edit or delete an entry, click **Edit** and change the information, or select **Enable**, **Disable**, or **Delete** from the **Status** drop-down menu.
 - An entry's status must be enabled in order for the protocol to be subject to the filter.
4. Reboot the AP for any changes to the Ethernet Protocol Filter Table to take effect.

Static MAC

The Static MAC Address filter optimizes the performance of a wireless (and wired) network. When this feature is properly configured, the AP can block traffic between wired devices and wireless devices based on MAC address. For example, you can set up a Static MAC filter to prevent wireless clients from communicating with a specific server on the Ethernet network. You can also use this filter to block unnecessary multicast packets from being forwarded to the wireless network.

NOTE

The Static MAC Filter is an advanced feature. You may find it easier to control wireless traffic via other filtering options, such as Ethernet Protocol Filtering.

Each static MAC entry contains the following fields:

- **Wired MAC Address**
- **Wired Mask**
- **Wireless MAC Address**
- **Wireless Mask**
- **Comment:** This field is optional.
- **Status**

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Each MAC Address or Mask is comprised of 12 hexadecimal digits (0-9, A-F) that correspond to a 48-bit identifier. (Each hexadecimal digit represents 4 bits (0 or 1).)

Taken together, a MAC Address/Mask pair specifies an address or a range of MAC addresses that the AP will look for when examining packets. The AP uses Boolean logic to perform an “AND” operation between the MAC Address and the Mask at the bit level. However, for most users, you do not need to think in terms of bits. It should be sufficient to create a filter using only the hexadecimal digits 0 and F in the Mask (where 0 is any value and F is the value specified in the MAC address). A Mask of 00:00:00:00:00:00 corresponds to all MAC addresses, and a Mask of FF:FF:FF:FF:FF:FF applies only to the specified MAC Address.

For example, if the MAC Address is 00:20:A6:12:54:C3 and the Mask is FF:FF:FF:00:00:00, the AP will examine the source and destination addresses of each packet looking for any MAC address starting with 00:20:A6. If the Mask is FF:FF:FF:FF:FF:FF, the AP will only look for the specific MAC address (in this case, 00:20:A6:12:54:C3).

When creating a filter, you can configure the Wired parameters only, the Wireless parameters only, or both sets of parameters. Which parameters to configure depends upon the traffic that you want block:

- To prevent all traffic from a specific wired MAC address from being forwarded to the wireless network, configure only the Wired MAC Address and Wired Mask (leave the Wireless MAC Address and Wireless Mask set to all zeros).
- To prevent all traffic from a specific wireless MAC address from being forwarded to the wired network, configure only the Wireless MAC address and Wireless Mask (leave the Wired MAC Address and Wired Mask set to all zeros).
- To block traffic between a specific wired MAC address and a specific wireless MAC address, configure all four parameters.

To create an entry, click **Add** and enter the appropriate MAC addresses and Masks to setup a filter. The entry is enabled automatically when saved. To edit an entry, click **Edit**. To disable or remove an entry, click **Edit** and change the **Status** field from **Enable** to **Disable** or **Delete**.

The static MAC filter can be used to optimize the network performance by allowing filtering based on MAC addresses or groups of MAC addresses on wired and wireless interfaces. Groups of MAC addresses can be specified by using a bitmask.

For Example: If a block of MAC addresses (header consisting of 00-11-22) is to be filtered from wired to wireless interface, then the following can be configured:

Wired MAC Address: 001122AABBCC
Wired Mask: FFFFFFF000000 (This mask filters out all MAC addresses with a header of 00-11-22)
Wireless MAC Address: 000000000000 (Enter all zeros since filtering wired MAC addresses)
Wireless Mask: 000000000000 (Enter all zeros for the mask since filtering wired MAC addresses)

Wired MAC Address	Wired Mask	Wireless MAC Address	Wireless Mask	Comment	Status
00:20:A6:12:34:56	FF:FF:FF:FF:FF:FF	00:20:A6:21:43:65	FF:FF:FF:FF:FF:FF		Enable

Figure 4-16 Static MAC Configuration Screen

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Static MAC Filter Examples

Consider a network that contains a wired server and three wireless clients. The MAC address for each unit is as follows:

- Wired Server: 00:40:F4:1C:DB:6A
- Wireless Client 1: 00:02:2D:51:94:E4
- Wireless Client 2: 00:02:2D:51:32:12
- Wireless Client 3: 00:20:A6:12:4E:38

Prevent Two Specific Devices from Communicating

Configure the following settings to prevent the Wired Server and Wireless Client 1 from communicating:

- **Wired MAC Address:** 00:40:F4:1C:DB:6A
- **Wired Mask:** FF:FF:FF:FF:FF:FF
- **Wireless MAC Address:** 00:02:2D:51:94:E4
- **Wireless Mask:** FF:FF:FF:FF:FF:FF

Result: Traffic between the Wired Server and Wireless Client 1 is blocked. Wireless Clients 2 and 3 can still communicate with the Wired Server.

Prevent Multiple Wireless Devices From Communicating With a Single Wired Device

Configure the following settings to prevent Wireless Clients 1 and 2 from communicating with the Wired Server.

- **Wired MAC Address:** 00:40:F4:1C:DB:6A
- **Wired Mask:** FF:FF:FF:FF:FF:FF
- **Wireless MAC Address:** 00:02:2D:51:94:E4
- **Wireless Mask:** FF:FF:FF:00:00:00

Result: When a logical “AND” is performed on the Wireless MAC Address and Wireless Mask, the result corresponds to any MAC address beginning with the 00:20:2D prefix. Since Wireless Client 1 and Wireless Client 2 share the same prefix (00:02:2D), traffic between the Wired Server and Wireless Clients 1 and 2 is blocked. Wireless Client 3 can still communicate with the Wired Server since it has a different prefix (00:20:A6).

Prevent All Wireless Devices From Communicating With a Single Wired Device

Configure the following settings to prevent all three Wireless Clients from communicating with Wired Server 1.

- **Wired MAC Address:** 00:40:F4:1C:DB:6A
- **Wired Mask:** FF:FF:FF:FF:FF:FF
- **Wireless MAC Address:** 00:00:00:00:00:00
- **Wireless Mask:** 00:00:00:00:00:00

Result: The Access Point blocks all traffic between Wired Server 1 and all wireless clients.

Prevent A Wireless Device From Communicating With the Wired Network

Configure the following settings to prevent Wireless Client 3 from communicating with any device on the Ethernet.

- **Wired MAC Address:** 00:00:00:00:00:00
- **Wired Mask:** 00:00:00:00:00:00
- **Wireless MAC Address:** 00:20:A6:12:4E:38
- **Wireless Mask:** FF:FF:FF:FF:FF:FF

Result: The Access Point blocks all traffic between Wireless Client 3 and the Ethernet network.

Prevent Messages Destined for a Specific Multicast Group from Being Forwarded to the Wireless LAN

If there are devices on your Ethernet network that use multicast packets to communicate and these packets are not required by your wireless clients, you can set up a Static MAC filter to preserve wireless bandwidth. For example, if routers on your network use a specific multicast address (such as 01:00:5E:00:32:4B) to exchange information, you can set up a filter to prevent these multicast packets from being forwarded to the wireless network:

- **Wired MAC Address:** 01:00:5E:00:32:4B

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- **Wired Mask:** FF:FF:FF:FF:FF:FF
- **Wireless MAC Address:** 00:00:00:00:00:00
- **Wireless Mask:** 00:00:00:00:00:00

Result: The Access Point does not forward any packets that have a destination address of 01:00:5E:00:32:4B to the wireless network.

Advanced

You can configure the following advanced filtering options:

- **Enable Proxy ARP:** Place a check mark in the box provided to allow the Access Point to respond to Address Resolution Protocol (ARP) requests for wireless clients. When enabled, the AP answers ARP requests for wireless stations without actually forwarding them to the wireless network. If disabled, the Access Point will bridge ARP requests for wireless clients to the wireless LAN.
- **Enable IP/ARP Filtering:** Place a check mark in the box provided to allow IP/ARP filtering based on the IP/ARP Filtering Address and IP Mask. Leave the box unchecked to prevent filtering. If enabled, you should also configure the IP/ARP Filtering Address and IP/ARP IP Mask.
- **IP/ARP Filtering Address:** Enter the Network filtering IP Address.
- **IP/ARP IP Mask:** Enter the Network Mask IP Address.

The following protocols are listed in the Advanced Filter Table:

- **Deny IPX RIP**
- **Deny IPX SAP**
- **Deny IPX LSP**
- **Deny IP Broadcasts**
- **Deny IP Multicasts**

The AP can filter these protocols in the wireless-to-Ethernet direction, the Ethernet-to-wireless direction, or in both directions. Click **Edit** and use the **Status** field to Enable or Disable the filter.

TCP/UDP Port

Port-based filtering enables you to control wireless user access to network services by selectively blocking TCP/UDP protocols through the AP. A user specifies a Protocol Name, Port Number, Port Type (TCP, UDP, or TCP/UDP), and filtering interfaces (Ethernet, Wireless A only, Wireless A and Ethernet, Wireless B only, Wireless B and Ethernet, All Interfaces) in order to block access to services, such as Telnet and FTP, and traffic, such as NETBIOS and HTTP.

For example, an AP with the following configuration would discard frames received on its Ethernet interface with a UDP destination port number of 137, effectively blocking NETBIOS Name Service packets.

Protocol Type (TCP/UDP)	Destination Port Number	Protocol Name	Interface	Status (Enable/Disable)
UDP	137	NETBIOS Name Service	Ethernet	Enable

Adding TCP/UDP Port Filters

1. Place a check mark in the box labeled **Enable TCP/UDP Port Filtering**.
2. Click **Add** under the **TCP/UDP Port Filter Table** heading.
3. In the **TCP/UDP Port Filter Table**, enter the Protocol Names to filter.
4. Set the destination Port Number (a value between 1 and 65535) to filter. See the IANA Web site at <http://www.iana.org/assignments/port-numbers> for a list of assigned port numbers and their descriptions.
5. Set the Port Type for the protocol: **TCP**, **UDP**, or both (**TCP/UDP**).
6. Set the **Interface** to:
 - Ethernet
 - Wireless Slot A

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- Ethernet and Wireless Slot A
 - Wireless Slot B
 - Ethernet and Wireless Slot B
 - Wireless Slot A and B
 - All Interfaces
7. Click **OK**.

Editing TCP/UDP Port Filters

1. Click **Edit** under the **TCP/UDP Port Filter Table** heading.
2. Make any changes to the Protocol Name or Port Number for a specific entry, if necessary.
3. Modify the Port Type, Interface, and Status using the drop down menus, as appropriate.
4. Select **OK**.

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Alarms

This tab has three sub-tabs.

- [Groups](#)
- [Alarm Host Table](#)
- [Syslog](#)
- [Rogue Access Point Detection \(RAD\)](#)

Groups

The AP can be configured to generate and send alarms/notifications/traps as version 1 or a version 2c. Use the drop-down menu to select **SNMP alarm type**.

There are seven alarm groups that can be enabled or disabled via the Web interface. Place a check mark in the box provided to enable a specific group. Remove the check mark from the box to disable the alarms. Alarm [Severity Levels](#) vary.

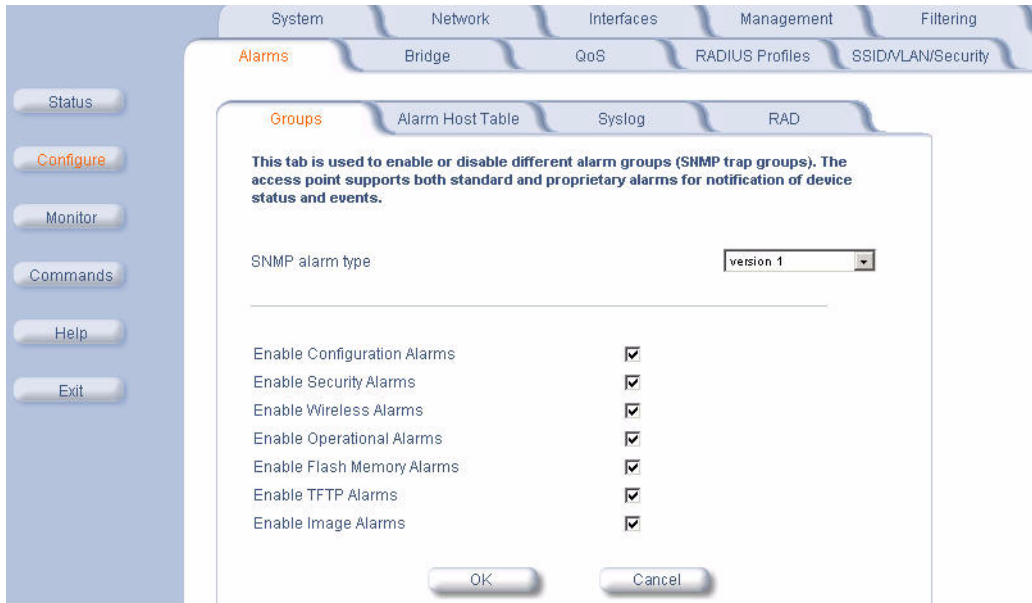


Figure 4-17 Syslog Configuration Screen

- **Configuration Trap Group**

Trap Name	Description
DNS IP Address not Configured	oriTrapDNSIPNotConfigured
RADIUS Authentication not Configured	oriTrapRADIUSAuthenticationNotConfigured
RADIUS Accounting not Configured	oriTrapRADIUSAccountingNotConfigured
Duplicate IP Address Encountered	oriTrapDuplicateIPAddressEncountered
VLAN ID Invalid Configuration	oriTrapVLANIDInvalidConfiguration
Auto Configuration Failure	oriTrapAutoConfigFailure
CLI Configuration Execution Failure	oriTrapBatchExecFailure
CLI Configuration Execution Start	oriTrapBatchFileExecStart
CLI Configuration Execution End	oriTrapBatchFileExecEnd

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- **Security Trap Group**

Trap Name	Description
Authentication Failure	oriTrapAuthenticationFailure
Unauthorized Manager Detected	oriTrapUnauthorizedManagerDetected
RAD Scan Complete	oriTrapRADScanComplete
RAD Scan Results	oriTrapRADScanResults

- **Wireless Interface/Card Trap Group**

Trap Name	Description
Wireless Card Not Present	oriTrapWLCNotPresent
Wireless Card Failure	oriTrapWLCFailure
Wireless Card Removal	oriTrapWLCRemoval
Incompatible Firmware	oriTrapWLCIncompatibleFirmware
Incompatible Vendor	oriTrapWLCIncompatibleVendor
Firmware Download Failure (classic card only)	oriTrapWLCFirmwareDownloadFailure
Firmware Failure	oriTrapWLCFirmwareFailure
Radar Interference Detected	oriTrapWLCRadarInterferenceDetected

- **Operational Trap Group**

Trap Name	Description
Unrecoverable Software Error Detected	oriTrapUnrecoverableSoftwareErrorDetected
RADIUS Server Not Responding	oriTrapRADIUSServerNotResponding
Module Not Initialized	oriTrapModuleNotInitialized
Device Rebooting	oriTrapDeviceRebooting
Task Suspended	oriTrapTaskSuspended
BootP Failed	oriTrapBootPFailed
DHCP Client Failed	oriTrapDHCPFailed
DNS Client Lookup Failure	oriTrapDNSClientLookupFailure
SSL Initialization Failure	oriTrapSSLInitializationFailure
SSH Initialization Status	oriTrapSSHInitializationStatus
Assigned User VLAN ID	oriTrapVLANIDUserAssignment
DHCP Lease Renewal	oriTrapDHCPLeaseRenewal

- **Flash Memory Trap Group**

Trap Name	Description
Flash Memory Empty	oriTrapFlashMemoryEmpty

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Flash Memory Corrupted	oriTrapFlashMemoryCorrupted
Restoring Last Known Good Configuration File	oriTrapFlashMemoryRestoringLastKnownGoodConfiguration

- **TFTP Trap Group**

Trap Name	Description
TFTP Operation Failure	oriTrapTFTPFailedOperation
TFTP Operation Initiated	oriTrapTFTPOperationInitiated
TFTP Operation Completed	oriTrapTFTPOperationCompleted

- **Image Trap Group**

Trap Name	Description
Zero Size Image	oriTrapZeroSizeImage
Invalid Image	oriTrapInvalidImage
Image Too Large	oriTrapImageTooLarge
Incompatible Image	oriTrapIncompatibleImage
Invalid Image Digital Signature	oriTrapInvalidImageDigitalSignature

In addition, the AP supports these standard traps, which are always enabled:

- **RFC 1215-Trap**

Trap Name	Description
coldStart	The AP has been turned on or rebooted. Trap Severity Level: Informational
linkUp	The AP's Ethernet interface link is up (working). Trap Severity Level: Informational
linkDown	The AP's Ethernet interface link is down (not working). Trap Severity Level: Informational

- **Bridge MIB (RFC 1493) Alarms**

Trap Name	Description
newRoot	This trap indicates that the AP has become the new root in the Spanning Tree network. Trap Severity Level: Informational
topologyChange	This trap is sent by the AP when any of its configured ports transitions from the Learning state to the Forwarding state, or from the Forwarding state to the Blocking state. This trap is not sent if a newRoot trap is sent for the same transition. Trap Severity Level: Informational

All these alarm groups correspond to System Alarms that are displayed in the [System Status](#) screen, including the traps that are sent by the AP to the SNMP managers specified in the [Alarm Host Table](#).

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Severity Levels

There are three severity levels for system alarms:

- Critical
- Major
- Informational

Critical alarms will often result in severe disruption in network activity or an automatic reboot of the AP

Major alarms are usually activated due to a breach in the security of the system. Clients cannot be authenticated or an attempt at unauthorized access into the AP has been detected.

Informational alarms are there to provide the network administrator with some general information about the activities the AP is performing.

Alarm Host Table

To add an entry and enable the AP to send SNMP trap messages to a Trap Host, click **Add**, and then specify the IP Address and Password for the Trap Host.

NOTE

Up to 10 entries are possible in the Alarm Host table.

- **IP Address:** Enter the Trap Host IP Address.
- **Password:** Enter the password in the **Password** field and the **Confirm** field.
- **Comment:** Enter an optional comment, such as the alarm (trap) host station name.

To edit or delete an entry, click **Edit**. Edit the information, or select **Enable**, **Disable**, or **Delete** from the **Status** drop-down menu.

Syslog

The Syslog messaging system enables the AP to transmit event messages to a central server for monitoring and troubleshooting. The AP can send messages to multiple Syslog servers. The access point logs “Session Start (Log-in)” and “Session Stop (Log-out)” events for each wireless client as an alternative to RADIUS accounting.

See RFC 3164 at <http://www.rfc-editor.org> for more information on the Syslog standard.

Setting Syslog Event Notifications

Syslog Events are logged according to the level of detail specified by the administrator. Logging only urgent system messages will create a far smaller, more easily read log than a log of every event the system encounters. Determine which events to log by selecting a priority defined by the following scale:

Event	Priority	Description
LOG_EMERG	0	system is unusable
LOG_ALERT	1	action must be taken immediately
LOG_CRIT	2	critical conditions
LOG_ERR	3	error conditions
LOG_WARNING	4	warning conditions
LOG_NOTICE	5	normal but significant condition
LOG_INFO	6	informational
LOG_DEBUG	7	debug-level messages

Configuring Syslog Event Notifications

You can configure the following Syslog settings from the HTTP interface:

- **Enable Syslog:** Place a check mark in the box provided to enable system logging.
- **Syslog Port Number:** This field is read-only and displays the port number (514) assigned for system logging.
- **Syslog Lowest Priority Logged:** The AP will send event messages to the Syslog server that correspond to the selected priority and above. For example, if set to 6, the AP will transmit event messages labeled priority 0 to 6 to the Syslog server(s). This parameter supports a range between 1 and 7; 6 is the default.

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- **Syslog Heartbeat Status:** Enables or disables the sending of heartbeat messages from the AP to the configured Syslog servers.
- **Syslog Heartbeat Interval:** Specifies the interval (in seconds) at which Syslog Heartbeat messages are sent to the configured Syslog servers.
- **Syslog Host Table:** This table specifies the IP addresses of a network servers that the AP will send Syslog messages to. Click **Add** to create a new entry. Click **Edit** to change an existing entry. Each entry contains the following field:
 - **IP Address:** Enter the IP Address for the management host.
 - **Comment:** Enter an optional comment such as the host name.
 - **Status:** The entry is enabled automatically when saved (so the Status field is only visible when editing an entry). Disable or delete entries by changing this field's value.

Syslog Messages

The following messages are supported in the AP:

Message	Severity
Auto Configuration via DHCP	Informational
Auto Configuration for static IP	Informational
TFTP server IP/Config filename missing in DHCP response	Minor
AutoConfig TFTP server IP address used is <IP address>	Informational
AutoConfig filename used is <filename>	Informational
AutoConfig TFTP download failed	Minor
Image Error check, invalid image	Minor
AP Heartbeat status	Minor
Client Authentication State	Informational
Accounting	Informational
RADIUS Responses	Informational

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Rogue Access Point Detection (RAD)

The Rogue AP Detection (RAD) feature provides an additional security level for wireless LAN deployments. Rogue AP detection provides a mechanism for detecting Rogue Access Points by utilizing the coverage of the trusted Access Point deployment.

The Rogue AP Scan employs background scanning using low-level 802.11 scanning functions for effective wireless detection of Access Points in its coverage area with minimal impact on the normal operation of the Access Point.

This RAD feature can be enabled on an Access Point via its HTTP, CLI, or SNMP Interfaces. The scan repetition duration is configurable. If the Access Point uses directional antennas to provide directional coverage, then the interface bitmask can be configured to maximize the scanning coverage area. The Access Point will periodically scan the wireless network and report all the available Access Points within its coverage area using SNMP traps. For additional reliability the results are stored in the Access Point in a table, which can be queried via SNMP. The BSSID and Channel number of the detected Access Points are provided in the scan results.

The RAD scan is done on a channel list initialized based on the regulatory domain of the device. The RAD Scan then performs background scanning on all the channels in this channel list using 802.11 MAC scanning functions. It will either actively scan the network by sending probe requests or passively scan by only listening for beacons. The access point information is then gathered from the probe responses and beacons.

To minimize traffic disruption and maximize the scanning efficiency, the RAD feature employs an enhanced background-scanning algorithm and uses the CTS to Self mechanism to keep the clients silent. The scanning algorithm allows traffic to be serviced between each channel scan. Before start of every scan (except scan on the working channel) the CTS to self-mechanism is used to set the NAV values of clients to keep them silent during the scanning period. In addition, the scan repetition duration can also be configured to reduce the frequency of RAD scan cycles to maximize Access Point performance.

RAD Configuration Requirements

The RAD feature can be configured/monitored via the HTTP, CLI, or SNMP management interfaces.

The following management options are provided:

- The RAD feature can be enabled or disabled.
- The repetition interval of RAD can be configured.
- The interface on which RAD can operate can be configured.
- SNMP Traps are sent after completion of a RAD scan cycle and also whenever a new Access Point is detected.

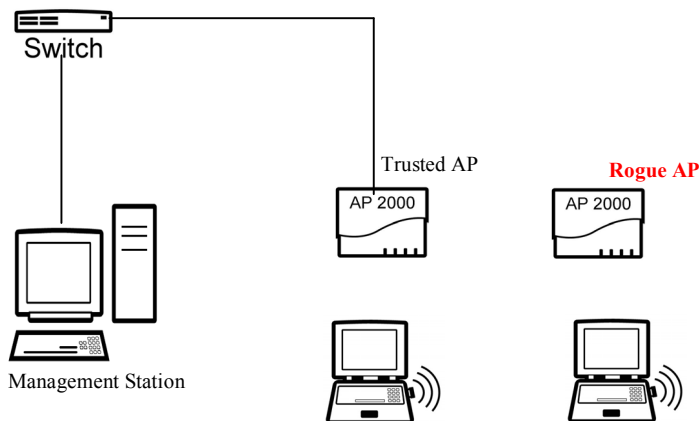


Figure 4-18 Example Rogue AP Detection Deployment

Additionally, the RAD scan results are maintained in a table that can be queried via SNMP. The system administrator has to enable RAD on the Access Points in the wireless network and also configure the Trap Host on all these Access

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Points to the IP address of the management station. The Access Points on detecting a new Access Point sends a RAD Scan Result Trap to the management station.

An example network deployment is shown. The Trusted AP has Rogue Access Detection enabled and the trap host is configured to be the management station. The Trusted AP on detecting the Rogue AP will send a trap to the management station with the Channel and BSSID of the Rogue Access Point.

Configuring RAD

Perform this procedure to enable and configure RAD.

The RAD screen also displays the time of the last scan and the number of new access points detected in the last scan.

1. Enable the Security Alarm Group. Select the Security Alarm Group link from the RAD screen. Configure a Trap Host to receive the list of access points detected during the scan.
2. Click **Configure > Alarms > RAD**.
3. Enable RAD by checking **Enable Rogue AP Detection**.
4. Enter the **Scan Interval**.
 - The Scan Interval specifies the time period in minutes between scans and can be set to any value between 15 and 1440 minutes.
5. Select the **Scan Interface** as Wireless - Slot A, Wireless - Slot B, or Both Wireless - Slots A & B.
6. Click **OK**.

The results of the RAD scan be viewed in the Status page in the HTTP interface.

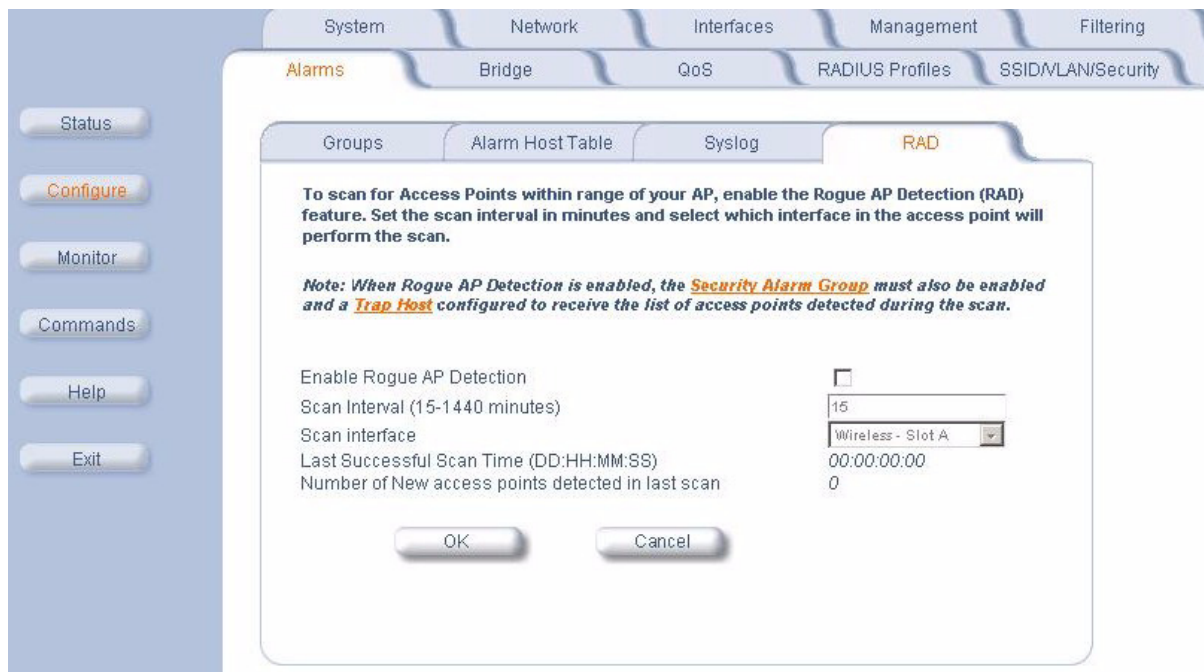


Figure 4-19 Rogue Access Point Detection Screen

Performing Advanced Configuration

Bridge

The AP is a bridge between your wired and wireless networking devices. As a bridge, the functions performed by the AP include:

- MAC address learning
- Forward and filtering decision making
- Spanning Tree protocol used for loop avoidance

Once the AP is connected to your network, it learns which devices are connected to it and records their MAC addresses in the Learn Table. The table can hold up to 10,000 entries. To view the Learn Table, click on the **Monitor** tab and select the [Learn Table](#) tab.

The **Bridge** tab has four sub-tabs.

- [Spanning Tree](#)
- [Storm Threshold](#)
- [Intra BSS](#)
- [Packet Forwarding \(Pkt Fwd\)](#)

Spanning Tree

A Spanning Tree is used to avoid redundant communication loops in networks with multiple bridging devices. Bridges do not have any inherent mechanism to avoid loops, because having redundant systems is a necessity in certain networks. However, redundant systems can cause Broadcast Storms, multiple frame copies, and MAC address table instability problems.

Complex network structures can create multiple loops within a network. The Spanning Tree configuration blocks certain ports on AP devices to control the path of communication within the network, avoiding loops and following a spanning tree structure.

For more information on Spanning Tree protocol, see Section 8.0 of the IEEE 802.1d standard. The Spanning Tree configuration options are advanced settings. Proxim recommends that you leave these parameters at their default values unless you are familiar with the Spanning Tree protocol.

Storm Threshold

Storm Threshold is an advanced Bridge setup option that you can use to protect the network against data overload by:

- Specifying a maximum number of frames per second as received from a single network device (identified by its MAC address).
- Specifying an absolute maximum number of messages per port.

The Storm Threshold parameters allow you to specify a set of thresholds for each port of the AP, identifying separate values for the number of broadcast messages/second and Multicast messages/second.

When the number of frames for a port or identified station exceeds the maximum value per second, the AP will ignore all subsequent messages issued by the particular network device, or ignore all messages of that type.

- **Address Threshold:** Enter the maximum allowed number of packets per second.
- **Ethernet Threshold:** Enter the maximum allowed number of packets per second.
- **Wireless-Slot A and Wireless-Slot B Threshold:** Enter the maximum allowed number of packets per second.

Intra BSS

The wireless clients (or *subscribers*) that associate with a certain AP form the Basic Service Set (BSS) of a network infrastructure. By default, wireless subscribers in the same BSS can communicate with each other. However, some administrators (such as wireless public spaces) may wish to block traffic between wireless subscribers that are associated with the same AP to prevent unauthorized communication and to conserve bandwidth. This feature enables you to prevent wireless subscribers within a BSS from exchanging traffic.

Although this feature is generally enabled in public access environments, Enterprise LAN administrators use it to conserve wireless bandwidth by limiting communication between wireless clients. For example, this feature prevents peer-to-peer file sharing or gaming over the wireless network.

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To block Intra BSS traffic, set **Intra BSS Traffic Operation** to **Block**. To allow Intra BSS traffic, set **Intra BSS Traffic Operation** to **Passthru**.

Packet Forwarding (Pkt Fwd)

The Packet Forwarding feature enables you to redirect traffic generated by wireless clients that are all associated to the same AP to a single MAC address. This filters wireless traffic without burdening the AP and provides additional security by limiting potential destinations or by routing the traffic directly to a firewall. You can redirect to a specific port (Ethernet or WDS) or allow the bridge's learning process (and the forwarding table entry for the selected MAC address) to determine the optimal port.

NOTE

The gateway to which traffic will be redirected should be node on the Ethernet network. It should not be a wireless client.

To configure interfaces for packet forwarding, specifying interface port(s) to which packets are redirected and a destination MAC address, as follows:

1. Within the **Packet Forwarding Configuration** screen, check the box labeled **Enable Packet Forwarding**.
2. Specify a destination **Packet Forwarding MAC Address**. The AP will redirect all unicast, multicast, and broadcast packets received from wireless clients to the address you specify.
3. Select a **Packet Forwarding Interface Port** from the drop-down menu. You can redirect traffic to:
 - Any Interface (traffic is redirected to a port based on the bridge learning process)
 - Ethernet
 - A WDS connection (see [Wireless Distribution System \(WDS\)](#) for details)
4. Click **OK** to save your changes.

QoS (Quality of Service)

This feature is not supported in the AP. Clicking on this tab displays the following message: "The Quality of Service (QoS) feature is not implemented on the AP-600 and AP-2000."

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RADIUS Profiles

Configuring RADIUS Profiles on the AP define a profile for RADIUS Servers used by the system or by a VLAN. The network administrator can define [RADIUS Servers per Authentication Mode and per VLAN](#).

The AP communicates with the RADIUS server defined in a profile to provide the following features:

- [MAC Access Control Via RADIUS Authentication](#)
- [802.1x Authentication using RADIUS](#)
- [RADIUS Accounting](#)

Also, [RADIUS Based Management Access](#) allows centralized user management.

The network administrator can configure default RADIUS authentication servers to be used on a system-wide basis, or in networks with VLANs enabled the administrator can also configure separate authentication servers to be used for MAC authentication, EAP authentication, or Accounting in each VLAN. You can configure the AP to communicate with up to six different RADIUS servers per VLAN/SSID:

- Primary Authentication Server (MAC-based authentication)
- Back-up Authentication Server (MAC-based authentication)
- Primary Authentication Server (EAP/802.1x authentication)
- Back-up Authentication Server (EAP/802.1x authentication)
- Primary Accounting Server
- Back-up Accounting Server

The back-up servers are optional, but when configured, the AP will communicate with the back-up server if the primary server is off-line. After the AP has switched to the backup server, it will periodically check the status of the primary RADIUS server every five (5) minutes. Once the primary RADIUS server is again online, the AP automatically reverts from the backup RADIUS server back to the primary RADIUS server. All subsequent requests are then sent to the primary RADIUS server.

You can view monitoring statistics for each of the configured RADIUS servers.

RADIUS Servers per Authentication Mode and per VLAN

The user can configure separate RADIUS authentication servers for each authentication mode and for each SSID (VLAN). For example:

- the user can configure separate RADIUS servers for RADIUS MAC authentication and 802.1x authentication
- the user can configure separate RADIUS servers for each VLAN: the Sales VLAN could support only WEP clients, whereas the Marketing VLAN could support 802.1x and WEP clients.

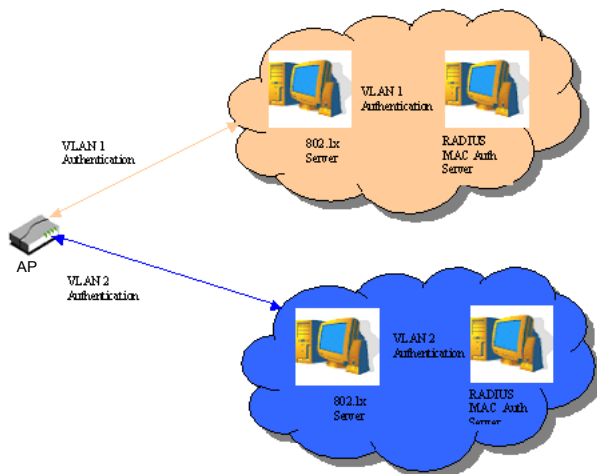


Figure 4-20 RADIUS Servers per VLAN

This figure shows a network with separate authentication servers for each authentication type and for each VLAN. The clients in VLAN 1 are authenticated using the authentication servers configured for VLAN 1. The type of authentication

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server used depends on whether the authentication is done for an 802.1x client or non-802.1x client. The clients in VLAN 2 are authenticated using a different set of authentication servers configured for authenticating users in VLAN 2. Authentication servers for each VLAN are configured as part of the configuration options for that VLAN. You can also configure authentication servers on a system-wide basis; these are called the *default authentication servers*. For each VLAN, the user could opt to use the default authentication servers, or to configure separate authentication servers to be used for a particular authentication type in that VLAN.

RADIUS-based VLAN Assignment

Radius-based VLAN assignment

The AP currently supports two methods of assigning a wireless client a VLAN ID. The wireless client can either be assigned the static VLAN ID configured for the SSID the wireless client is associated to, or the wireless client can be assigned a VLAN ID which is returned by the RADIUS server during authentication.

A VLAN ID can only be assigned to a wireless client by a RADIUS server if they are associated to an SSID that is configured to a RADIUS-based authentication security mode/protocol (802.1X, WPA, 802.11i/WPA2, and RADIUS based MAC Address Authentication). If the wireless client is associated to an SSID that does not provide RADIUS-based authentication (such as None, WEP, WPA-PSK, and 802.11i/WPA2-PSK), then the wireless client will be assigned the static VLAN ID configured for respective SSID. See [SSID/VLAN/Security](#) for more information.

RADIUS Servers Enforcing VLAN Access Control

A RADIUS server can be used to enforce VLAN access control in two ways:

- Authorize the SSID the client uses to connect to the AP. The SSID determines the VLAN that the client gets assigned to.

Assigning the user to a VLAN by specifying the VLAN membership information of the user.

Configuring RADIUS Profiles

A RADIUS server Profile consists of a Primary and a Secondary RADIUS server that get assigned to act as either MAC Authentication servers, 802.1x/EAP Authentication servers, or Accounting Servers in the VLAN Configuration. Refer to [SSID/VLAN/Security](#).

The RADIUS Profiles tab allows you to add new RADIUS profiles or modify or delete existing profiles.

The screenshot shows the 'RADIUS Profiles' configuration page. The page title is 'RADIUS Profiles' and it is part of the 'SSID/VLAN/Security' section. The page contains the following text:

This page is used to configure the RADIUS Server Profiles. A RADIUS server Profile consists of a Primary and a Secondary RADIUS server.

The RADIUS server profiles created on this page will be assigned to act as MAC authentication / EAP authentication / Accounting server in the SSID configuration

Click on "ADD" to create a new profile. To Modify an existing profile, select the profile and click "Edit". To Delete an existing profile select the profile and click "Delete".

Note: Changes to the RADIUS Server Profiles will not require a reboot of the device.

Index	ProfileName	Primary Status	Secondary Status
<input type="radio"/> 1	MAC Authentication	Disabled	Disabled
<input type="radio"/> 2	EAP Authentication	Disabled	Disabled
<input type="radio"/> 3	Accounting	Disabled	Disabled
<input type="radio"/> 4	Management Access	Disabled	Disabled

Figure 4-21 RADIUS Server Profiles

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Adding or Modifying a RADIUS Server Profile

Perform the following procedure to add a RADIUS server profile and to configure its parameters.

1. Click **Add** to create a new profile. To Modify an existing profile, select the profile and click Edit. To delete an existing profile, select the profile and click Delete. You cannot delete a RADIUS server profile if you are using it in an SSID. Also, the four default RADIUS server profiles cannot be deleted.

Figure 4-22 Add RADIUS Server Profile

Configure the following parameters for the RADIUS Server profile:

⇒ NOTE

This page configures only the Primary RADIUS Server associated with the profile. After configuring these parameters, save them by clicking OK. Then, to configure the Secondary RADIUS Server, edit the profile from the main page.

- **Server Profile Name:** the profile name. This is the name used to associated a VLAN to the profile. Refer to [SSID/VLAN/Security](#).
- **MAC Address Format Type:** This parameter should correspond to the format in which the clients' 12-digit MAC addresses are listed within the RADIUS server. Available options are:
 - Dash delimited: dash between each pair of digits: xx-yy-zz-aa-bb-cc
 - Colon delimited: colon between each pair of digits: xx:yy:zz:aa:bb:cc
 - Single dash delimited: dash between the sixth and seventh digits: xxyyzz-aabbcc
 - No delimiters: No characters or spaces between pairs of hexadecimal digits: xxyyzaabbcc
- **Accounting Inactivity Timer:** Enter the accounting inactivity timer. This parameter supports a value from 1-60 minutes. The default is 5 minutes.
- **Authorization Lifetime:** Enter the time, in seconds, each client session may be active before being automatically re-authenticated. This parameter supports a value between 900 and 43200 seconds. The default is 900 sec.
- **Server Addressing Format:** select IP Address or Name. If you want to identify RADIUS servers by name, you must configure the AP as a DNS Client. See DNS Client for details.

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- **Server Name/IP Address:** Enter the server's name or IP address.
 - **Destination Port:** Enter the port number which the AP and the server will use to communicate. By default, RADIUS servers communicate on port 1812.
 - **Server VLAN ID:** Indicates the VLAN that uses this RADIUS server profile. If VLAN is disabled, the text "VLAN is disabled" will appear.
 - **Shared Secret and Confirm Shared Secret:** Enter the password shared by the RADIUS server and the AP. The same password must also be configured on the RADIUS server.
 - **Response Time (seconds):** Enter the maximum time, in seconds, that the AP should wait for the RADIUS server to respond to a request. The range is 1-10 seconds; the default is 3 seconds.
 - **Maximum Retransmissions (0-4):** Enter the maximum number of times an authentication request may be transmitted. The range is 0 to 4, the default is 3.
 - **Server Status:** Select Enable from the drop-down box to enable the RADIUS Server Profile.
2. Click **OK**.
 3. Select the Profile and click **Edit** to configure the Secondary RADIUS Server, if required.
 4. Reboot the AP.

MAC Access Control Via RADIUS Authentication

If you want to control wireless access to the network and if your network includes a RADIUS Server, you can store the list of MAC addresses on the RADIUS server rather than configure each AP individually. You can define a RADIUS Profile that specifies the IP Address of the server that contains a central list of MAC Address values identifying the authorized stations that may access the wireless network. You must specify information for at least the primary RADIUS server. The back-up RADIUS server is optional.

NOTE

Each VLAN can be configured to use a separate RADIUS server (and backup server) for MAC authentication.

NOTE

Contact your RADIUS server manufacturer if you have problems configuring the server or have problems using RADIUS authentication.

802.1x Authentication using RADIUS

You must configure a primary EAP/802.1x Authentication server to use 802.1x security. A back-up server is optional.

NOTE

Each VLAN can be configured to use a separate RADIUS server (and backup server) for 802.1x authentication. 802.1x authentication ("EAP authentication") can be separately enabled for each VLAN.

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RADIUS Accounting

Using an external RADIUS server, the AP can track and record the length of client sessions on the access point by sending RADIUS accounting messages per RFC2866. When a wireless client is successfully authenticated, RADIUS accounting is initiated by sending an "Accounting Start" request to the RADIUS server. When the wireless client session ends, an "Accounting Stop" request is sent to the RADIUS server.

Session Length

Accounting sessions continue when a client reauthenticates to the same AP. Sessions are terminated when:

- A client disassociates.
- A client does not transmit any data to the AP for a fixed amount of time.
- A client is detected on a different interface.

If the client roams from one AP to another, one session is terminated and a new session is begun.

NOTE

This feature requires RADIUS authentication using MAC Access Control or 802.1x. Wireless clients configured in the Access Point's static MAC Access Control list are not tracked.

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SSID/VLAN/Security

The AP provides several security features to protect your network from unauthorized access.

Virtual Local Area Networks (VLANs) are logical groupings of network hosts. Defined by software settings, other VLAN members or resources appear (to clients) to be on the same physical segment, no matter where they are attached on the logical LAN or WAN segment. They simplify traffic flow between clients and their frequently-used or restricted resources.

The AP uses Security Profiles to define allowed wireless clients, and authentication and encryption types and RADIUS Profiles to define RADIUS Servers used by the system or by a VLAN.

The SSID/VLAN/Security tab contains the following sub-tabs:

- [Management VLAN](#)
- [Security Profiles](#)
- [MAC Access](#)
- [Wireless-A and Wireless-B](#)

Management VLAN

VLAN Overview

Virtual Local Area Networks (VLANs) are logical groupings of network hosts. Defined by software settings, other VLAN members or resources appear (to clients) to be on the same physical segment, no matter where they are attached on the logical LAN or WAN segment. They simplify traffic flow between clients and their frequently-used or restricted resources.

VLANs now extend as far as the reach of the access point signal. Clients can be segmented into wireless sub-networks via SSID and VLAN assignment. A Client can access the network by connecting to an AP configured to support its assigned SSID/VLAN.

AP devices are fully VLAN-ready; however, by default VLAN support is disabled. Before enabling VLAN support, certain network settings should be configured, and network resources such as a VLAN-aware switch, a RADIUS server, and possibly a DHCP server should be available.

Once enabled, VLANs are used to conveniently, efficiently, and easily manage your network in the following ways:

- Manage adds, moves, and changes from a single point of contact
- Define and monitor groups
- Reduce broadcast and multicast traffic to unnecessary destinations
 - Improve network performance and reduce latency
- Increase security
 - Secure network restricts members to resources on their own VLAN
 - Clients roam without compromising security

VLAN tagged data is collected and distributed through an AP's wireless interface(s) based on Network Name (SSID). An Ethernet port on the access point connects a wireless cell or network to a wired backbone. The access points communicate across a VLAN-capable switch that analyzes VLAN-tagged packet headers and directs traffic to the appropriate ports. On the wired network, a RADIUS server authenticates traffic and a DHCP server manages IP addresses for the VLAN(s). Resources like servers and printers may be present, and a hub may include multiple APs, extending the network over a larger area.

In this figure, the numbered items correspond to the following components:

1. VLAN-enabled access point
2. VLAN-aware switch (IEEE 802.1Q uplink)
3. AP management via wired host (SNMP, Web interface or CLI)
4. DHCP Server
5. RADIUS Server
6. VLAN 1
7. VLAN 2

Performing Advanced Configuration

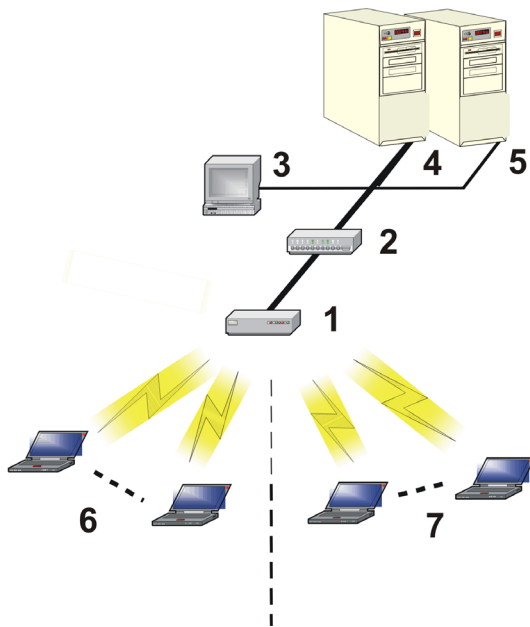


Figure 4-23 Components of a typical VLAN

VLAN Workgroups and Traffic Management

Access Points that are not VLAN-capable typically transmit broadcast and multicast traffic to all wireless Network Interface Cards (NICs). This process wastes wireless bandwidth and degrades throughput performance. In comparison, VLAN-capable AP is designed to efficiently manage delivery of broadcast, multicast, and unicast traffic to wireless clients.

The AP assigns clients to a VLAN based on a Network Name (SSID). The AP can support up to 16 VLAN/SSID pairs per radio (based on model type).



NOTE

The ability to configure up to 16 VLAN/SSID pairs and to configure a security profile per SSID is available only for 802.11b/g APs and 802.11a Upgrade Kit APs.

802.11b APs do not support multiple VLAN/SSID pairs. APs with the 802.11a card support multiple VLAN/SSID pairs, but do not support the security profile per SSID capability.

The AP matches packets transmitted or received to a network name with the associated VLAN. Traffic received by a VLAN is only sent on the wireless interface associated with that same VLAN. This eliminates unnecessary traffic on the wireless LAN, conserving bandwidth and maximizing throughput.

In addition to enhancing wireless traffic management, the VLAN-capable AP supports easy assignment of wireless users to workgroups. In a typical scenario, each user VLAN represents a workgroup; for example, one VLAN could be used for an EMPLOYEE workgroup and the other, for a GUEST workgroup.

In this scenario, the AP would assign every packet it accepted to a VLAN. Each packet would then be identified as EMPLOYEE or GUEST, depending on which wireless NIC received it. The AP would insert VLAN headers or “tags” with identifiers into the packets transmitted on the wired backbone to a network switch.

Finally, the switch would be configured to route packets from the EMPLOYEE workgroup to the appropriate corporate resources such as printers and servers. Packets from the GUEST workgroup could be restricted to a gateway that allowed access to only the Internet. A member of the GUEST workgroup could send and receive e-mail and access the Internet, but would be prevented from accessing servers or hosts on the local corporate network.

Typical User VLAN Configurations

VLANs segment network traffic into workgroups, which enable you to limit broadcast and multicast traffic. Workgroups enable clients from different VLANs to access different resources using the same network infrastructure. Clients using the same physical network are limited to those resources available to their workgroup.

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The AP can segment users into a maximum of 16 different workgroups (32 if using two cards in a Dual-radio AP) based on an SSID/VLAN pair (also referred as a VLAN Workgroup or a Sub-network).

NOTE

The ability to configure up to 16 VLAN/SSID pairs and to configure a security profile per SSID is available only for 802.11b/g APs and 802.11a Upgrade Kit APs.

802.11b APs do not support multiple VLAN/SSID pairs. APs with the 802.11a card support multiple VLAN/SSID pairs, but do not support the security profile per SSID capability.

The three primary scenarios for using VLAN workgroups are as follows:

1. VLAN disabled: Your network does not use VLANs, and you cannot configure the AP to use multiple SSIDs.
2. VLAN enabled, each VLAN workgroup uses a different VLAN ID Tag
3. VLAN enabled, a mixture of Tagged and Untagged workgroups

Enabling/Disabling VLAN Protocol

Control Access to the AP

Management access to the AP can easily be secured by making management stations or hosts and the AP itself members of a common VLAN. Simply configure a non-zero management VLAN ID and enable VLAN to restrict management of the AP to members of the same VLAN.

CAUTION

If a non-zero management VLAN ID is configured then management access to the AP is restricted to wired or wireless hosts that are members of the same VLAN. Ensure your management platform or host is a member of the same VLAN before attempting to manage the AP.

1. Click **Configure > SSID/VLAN/Security**.
2. Set the **VLAN Management ID** to a value between -1 and 4094 (a value of 0 disables VLAN management).
3. Place a check mark in the **Enable VLAN Protocol** box.

Provide Access to a Wireless Host in the Same Workgroup

The VLAN feature can allow wireless clients to manage the AP. If the VLAN Management ID matches a VLAN User ID, then those wireless clients who are members of that VLAN will have AP management access.

CAUTION

Once a VLAN Management ID is configured and is equivalent to one of the VLAN User IDs on the AP, all members of that User VLAN will have management access to the AP. Be careful to restrict VLAN membership to those with legitimate access to the AP.

1. Click **Configure > SSID/VLAN/Security**.
2. Set the **VLAN Management ID** to use the same VLAN ID as one of the configured SSID/VLAN pairs. See [Typical User VLAN Configurations](#) for details.
3. Place a check mark in the **Enable VLAN Protocol** box.

Disable VLAN Management

1. Click **Configure > SSID/VLAN/Security**.
2. Remove the check mark from the **Enable VLAN Protocol** box to disable all VLAN functionality.

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MAC Access

The MAC Access sub-tab allows you to build a list of stations, identified by their MAC addresses, authorized to access the network through the AP. The list is stored inside each AP within your network. Note that you must reboot the AP for any changes to the MAC Access Control Table to take effect.

The “MAC ACL Status” parameter (configurable on the SSID/VLAN -> Wireless sub-tab) is per VLAN if VLAN Management is enabled. All other parameters besides “MAC ACL Status” are configured per AP, even if VLAN is enabled.

Configuring MAC Access

⇒ NOTE

MAC Access Control status is enabled or disabled when configuring each Security Profile.

- **Operation Type:** Choose between **Passthru** and **Block**. This determines how the stations identified in the MAC Access Control Table are filtered.
 - If set to **Passthru**, only the addresses listed in the Control Table will pass through the bridge.
 - If set to **Block**, the bridge will block traffic to or from the addresses listed in the Control Table.
- **MAC Access Control Table:** Click **Add** to create a new entry. Click **Edit** to change an existing entry. Each entry contains the following field:
 - **MAC Address:** Enter the wireless client’s MAC address.
 - **Comment:** Enter an optional comment such as the client’s name.
- **Status:** The entry is enabled automatically when saved (so the Status field is only visible when editing an entry). You can also disable or delete entries by changing this field’s value.

⇒ NOTE

For larger networks that include multiple Access Points, you may prefer to maintain this list on a centralized location using the [MAC Access Control Via RADIUS Authentication](#).

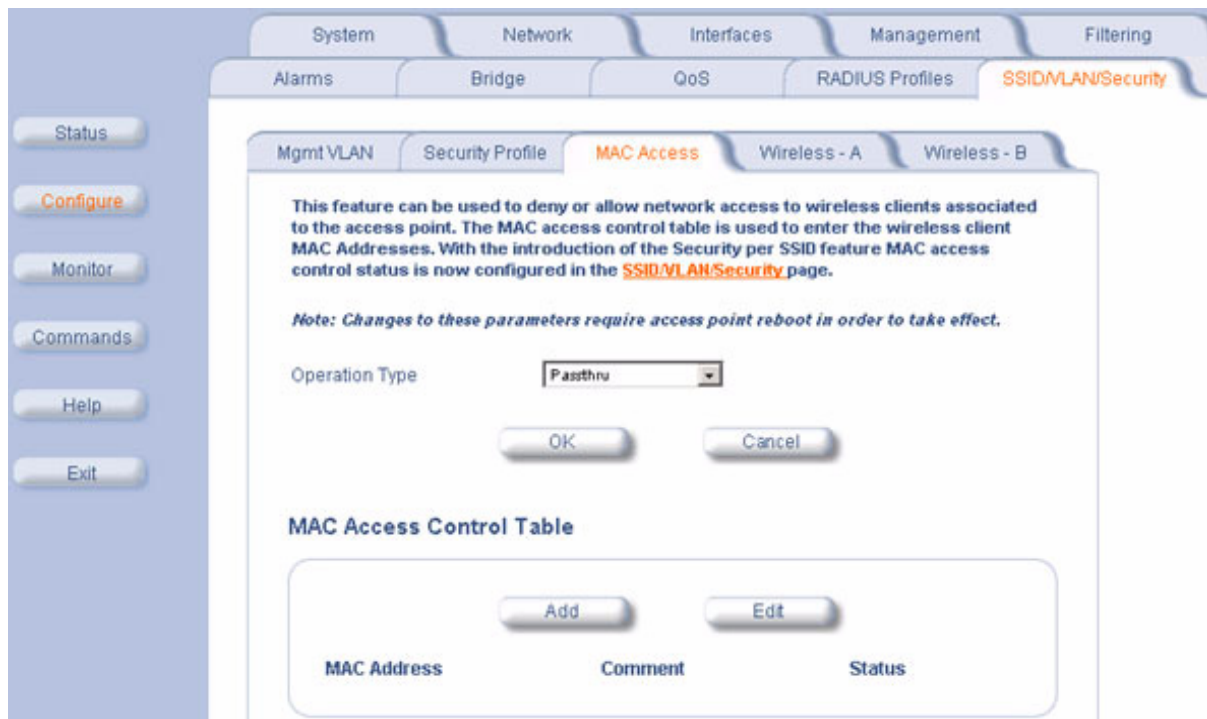


Figure 4-24 MAC Access Configuration Screen

Performing Advanced Configuration

Security Profiles

The AP supports the following Security features:

- **WEP Encryption:** The original encryption technique specified by the IEEE 802.11 standard.
- **802.1x Authentication:** An IEEE standard for client authentication.
- **Wi-Fi Protected Access (WPA):** A new standard that provides improved encryption security over WEP.

WEP Encryption

The IEEE 802.11 standards specify an optional encryption feature, known as Wired Equivalent Privacy or WEP, that is designed to provide a wireless LAN with a security level equal to what is found on a wired Ethernet network. WEP encrypts the data portion of each packet exchanged on an 802.11 network using an Encryption Key (also known as a WEP Key).

When Encryption is enabled, two 802.11 devices must have the same Encryption Keys and both devices must be configured to use Encryption in order to communicate. If one device is configured to use Encryption but a second device is not, then the two devices will not communicate, even if both devices have the same Encryption Keys.

- An 802.11b AP supports 64-bit and 128-bit encryption:
 - For 64-bit encryption, an encryption key is 10 hexadecimal characters (0-9 and A-F) or 5 ASCII characters (see [ASCII Character Chart](#)).
 - For 128-bit encryption, an encryption key is 26 hexadecimal characters or 13 ASCII characters.
- An 802.11a or 802.11b/g AP supports 64-bit, 128-bit, and 152-bit encryption:
 - For 64-bit encryption, an encryption key is 10 hexadecimal characters (0-9 and A-F) or 5 ASCII characters (see [ASCII Character Chart](#)).
 - For 128-bit encryption, an encryption key is 26 hexadecimal characters or 13 ASCII characters.
 - For 152-bit encryption, an encryption key is 32 hexadecimal characters or 16 ASCII characters.

802.1x Authentication

IEEE 802.1x is a standard that provides a means to authenticate and authorize network devices attached to a LAN port. A port in the context of IEEE 802.1x is a point of attachment to the LAN, either a physical Ethernet connection or a wireless link to an Access Point. 802.1x requires a RADIUS server and uses the Extensible Authentication Protocol (EAP) as a standards-based authentication framework, and supports automatic key distribution for enhanced security. The EAP-based authentication framework can easily be upgraded to keep pace with future EAP types.

Popular EAP types include:

- EAP-Message Digest 5 (MD5): Username/Password-based authentication; does not support automatic key distribution
- EAP-Transport Layer Security (TLS): Certificate-based authentication (a certificate is required on the server and each client); supports automatic key distribution
- EAP-Tunneled Transport Layer Security (TTLS): Certificate-based authentication (a certificate is required on the server; a client's username/password is tunneled to the server over a secure connection); supports automatic key distribution
- PEAP - Protected EAP with MS-CHAP v2: Secure username/password-based authentication; supports automatic key distribution

Different servers support different EAP types and each EAP type provides different features. Refer to the documentation that came with your RADIUS server to determine which EAP types it supports.

NOTE

The AP supports the following EAP types when Authentication Mode is set to **802.1x**, **WPA** or **802.11i (WPA2)**: EAP-TLS, PEAP, and EAP-TTLS. When Authentication Mode is set to Mixed, the AP supports the following EAP types: EAP-TLS, PEAP, EAP-TLLS, and EAP-MD5 (MD5 does not support automatic key distribution; therefore, if you choose this method you need to manually configure each client with the network's encryption key).

Performing Advanced Configuration

Authentication Process

There are three main components in the authentication process. The standard refers to them as:

1. supplicant (client PC)
2. authenticator (Access Point)
3. authentication server (RADIUS server)

When using Authentication Mode to 802.1x, WPA, Mixed mode (802.1x and WEP), or 802.11i, you need to configure your RADIUS server for authentication purposes.

Prior to successful authentication, an unauthenticated client PC cannot send any data traffic through the AP device to other systems on the LAN. The AP inhibits all data traffic from a particular client PC until the client PC is authenticated. Regardless of its authentication status, a client PC can always exchange 802.1x messages in the clear with the AP (the client begins encrypting data after it has been authenticated).

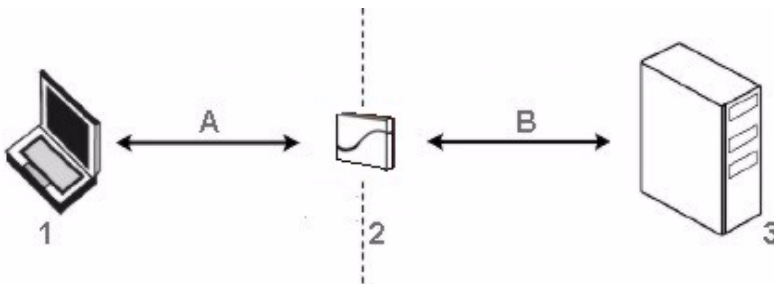


Figure 4-25 RADIUS Authentication Illustrated

The AP acts as a pass-through device to facilitate communications between the client PC and the RADIUS server. The AP (2) and the client (1) exchange 802.1x messages using an EAPOL (EAP Over LAN) protocol (A). Messages sent from the client station are encapsulated by the AP and transmitted to the RADIUS (3) server using EAP extensions (B).

Upon receiving a reply EAP packet from the RADIUS, the message is typically forwarded to the client, after translating it back to the EAPOL format. Negotiations take place between the client and the RADIUS server. After the client has been successfully authenticated, the client receives an Encryption Key from the AP (if the EAP type supports automatic key distribution). The client uses this key to encrypt data after it has been authenticated.

For 802.11a and 802.11b/g clients that communicate with an AP, each client receives its own unique encryption key; this is known as Per User Per Session Encryption Keys.

Wi-Fi Protected Access (WPA)

Wi-Fi Protected Access (WPA) is a security standard designed by the Wi-Fi Alliance in conjunction with the Institute of Electrical and Electronics Engineers (IEEE). THE AP supports WPA2, based on the IEEE 802.11i security standard.

➡ NOTE

For Dual-radio APs: WPA is available only for the AP-2000b/g and for APs using either an 802.11a or 802.11b/g Upgrade Kit. WPA is not available for APs with an 802.11b PC Card or a 5 GHz Upgrade Kit.

WPA is a replacement for Wired Equivalent Privacy (WEP), the encryption technique specified by the original 802.11 standard. WEP has several vulnerabilities that have been widely publicized. WPA addresses these weaknesses and provides a stronger security system to protect wireless networks.

WPA provides the following new security measures not available with WEP:

- Improved packet encryption using the Temporal Key Integrity Protocol (TKIP) and the Michael Message Integrity Check (MIC).
- Per-user, per-session dynamic encryption keys:
 - Each client uses a different key to encrypt and decrypt unicast packets exchanged with the AP
 - A client's key is different for every session; it changes each time the client associates with an AP
 - The AP uses a single global key to encrypt broadcast packets that are sent to all clients simultaneously
 - Encryption keys change periodically based on the **Re-keying Interval** parameter
 - WPA uses 128-bit encryption keys

Performing Advanced Configuration

- Dynamic Key distribution
 - The AP generates and maintains the keys for its clients
 - The AP securely delivers the appropriate keys to its clients
- Client/server mutual authentication
 - 802.1x
 - Pre-shared key (for networks that do not have an 802.1x solution implemented)

⇒ NOTE

For more information on WPA, see the Wi-Fi Alliance Web site at <http://www.wi-fi.org>.

The AP supports the following WPA authentication modes:

- **WPA:** The AP uses 802.1x to authenticate clients. You should only use an EAP that supports mutual authentication and session key generation, such as EAP-TLS, EAP-TTLS, and PEAP. See [802.1x Authentication](#) for details.
- **WPA-PSK (Pre-Shared Key):** For networks that do not have 802.1x implemented, you can configure the AP to authenticate clients based on a Pre-Shared Key. This is a shared secret that is manually configured on the AP and each of its clients. The Pre-Shared Key must be 256 bits long, which is 64 hexadecimal digits. The AP also supports a **PSK Pass Phrase** option to facilitate the creation of the Pre-Shared Key (so a user can enter an easy-to-remember phrase rather than a string of characters).
- **802.11i** (also known as WPA2): The AP authenticates clients according to the 802.11i draft standard, using 802.1x authentication, an AES cipher, and re-keying.
- **802.11i-PSK** (also known as WPA2 PSK): The AP uses an AES cipher, and authenticates clients based on a Pre-Shared Key. The Pre-Shared Key must be 256 bits long, which is either 64 hexadecimal digits. The AP also supports a **PSK Pass Phrase** option to facilitate the creation of the Pre-Shared Key (so a user can enter an easy-to-remember phrase rather than a string of characters).

Authentication Protocol Hierarchy

There is a hierarchy of authentication protocols defined for the AP.

The hierarchy is as follows, from Highest to lowest:

- 802.1x authentication
- MAC Access Control via RADIUS Authentication
- MAC Access Control through individual APs' MAC Access Control Lists

If you have both 802.1x and MAC authentication enabled, the 802.1x results will take effect. This is required in order to propagate the WEP keys to the clients in such cases. Once you disable 802.1x on the AP, you will see the effects of MAC authentication.

VLANs and Security Profiles

The AP2000 allows you to segment wireless networks into multiple sub-networks based on Network Name (SSID) and VLAN membership. A Network Name (SSID) identifies a wireless network. Clients associate with Access Points that share an SSID. During installation, the [Setup Wizard](#) prompts you to configure a Primary Network Name for each wireless interface.

After initial setup and once VLAN is enabled, the AP can be configured to support up to 16 SSIDs per wireless interface to segment wireless networks based on VLAN membership.

Each VLAN can be associated to a Security Profile and RADIUS Server Profiles. A Security Profile defines the allowed wireless clients, and authentication and encryption types. Refer to [VLANs and Security Profiles](#) for configuration details.

⇒ NOTE

The ability to configure up to 16 VLAN/SSID pairs and to configure a security profile per SSID is available only for 802.11b/g APs and 802.11a Upgrade Kit APs.

802.11b APs do not support multiple VLAN/SSID pairs. APs with the 802.11a card support multiple VLAN/SSID pairs, but do not support the security profile per SSID capability.

Performing Advanced Configuration

Configuring Security Profiles

Security policies can be configured and applied on the AP as a whole, or on a per VLAN basis. When VLAN is disabled on the AP, the user can configure a security profile for each interface of the AP. When VLANs are enabled and Security per SSID is enabled, the user can configure a security profile for each VLAN.

The user defines a security policy by specifying one or more values for the following parameters:

- Wireless STA types (WPA station, 802.11i station, 802.1x station, WEP station) that can associate to the AP.
- Authentication mechanisms (802.1x, RADIUS MAC authentication) that are used to authenticate clients for each type of station.
- Cipher Suites (CCMP, TKIP, WEP) used for encapsulating the wireless data for each type of station.

Up to 16 security profiles can be configured per wireless interface.

1. Click **Configure** -> **SSID/VLAN/Security** -> **Security Profile**.

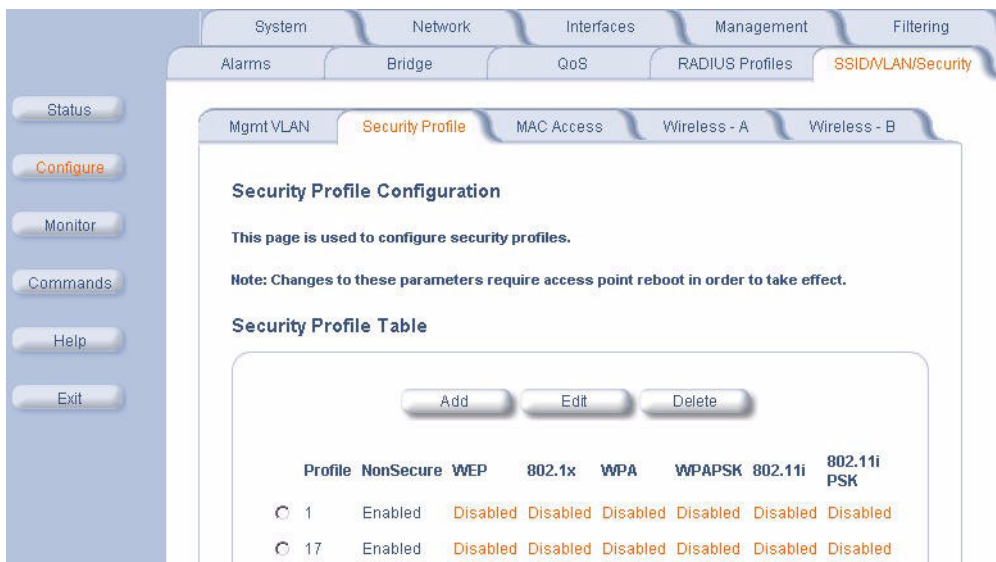


Figure 4-26 Security Profile Sub-tab

2. Click **Add** in the Security Profile Table to create a new entry. To modify an existing profile, select the profile and click **Edit**. To delete an existing profile, select the profile and click **Delete**. You cannot delete a Security Profile used in an SSID. Also, the first Security Profile (index 1.1 to 1.7) cannot be deleted.
3. Configure one or more types of wireless stations (security modes) that are allowed access to the AP under the security profile. The WEP/PSK parameters are separately configurable for each security mode. To enable a security mode in the profile (Non Secure Station, WEP Station, 802.1x Station, WPA Station, WPA-PSK Station, 802.11i Station, 802.11i-PSK Station), check the box next to the mode. See [Figure 4-27 on page 92](#).
If the security mode selected in a profile is WEP, WPA-PSK, or 802.11i-PSK, then you must configure the WEP or Pre-Shared Keys.
4. Configure the parameters as follows for each enabled security mode. Refer to [Figure 4-27 on page 92](#).
 - **Non Secure Station:**
 - Authentication Mode: None. The AP allows access to Stations without authentication.
 - Non secure station should be used only with WEP or 802.1x security mode.
 - Cipher: None
 - **WEP Station:**
 - Authentication Mode: None
 - Cipher: WEP
 - Encryption Key 0, Encryption Key 1, Encryption Key 2, Encryption Key 3
 - Encryption Transmit Key: select Key 0, Key 1, Key 2, or Key 3

Performing Advanced Configuration

- **802.1x Station:**
 - Authentication Mode: 802.1x
 - Cipher: WEP
 - Encryption Key Length: 64 or 128 Bits.
 - If 802.1x is enabled simultaneously with WEP, the 802.1x Station's encryption key length is determined by the WEP encryption key.
 - **WPA Station:**
 - Authentication Mode: 802.1x
 - Cipher: TKIP
 - **WPA-PSK Station:**
 - Authentication Mode: PSK
 - Cipher: TKIP
 - PSK Passphrase: an 8-63 character user-defined phrase. It is recommended a passphrase of at least 13 characters, including both letters and numbers, and upper and lower case characters to ensure that the generated key cannot be easily deciphered by network infiltrators.
 - **802.11i Station:**
 - Authentication Mode: 802.1x
 - Cipher: AES
 - **802.11i-PSK Station:**
 - Authentication Mode: PSK
 - Cipher: AES
 - PSK Passphrase: an 8-63 character user-defined phrase. It is recommended a passphrase of at least 13 characters, including both letters and numbers, and upper and lower case characters to ensure that the generated key cannot be easily deciphered by network infiltrators.
5. When finished configuring all parameters, click **OK**.
 6. If you selected a Security Mode of 802.1x Station, WPA Station, or 802.11i Station, you must configure a RADIUS 802.1x/EAP server. Refer to the [Configuring RADIUS Profiles](#) section.
Security Profile 1 will be used by default for all wireless interfaces.
 7. Refer to the following section for advanced VLAN configuration options: [Adding or Modifying an SSID/VLAN with VLAN Protocol Disabled](#) and [Adding or Modifying an SSID/VLAN with VLAN Protocol Enabled](#).
 8. Reboot the AP.

Performing Advanced Configuration

The screenshot shows the 'Security Profile Table - Add Entries' configuration page. The breadcrumb trail at the top indicates the path: System > Network > Interfaces > Management > Filtering > SSID/LAN/Security. The left sidebar contains buttons for Status, Configure, Monitor, Commands, Help, and Exit. The main content area includes a title bar with tabs for Alarms, Bridge, DoS, RADIUS Profiles, and SSID/LAN/Security. Below the title bar, there is a back arrow button and the title 'Security Profile Table - Add Entries'. The page contains several paragraphs of text explaining the purpose of the page and providing instructions for configuring WEP, WPA, and 802.11i security modes. A table provides information on how to configure encryption keys using HEX or ASCII values. Below the table, there are several paragraphs of text, including a note about changes requiring a reboot. The main configuration area consists of a list of security modes with checkboxes and associated configuration fields for Authentication Mode, Cipher, and other parameters. At the bottom, there are 'OK' and 'Cancel' buttons.

Security Profile Table - Add Entries

This page is used to edit a Security Profile.

If the WEP security mode is configured, then the appropriate key size must be configured. The access point supports 64, 128, and 152 bit encryption keys. The following table provides information on how to configure encryption keys using HEX or ASCII values.

	Configuration in Hex	Configuration in ASCII
64 bit encryption key	10 characters (0-F)	5 alphanumeric characters
128 bit encryption key	26 characters (0-F)	13 alphanumeric characters
152 bit encryption key	37 characters (0-F)	16 alphanumeric characters

If the WPA/PSK or 802.11i/PSK security mode is configured, then the appropriate PSK pass phrase must be configured. The PSK pass phrase consists of a alphanumeric string from 8 to 63 characters.

802.1x, WPA or 802.11i security mode can be configured only if an EAP RADIUS server profile is configured and enabled. Certain security modes and their combinations may not be available depending on the security capabilities of the wireless interface.

Note: Changes to these parameters require access point reboot in order to take effect.

Non-Secure Station

Authentication Mode: None
Cipher: None

WEP Station

Authentication Mode: None
Cipher: WEP
Encryption Key 3:
Encryption Key 1:
Encryption Key 2:
Encryption Key 3:
Encryption Transmit Key: Key 3

802.1x Station

Authentication Mode: 802.1x
Cipher: WEP
Encryption Key Length: 64 Bits

WPA Station

Authentication Mode: 802.1x
Cipher: TKIP

WPA-PSK Station

Authentication Mode: PSK
Cipher: TKIP
PSK Passphrase:

802.11i Station

Authentication Mode: 802.1x
Cipher: AES

802.11i-PSK Station

Authentication Mode: PSK
Cipher: AES
PSK Passphrase:

OK Cancel

Figure 4-27 Security Profile Table - Add Entries

Performing Advanced Configuration

Wireless-A and Wireless-B

Each SSID/VLAN can have its own Security Profile that defines its security mode, authentication mechanism, and encryption, so that customers can have multiple types of clients (non-WEP, WEP, 802.1x, WPA) on the same system, but separated per VLAN. Refer to the [Security Profiles](#) section for more information. These parameters are configurable from the Wireless A and Wireless B sub-tabs.

Adding or Modifying an SSID/VLAN with VLAN Protocol Disabled

1. Click on **SSID/VLAN/Security > Wireless-A** or **Wireless-B**.
This tab allows you to select the index of the SSID/VLAN to be added or edited. It also allows you to configure the RADIUS Accounting and Authentication Status, the MAC ACL Status, the Rekeying Interval, the Security Profile, and the RADIUS Server Profiles for the VLAN.
2. Scroll down to the SSID and VLAN table
3. Click **Add** to configure additional SSIDs, VLANs, and their associated security profiles and RADIUS server profiles, or click **Edit** to modify an existing VLAN/SSID. See [Figure 4-28](#).

SSID and VLAN Data Table

Index	Network Name (SSID)	VLAN ID	QoS Profile	Status
1	My Wireless Network A	untagged	1	Enable

Figure 4-28 SSID and VLAN Table

The Add Entry or Edit Entry screen appears. See [Figure 4-29](#) and [Figure 4-30](#) on page 94.

System Network Interfaces Management Filtering

Alarms Bridge QoS RADIUS Profiles **SSID/VLAN/Security**

Status

Configure

Monitor

Commands

Help

Exit

SSID and VLAN Table - Wireless A - Add Entries.

This page is used to configure additional SSIDs, and VLANs. Each table entry requires a unique SSID and VLAN ID.

Note: Changes to these parameters require access point reboot in order to take effect.

Network name (SSID)

VLAN ID (0-4094, untagged)

OK Cancel

Figure 4-29 SSID/VLAN Add Entries Screen (VLAN Protocol Disabled)

Performing Advanced Configuration

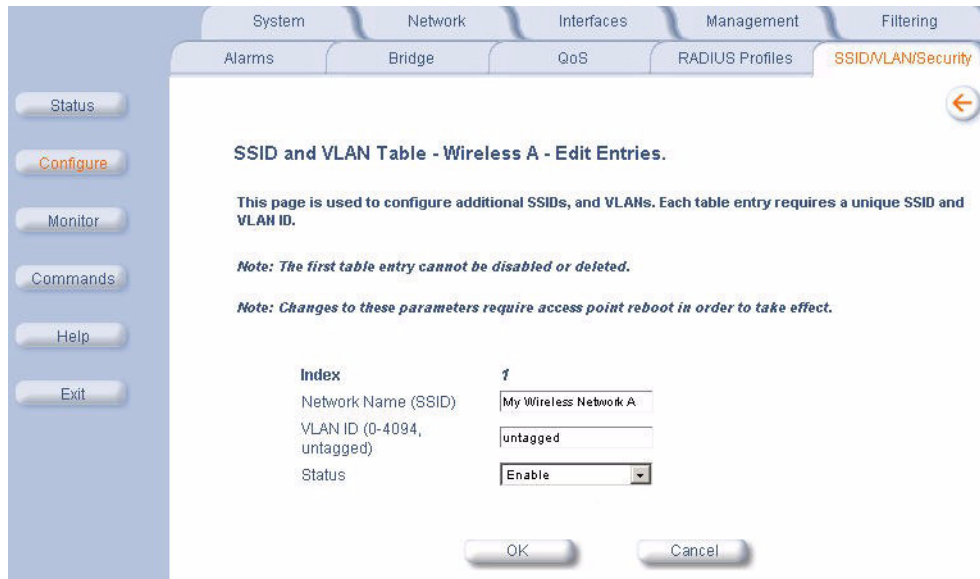


Figure 4-30 SSID/VLAN Edit Entries Screen (VLAN Protocol Disabled)

4. Enter a unique **Network Name** (SSID), between 1 and 32 characters. This parameter is mandatory.
5. Enter a unique **VLAN ID**. This parameter is mandatory.
 - You must specify a unique VLAN ID for each SSID on the interface. A VLAN ID is a number from -1 to 4094. A value of -1 means that an entry is “untagged.”
 - You can set the VLAN ID to “-1” or “untagged” if you do not want clients that are using a specific SSID to be members of a VLAN workgroup. Only one “untagged” VLAN ID is allowed per interface.
 - The VLAN ID must match an ID used by your network; contact your network administrator if you need assistance defining the VLAN IDs.
6. If editing an entry, enable or disable the VLAN using the **Status** drop-down menu. If adding an entry, this field will not appear.
7. Click OK to return to Wireless A or B Security Configuration Screen. See [Figure 4-31 on page 95](#).

Performing Advanced Configuration

The screenshot shows the configuration page for 'Wireless - A'. The page title is 'SSID, VLAN, and Security Data Configuration - Wireless A'. It contains several sections:

- Instructions:** A paragraph explaining the purpose of the page and a note that VLAN Status must be enabled (Mgmt VLAN).
- Security Profiles:** A paragraph explaining that Security Profiles are used to configure security modes and that RADIUS server profiles should be configured and assigned to this SSID.
- Note:** A note stating that changes to these parameters require an access point reboot.
- Enable Security Per SSID:** A checkbox that is currently unchecked.
- Configuration Fields:** A series of fields with dropdown menus and text boxes:
 - Accounting Status: Disable
 - RADIUS MAC Authentication Status: Disable
 - MAC ACL Status: Disable
 - Rekeying Interval (seconds): 900
 - Security Profile: 1
 - RADIUS MAC Authentication Profile: MAC Authentication
 - RADIUS EAP Authentication Profile: EAP Authentication
 - RADIUS Accounting Profile: Accounting
- Buttons:** OK and Cancel buttons.
- SSID and VLAN Data Table:** A table with columns for Index, Network Name (SSID), VLAN ID, QoS Profile, and Status. It contains one row:

Index	Network Name (SSID)	VLAN ID	QoS Profile	Status
1	My Wireless Network A	untagged	1	Enable

Figure 4-31 SSID, VLAN, and Security Data Configuration (VLAN Protocol Disabled)

8. Enable or disable RADIUS accounting on the VLAN/SSID under the **Accounting Status** drop-down menu.
9. Enable or disable RADIUS MAC authentication status on the VLAN/SSID under the **RADIUS Authentication Status** drop-down menu.
10. Enable or disable MAC Access Control List status on the VLAN/SSID under the **MAC ACL Status** drop-down menu.
11. Enter the **Rekeying Interval** in seconds. The default interval is 900 seconds.
12. Enter the **Security Profile** used by the VLAN in the Security Profile field. Refer to the [Security Profiles](#) section for more information.

➤ NOTE

If you have two or more SSIDs per interface using a security Profile with a security mode of Non Secure, be aware that security being applied in the VLAN is not being applied in the wireless network.

Performing Advanced Configuration

13. Define the **RADIUS Server Profile Configuration** for the VLAN/SSID:

- RADIUS MAC Authentication Profile
- RADIUS EAP Authentication Profile
- RADIUS Accounting Profile

If 802.1x, WPA, or 802.11i security mode is used, the RADIUS EAP Authentication Profile must have a value.

A RADIUS Server Profile for authentication for each VLAN shall be configured as part of the configuration options for that VLAN. RADIUS profiles are independent of VLANs. The user can define any profile to be the default and associate all VLANs to that profile. Four profiles are created by default, "MAC Authentication", "EAP Authentication", Accounting", and "Management".

14. Reboot the AP.

Adding or Modifying an SSID/VLAN with VLAN Protocol Enabled

1. Click **SSID/VLAN/Security > Wireless-A** or **Wireless-B**.

This tab allows you to select the index of the SSID/VLAN to be added or edited. It also allows you to enable Security Per SSID, and configure the RADIUS Accounting and Authentication Status, the MAC ACL Status, the Rekeying Interval, the Security Profile, and the RADIUS Server Profiles for the VLAN.

2. Select the **Enable Security Per SSID** option. The screen will update to the following:

The screenshot shows the configuration page for 'Wireless - A'. The page title is 'SSID, VLAN, and Security Data Configuration - Wireless A'. It contains several sections of text and a table.

Enable Security Per SSID

SSID, VLAN, and Security Data Table

Index	Network Name (SSID)	VLAN ID	Security Profile	QoS Profile	Status
1	My Wireless Network A	untagged	1	1	Enable

Figure 4-32 SSID/VLAN Configuration (VLAN Protocol Enabled)

3. Click **Add** to configure additional SSIDs, VLANs, and their associated security profiles and RADIUS server profiles, or click **Edit** to modify an existing VLAN/SSID.

Performing Advanced Configuration

The Add Entry or Edit Entry screen appears. See [Figure 4-33](#) below and [Figure 4-34](#) on page 98.

The screenshot shows the configuration interface for SSID, VLAN, and Security. The top navigation bar includes System, Network, Interfaces, Management, and Filtering. The left sidebar contains buttons for Status, Configure, Monitor, Commands, Help, and Exit. The main content area is titled "SSID, VLAN, and Security Table - Wireless A - Add Entries." and contains the following configuration fields:

Network name (SSID)	<input type="text"/>
VLAN ID (0-4094, untagged)	<input type="text" value="untagged"/>
SSID Authorization	<input type="text" value="Disable"/>
Accounting Status	<input type="text" value="Disable"/>
RADIUS MAC Authentication Status	<input type="text" value="Disable"/>
MAC ACL Status	<input type="text" value="Disable"/>
Rekeying Interval (seconds)	<input type="text" value="900"/>
Security Profile	<input type="text" value="1"/>
RADIUS MAC Authentication Profile	<input type="text"/>
RADIUS EAP Authentication Profile	<input type="text"/>
RADIUS Accounting Profile	<input type="text"/>
QoS Profile	<input type="text"/>

At the bottom of the form are "OK" and "Cancel" buttons.

Figure 4-33 SSID/VLAN Add Entries Screen (VLAN Protocol Enabled)

Performing Advanced Configuration

The screenshot shows the configuration interface for 'Wireless A' under the 'SSID/VLAN/Security' tab. The interface includes a navigation menu on the left with buttons for Status, Configure, Monitor, Commands, Help, and Exit. The main content area is titled 'SSID, VLAN, and Security Table - Wireless A - Edit Entries.' and contains the following text:

This page is used to configure additional SSIDs, VLANs, and their associated security profiles and RADIUS server profiles. Each table entry requires a unique SSID and VLAN ID.

Security Profiles are used to configure the allowed security modes. If RADIUS MAC, 802.1x, WPA or RADIUS accounting is enabled in the SSID's security profile then the respective **RADIUS server profiles** should be configured and assigned to this SSID.

Note: Changes to these parameters require access point reboot in order to take effect.

Index	1
Network Name (SSID)	My Wireless Network A
VLAN ID (0-4094, untagged)	untagged
Status	Enable
SSID Authorization	Disable
Accounting Status	Disable
RADIUS MAC Authentication Status	Disable
MAC ACL Status	Disable
Rekeying Interval (seconds)	900
Security Profile	1
RADIUS MAC Authentication Profile	MAC Authentication
RADIUS EAP Authentication Profile	EAP Authentication
RADIUS Accounting Profile	Accounting

At the bottom of the form are 'OK' and 'Cancel' buttons.

Figure 4-34 SSID/VLAN Edit Entries Screen (VLAN Protocol Enabled)

4. Enter a unique **Network Name** (SSID), between 1 and 32 characters. This parameter is mandatory.
5. Enter a unique **VLAN ID**. This parameter is mandatory.
 - You must specify a unique VLAN ID for each SSID on the interface. A VLAN ID is a number from -1 to 4094. A value of -1 means that an entry is “untagged.”
 - You can set the VLAN ID to “-1” or “untagged” if you do not want clients that are using a specific SSID to be members of a VLAN workgroup. Only one “untagged” VLAN ID is allowed per interface.
 - The VLAN ID must match an ID used by your network; contact your network administrator if you need assistance defining the VLAN IDs.
6. If editing an entry, enable or disable the VLAN using the **VLAN Status** drop-down menu. If adding, this drop-down menu will not appear.
7. Enable or disable the **SSID Authorization** status from the drop-down menu.
SSID Authorization is the RADIUS based authorization of the SSID for a particular client. The authorized SSIDs are sent as the tunnel attributes.
8. Enable or disable RADIUS accounting on the VLAN/SSID under the **Accounting Status** drop-down menu.
9. Enable or disable RADIUS MAC authentication status on the VLAN/SSID under the **RADIUS Authentication Status** drop-down menu.
10. Enable or disable MAC Access Control List status on the VLAN/SSID under the **MAC ACL Status** drop-down menu.
11. Enter the **Rekeying Interval** in seconds. The default interval is 900 seconds.
12. Enter the Security Profile used by the VLAN in the **Security Profile** field.

Performing Advanced Configuration

⇒ NOTE

If you have two or more SSIDs per interface using a security Profile with a security mode of Non Secure, be aware that security being applied in the VLAN is not being applied in the wireless network.

13. Define the **RADIUS Server Profile Configuration** for the VLAN/SSID:

- RADIUS MAC Authentication Profile
- RADIUS EAP Authentication Profile
- RADIUS Accounting Profile

If 802.1x, WPA, or 802.11i security mode is used, the RADIUS EAP Authentication Profile must have a value.

A RADIUS Server Profile for authentication for each VLAN shall be configured as part of the configuration options for that VLAN. RADIUS profiles are independent of VLANs. The user can define any profile to be the default and associate all VLANs to that profile. Four profiles are created by default, "MAC Authentication", "EAP Authentication", "Accounting", and "Management".

14. Reboot the AP.

Broadcast SSID and Closed System

Broadcast SSID allows the broadcast of a single SSID when the AP is configured for multiple SSIDs. Broadcast SSID may only be enabled for a single SSID. This object can only be configured using the CLI and SNMP using a MIB browser or network management application.

Closed System manages the way probe requests are handled. If enabled, the AP will respond to probe requests with an SSID only if the client has specified the SSID in the probe request. If the client sends a probe request with a null or "ANY" SSID, the AP will respond with a null SSID. If disabled, the AP will respond with each configured SSID, whether or not an SSID has been specified in the probe request. This option is disabled by default.

To enable Closed System, click on **Interfaces > Wireless-A** or **Wireless-B** and check the **Enable Closed System** box.

For more information, on Broadcast SSID and Closed System, refer to Technical Bulletin 69680 at <http://support.proxim.com>.

Monitoring the AP-2000

- [Logging into the HTTP Interface](#)
- **Version:** Provides version information for the Access Point's system components.
- **ICMP:** Displays statistics for Internet Control Message Protocol packets sent and received by the AP.
- **IP/ARP Table:** Displays the AP's IP Address Resolution table.
- **Learn Table:** Displays the list of nodes that the AP has learned are on the network.
- **IAPP:** Provides statistics for the Inter-Access Point Protocol messages sent and received by the AP.
- **RADIUS:** Provides statistics for the configured primary and backup RADIUS server(s).
- **Interfaces:** Displays the Access Point's interface statistics (Wireless and Ethernet).
- **Station Statistics:** Displays statistics for stations and Wireless Distribution System links.

Logging into the HTTP Interface

Once the AP has a valid IP Address and an Ethernet connection, you may use your web browser to monitor network statistics.

The Command Line Interface (CLI) also provides a method for viewing network statistics using Telnet or a serial connection. This section covers only use of the HTTP interface. For more information about viewing network statistics with the CLI, refer to [Using the Command Line Interface \(CLI\)](#).

Follow these steps to monitor an AP's operating statistics using the HTTP interface:

1. Open a Web browser on a network computer.

NOTE

The HTTP interface supports the following Web browser:

- Microsoft Internet Explorer 6 with Service Pack 1 or later
 - Netscape 6.1 or later
2. If necessary, disable the Internet proxy settings. For Internet Explorer users, follow these steps:
 - Select **Tools > Internet Options...**
 - Click the **Connections** tab.
 - Click **LAN Settings...**
 - If necessary, remove the check mark from the **Use a proxy server** box.
 - Click **OK** twice to save your changes and return to Internet Explorer.
 3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.
 - Result: The AP **Enter Network Password** screen appears.
 4. Enter the HTTP password in the **Password** field and click **OK**. Leave the **User Name** field blank. (By default, the HTTP password is "public").
 - Result: The **System Status** screen appears.

Monitoring the AP-2000



Figure 5-1 Enter Network Password Screen

5. Click the **Monitor** button located on the left-hand side of the screen.

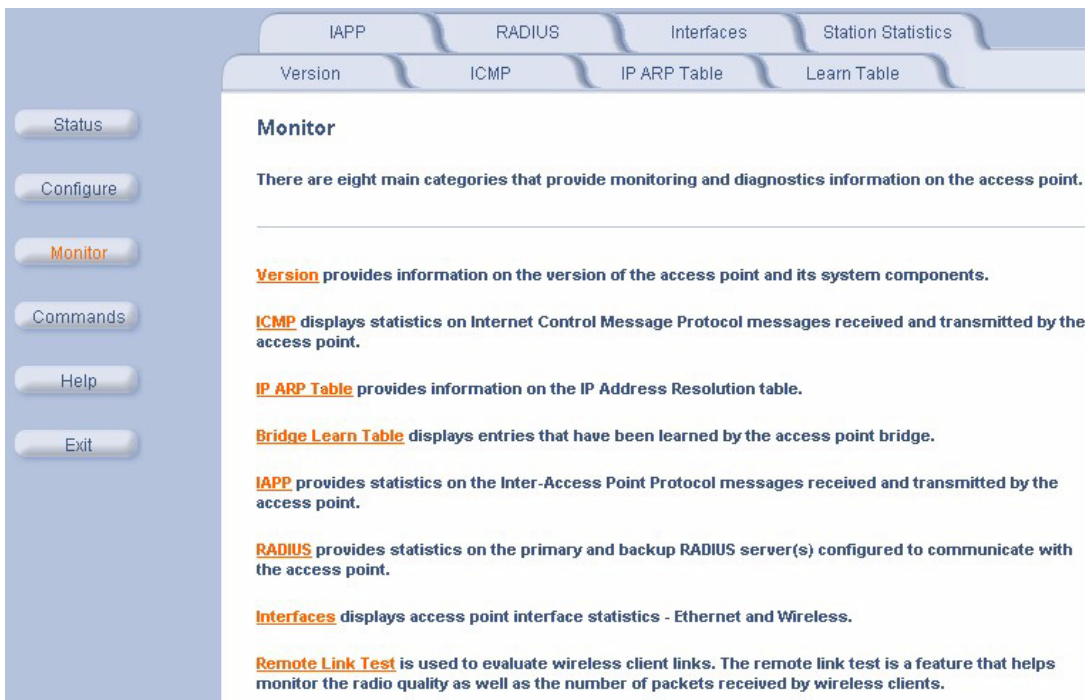



Figure 5-2 Monitor Main Screen

6. Click the tab that corresponds to the statistics you want to review. For example, click **Learn Table** to see the list of nodes that the AP has discovered on the network.
7. If applicable, click the **Refresh**  button to update the statistics.

Monitoring the AP-2000

Version

From the HTTP interface, click the **Monitor** button and select the **Version** tab. The list displayed provides you with information that may be pertinent when calling Technical Support. With this information, your Technical Support representative can verify compatibility issues and make sure the latest software are loaded. This screen displays the following information for each Access Point component:

- **Serial Number:** The component's serial number, if applicable.
- **Component Name**
- **ID:** The AP identifies a system component based on its ID. Each component has a unique identifier.
- **Variant:** Several variants may exist of the same component (for example, a hardware component may have two variants, one with more memory than the other).
- **Version:** Specifies the component's version or build number. The Software Image version is the most useful information on this screen for the typical end user.

This tab displays version information of the access point system components. This information can be used by Technical Support to diagnose incompatibility issues and to determine if updated software or drivers are required and available.

Serial Number	Name	ID	Variant	Version
Not Applicable	Software Image	89	1	2.5.2
01R706021386	Hardware Inventory	97	1	1.0
Not Applicable	AP- Firmware	842	1	8.42
Not Applicable	BSP-BL Original	111	1	2.0.10
Not Applicable	Wireless MIB	122	1	3.22
Not Applicable	Wireless-PRI Firmware	21	1	4.4
01UT27365294	Wireless-NIC	1	1	4.2

Figure 5-3 Version Information Screen

Monitoring the AP-2000

ICMP

This tab provides statistical information for both received and transmitted messages directed to the AP. Not all ICMP traffic on the network is counted in the ICMP (Internet Control Message Protocol) statistics.

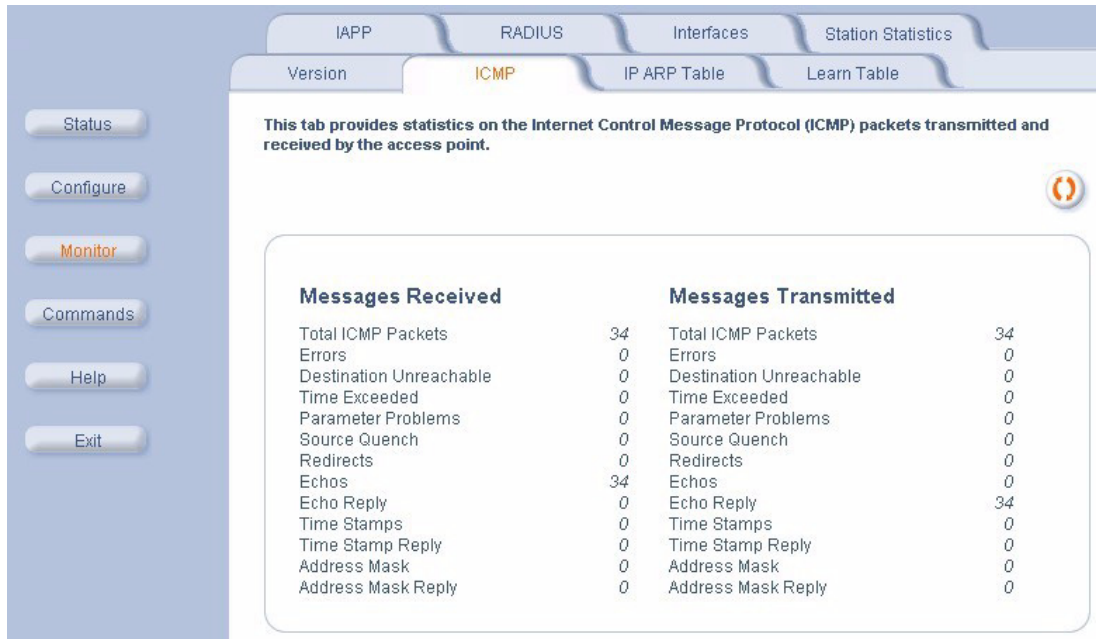


Figure 5-4 ICMP Monitoring Screen

IP/ARP Table

This tab provides information based on the Address Resolution Protocol (ARP), which relates MAC Address and IP Addresses.

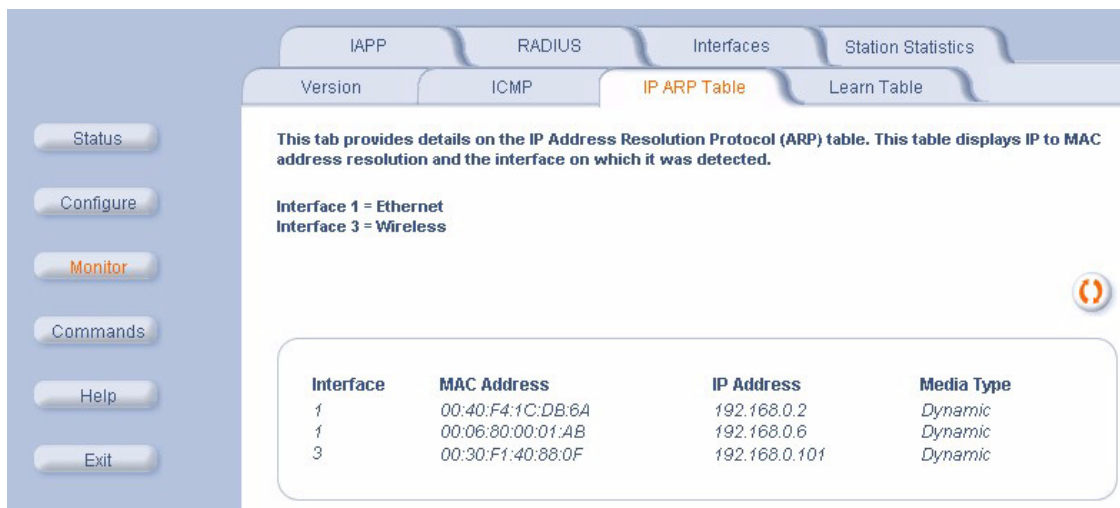


Figure 5-5 IP/ARP Table

Monitoring the AP-2000

Learn Table

This tab displays information relating to network bridging. It reports the MAC address for each node that the device has learned is on the network and the interface on which the node was detected. There can be up to 10,000 entries in the Learn Table.



Figure 5-6 Learn Table

IAPP

This tab displays statistics relating to client handovers and communications between ORiNOCO Access Points.

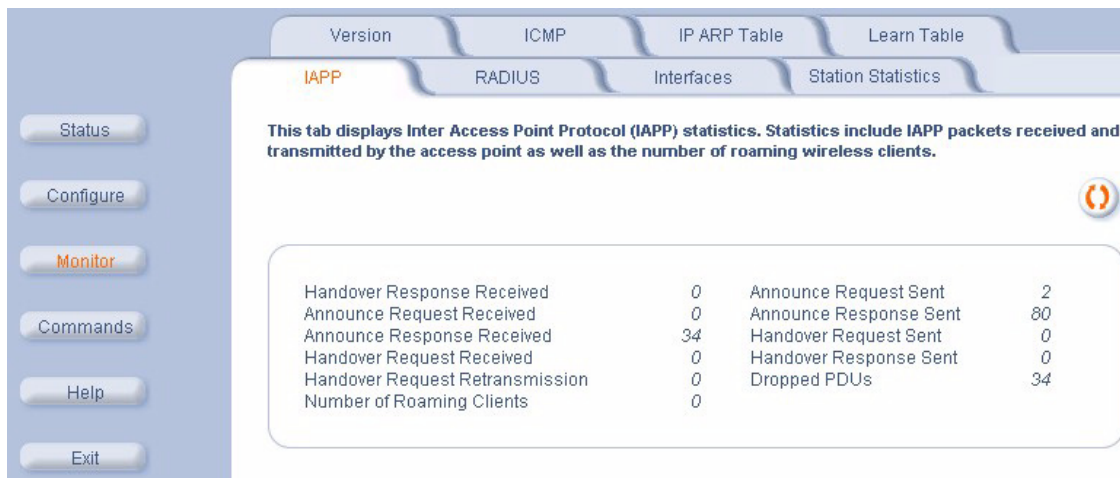


Figure 5-7 IAPP Screen

Monitoring the AP-2000

RADIUS

This tab provides RADIUS authentication, EAP/802.1x authentication, and accounting information for both the Primary and Backup RADIUS servers.

⇒ NOTE

RADIUS authentication and accounting must be enabled for this information to be valid.

RADIUS Monitoring - Microsoft Internet Explorer

Address: http://10.0.0.1/mon/radius.html

proxim WIRELESS NETWORKS

Version | ICMP | IP ARP Table | Learn Table

IAPP | **RADIUS** | Interfaces | Link Test | Station Statistics

Status | Configure | **Monitor** | Commands | Help | Exit

This tab provides statistics on the primary and backup RADIUS (Authentication and Accounting) server(s) with which the access point is configured to communicate.

Primary Authentication Server		Backup Authentication Server	
Access Requests	0	Access Requests	0
Access Accepts	0	Access Accepts	0
Access Retransmissions	0	Access Retransmissions	0
Access Rejects	0	Access Rejects	0
Access Challenges	0	Access Challenges	0
Malformed Access Responses	0	Malformed Access Responses	0
Authentication Bad Authenticators	0	Authentication Bad Authenticators	0
Timeouts	0	Timeouts	0

Primary EAP/802.1x Authentication Server		Backup EAP/802.1x Authentication Server	
Access Requests	0	Access Requests	0
Access Accepts	0	Access Accepts	0
Access Retransmissions	0	Access Retransmissions	0
Access Rejects	0	Access Rejects	0
Access Challenges	0	Access Challenges	0
Malformed Access Responses	0	Malformed Access Responses	0
Authentication Bad Authenticators	0	Authentication Bad Authenticators	0
Timeouts	0	Timeouts	0

Primary Accounting Server		Backup Accounting Server	
Accounting Requests	0	Accounting Requests	0

Figure 5-8 RADIUS Monitoring Screen

Monitoring the AP-2000

Interfaces

This tab displays statistics for the Ethernet and wireless interfaces. The Operational Status can be up, down, or testing.

This tab provides information and statistics on the Ethernet interface of the Access Point.

Ethernet

Type: ethernet-csmacd

Description: 0.0

MIB Specific Definition: wlc1

Physical Address: 00:02:2D:2A:67:30

Last Change: 140400

Operational Status: Up

Admin Status: Up

Speed: 11000000

Maximum Packet Size: 1500

In Octets (bytes): 12236

In Unicast Packets: 19

In Non-unicast Packets: 82

In Discards: 0

In Errors: 0

Unknown Protocols: 0

Out Octets (bytes): 1817820

Out Unicast Packets: 1

Out Non-unicast Packets: 29582

Out Discards: 0

Out Errors: 0

Output Queue Length: 10

Alignment Error: 0

FCS Errors: 0

Single Collision Fram: 0

Multiple Collision Fram: 0

SQE Test Errors: 0

Deferred Transmissio: 0

Late Collisions: 0

Excessive Collisions: 0

Internal MAC Transmit: 0

Carrier Sense Errors: 0

Frames Too Long: 0

Internal MAC Receive: 0

This tab displays information and statistics on the wireless interface.

Wireless

Type: ethernet-csmacd

Description: 0.0

MIB Specific Definition: wlc1

MAC Address: 00:02:2D:2A:67:30

Last Change: 140400

Operational Status: Up

Admin Status: Up

Speed: 11000000

Maximum Packet Size: 1500

In Octets (bytes): 12236

In Unicast Packets: 19

In Non-unicast Packets: 82

In Discards: 0

In Errors: 0

Unknown Protocols: 0

Out Octets (bytes): 1817820

Out Unicast Packets: 1

Out Non-unicast Packets: 29582

Out Discards: 0

Out Errors: 0

Output Queue Length: 10

Transmitted Fragment Count: 13752

Multicast Transmitted Frame Count: 112

Failed Count: 0

Retry Count: 0

Multiple Retry Count: 0

Duplicate Frame Count: 0

Successful RTS Count: 0

Failed RTS Count: 0

Failed ACK Count: 0

Received Fragment Count: 176

Multicast Received Frame Count: 78

FCS Error: 0

Figure 5-9 Wireless Interface Monitoring

Monitoring the AP-2000

Station Statistics

This tab displays information on wireless clients attached to the AP and on Wireless Distribution System links.

Enabling and Viewing Station Statistics

To enable the monitoring of Stations Statistics, perform the following procedure:

1. Click on the **Monitor** tab on the left on the web page.
2. Click on the **Station Statistics** tab on the Monitor screen.
3. Enable the Monitoring Station Statistics feature (Station Statistics are disabled by default) by checking **Enable Monitoring Station Statistics** and click **OK**.

You do not need to reboot the AP for the changes to take effect. If clients are connected to the device or WDS links are configured for the device, the statistics will now be shown on the screen.

Refreshing Station Statistics

Click on the **Refresh** button in the browser window to view the latest statistics. If any new clients associate to the AP, you can see the statistics of the new clients after you click the refresh button.

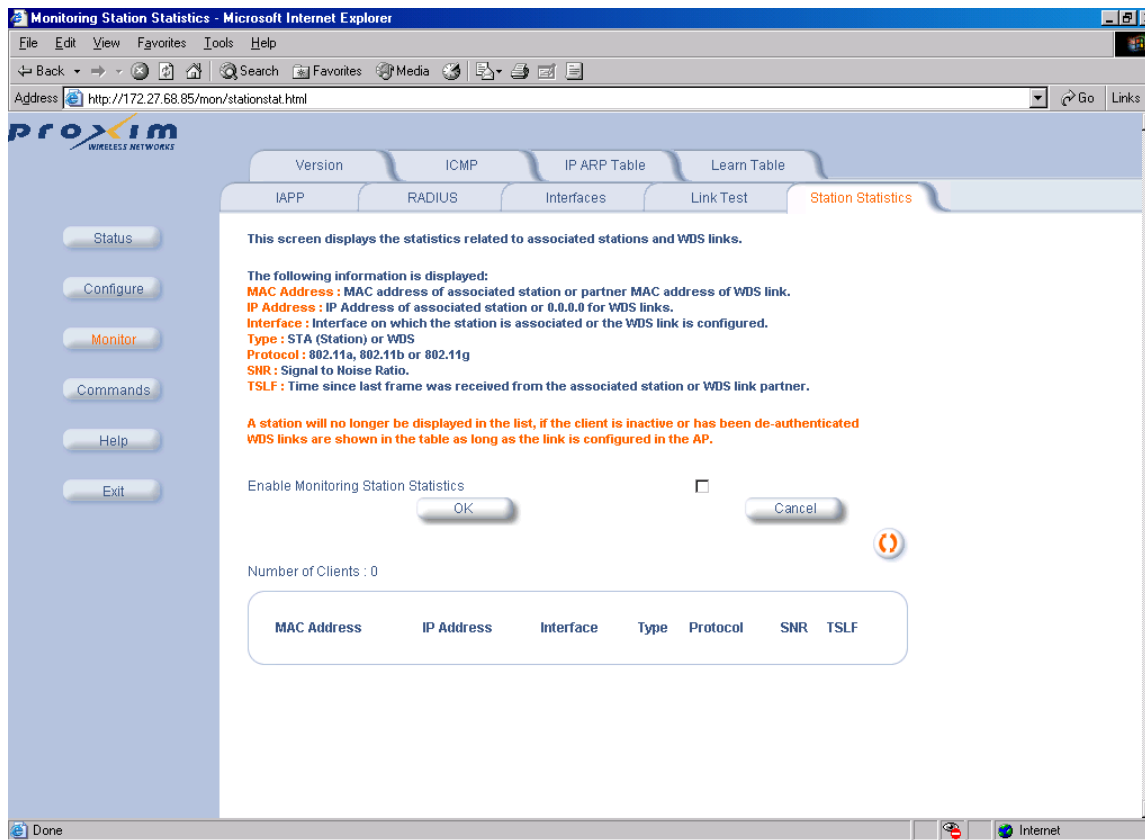


Figure 5-10 Station Statistics Screen

Description of Station Statistics

The following stations statistics are displayed:

- **MAC Address:** The MAC address of the wireless client for which the statistics are gathered. For WDS links, this is the partner MAC address of the link.
- **IP Address:** The IP address of the associated wireless station for which the Statistics are gathered. (0.0.0.0 for WDS links)

Monitoring the AP-2000

- **Interface to which the Station is connected:** The interface number on which the client is connected with the AP. For WDS links this is the interface on which the link is configured.
- **Station Type:** The type of wireless client (STA or WDS).
- **MAC Protocol:** The MAC protocol for this wireless client (or WDS link partner). The possible values are 802.11a, 802.11b, 802.11g
- **Signal / Noise:** The Signal /Noise Level measured at the AP when frames are received from the associated wireless station (or WDS link partner)
- **Time since Last Packet Received:** The time elapsed since the last frame from the associated wireless station (or WDS link partner) was received.
- **Number of Clients:** The number of stations and WDS links monitored.

The following stations statistics are not displayed in the Graphical User Interface, but can be viewed from a MIB browser:

- **Octets Received:** The number of octets received from the associated wireless station (or WDS link partner) by the AP.
- **Unicast Frames Received:** The number of Unicast frames received from the associated wireless station (or WDS link partner) by the AP.
- **Non-Unicast Frames Received:** The number of Non-Unicast frames received (i.e. broadcast or multicast) from the associated wireless station (or WDS link partner) by the AP.
- **Octets Transmitted:** The number of octets sent to the associated wireless station (or WDS link partner) from the AP.
- **Unicast Frames Transmitted:** The number of Unicast frames transmitted to the associated wireless station (or WDS link partner) from the AP.

Performing Commands

- [Logging into the HTTP Interface](#)
- [Introduction to File Transfer via TFTP or HTTP](#): Describes the available file transfer methods.
- [Update AP via TFTP](#): Download files from a TFTP server to the AP.
- [Update AP via HTTP](#): Download files to the AP from HTTP.
- [Retrieve File via TFTP](#): Upload configuration files from the AP to a TFTP server.
- [Retrieve File via HTTP](#): Upload configuration files from the AP via HTTP.
- [Reboot](#): Reboot the AP in the specified number of seconds.
- [Reset](#): Reset all of the Access Point's configuration settings to factory defaults.
- [Help Link](#): Configure the location where the AP Help files can be found.

Logging into the HTTP Interface

Once the AP has a valid IP Address and an Ethernet connection, you may use your web browser to issue commands. The Command Line Interface (CLI) also provides a method for issuing commands using Telnet or a serial connection. This section covers only use of the HTTP Interface. For more information about issuing commands with the CLI, refer to [Using the Command Line Interface \(CLI\)](#).

Follow these steps to view the available commands supported by the AP's HTTP interface:

1. Open a Web browser on a network computer.

NOTE

The HTTP interface supports the following Web browser:

- Microsoft Internet Explorer 6 with Service Pack 1 or later
 - Netscape 6.1 or later
2. If necessary, disable the Internet proxy settings. For Internet Explorer users, follow these steps:
 - Select **Tools > Internet Options...**
 - Click the **Connections** tab.
 - Click **LAN Settings...**
 - If necessary, remove the check mark from the **Use a proxy server** box.
 - Click **OK** twice to save your changes and return to Internet Explorer.
 3. Enter the Access Point's IP address in the browser's **Address** field and press **Enter**.
 - Result: The **Enter Network Password** screen appears.
 4. Enter the HTTP password in the **Password** field and click **OK**. Leave the **User Name** field blank. (By default, the HTTP password is "public").
 - Result: The **System Status** screen appears.

Performing Commands



Figure 6-1 Enter Network Password Screen

5. Click the **Commands** button located on the left-hand side of the screen.

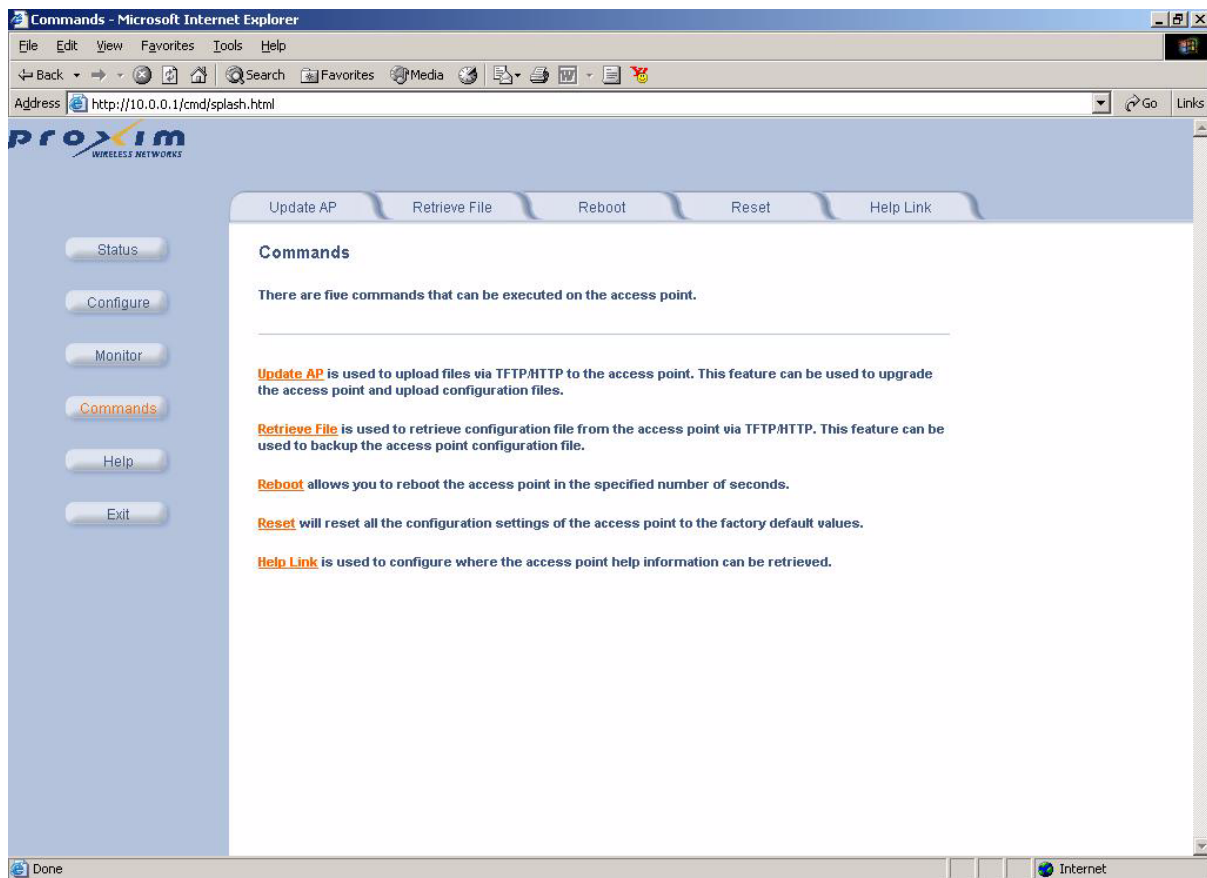


Figure 6-2 Commands Main Screen

6. Click the tab that corresponds to the command you want to issue. For example, click **Reboot** to restart the unit.

Performing Commands

Introduction to File Transfer via TFTP or HTTP

There are two methods of transferring files to or from the AP, TFTP or HTTP (or HTTPS if enabled).

The following procedures describe downloading Configuration, AP Image, Bootloader, Private Key, and Certificate files to the AP:

- [Update AP via TFTP](#)
- [Update AP via HTTP](#)

The following procedures describe uploading Configuration files from the AP:

- [Retrieve File via TFTP](#)
- [Retrieve File via HTTP](#)

TFTP File Transfer Guidelines

A TFTP server must be running and configured to point to the directory containing the file.

If you do not have a TFTP server installed on your system, install the TFTP server from the ORiNOCO CD.

HTTP File Transfer Guidelines

HTTP file transfer can be performed either with or without SSL enabled.

HTTP file transfers with SSL require enabling Secure Management and Secure Socket Layer. HTTP transfers that use SSL may take additional time.

NOTE

SSL requires Internet Explorer version 6, 128 bit encryption, Service Pack 1, and patch Q323308.

Image Error Checking during File Transfer

The Access Point performs checks to verify that an image downloaded through HTTP or TFTP is valid. The following checks are performed on the downloaded image:

- Zero Image size
- Large image size
- Non VxWorks image
- AP image
- Digital signature verification

If any of the above checks fail on the downloaded image, the Access Point deletes the downloaded image and retains the old image. Otherwise, if all checks pass successfully, the AP deletes the old image and retains the downloaded image.

These checks are to ensure that the AP does not enter an invalid image state. The storage of the two images is only temporary to ensure the proper verification; the two images will not be stored in the AP permanently.

Image error checking functions automatically in the background. No user configuration is required.

Performing Commands

Update AP via TFTP

Use the **Update AP via TFTP** tab to download Configuration, AP Image, Bootloader files, and Certificate and Private Key files to the AP. A TFTP server must be running and configured to point to the directory containing the file.

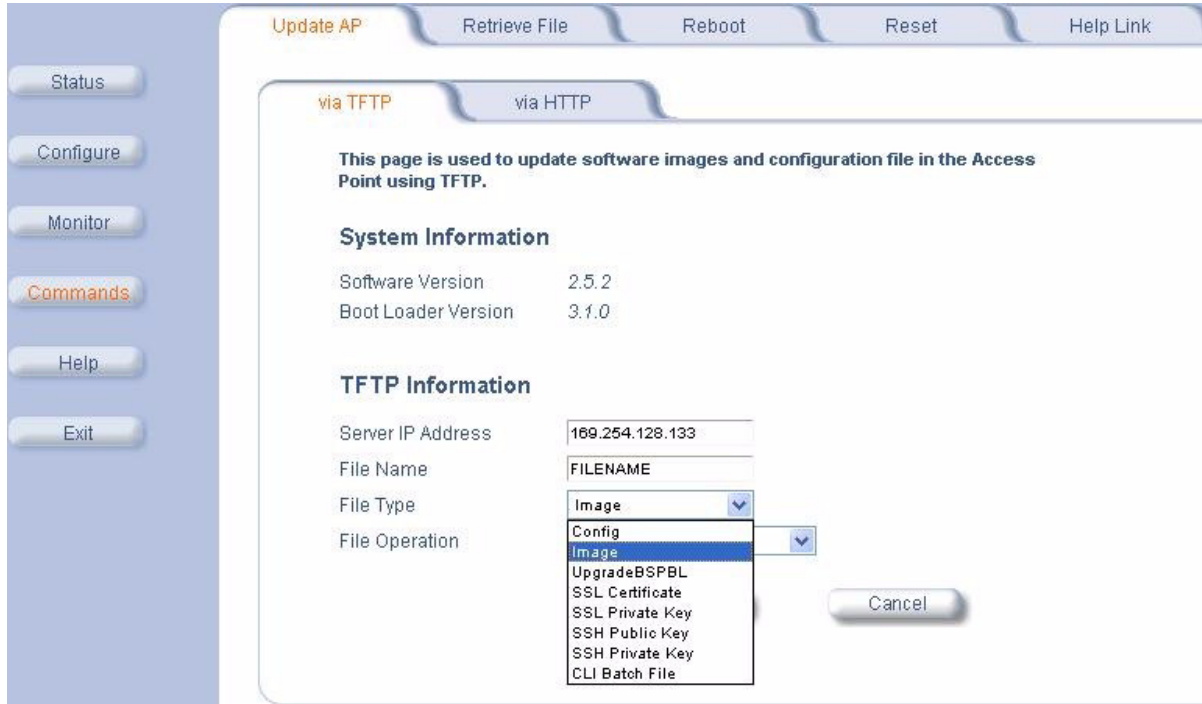


Figure 6-3 Update AP via TFTP Command Screen

If you do not have a TFTP server installed on your system, install the TFTP server from the ORiNOCO CD. You can either install the TFTP server from the CD Wizard or run **OEM-TFTP-Server.exe** found in the CD's *Xtras/SolarWinds* sub-directory.

The **Update AP via TFTP** tab shows version information and allows you to enter TFTP information as described below.

- **Server IP Address:** Enter the TFTP server IP Address.
 - Double-click the TFTP server icon on your desktop and locate the IP address assigned to the TFTP server. Note: This is the IP address that will be used to point the Access Point to the AP Image file.
- **File Name:** Enter the name of the file to be downloaded (including the file extension).
 - Copy the updated AP Image file to the TFTP server's root folder. The default AP Image is located at *C:/Program Files/ORiNOCO/AP/*.
- **File Type:** Select the proper file type. Choices include:
 - **Config** for configuration information, such as System Name, Contact Name, and so on.
 - **Image** for the AP Image (executable program).
 - **UpgradeBspBI** for the Bootloader software.
 - **SSL Certificate:** the digital certificate for authentication in SSL communications.
 - **SSL Private Key:** the private key for encryption in SSL communications.
 - **SSH Public Key:** the public key in SSH communications. Refer to Secure Shell (SSH) for more information.
 - **SSH Private Key:** the private key in SSH communications. Refer to Secure Shell (SSH) for more information.
 - **CLI Batch File:** a CLI Batch file that contains CLI commands to configure the AP. This file will be executed by the AP immediately after being uploaded. Refer to [CLI Batch File](#) for more information.
- **File Operation:** Select either **Update AP** or **Update AP & Reboot**. You should reboot the AP after downloading files.

Performing Commands

Update AP via HTTP

Use the **Update AP via HTTP** tab to download Configuration, AP Image, Bootloader files, and Certificate and Private Key files to the AP.

Once on the Update AP screen, click on the **via HTTP** tab.

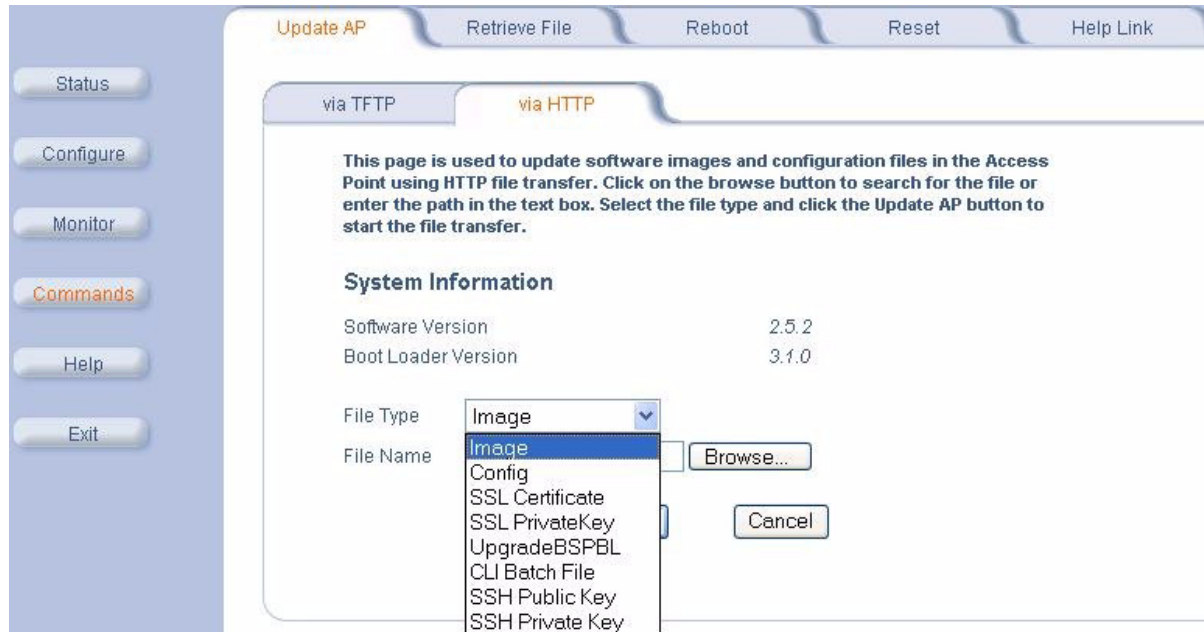


Figure 6-4 Update AP via HTTP Command Screen

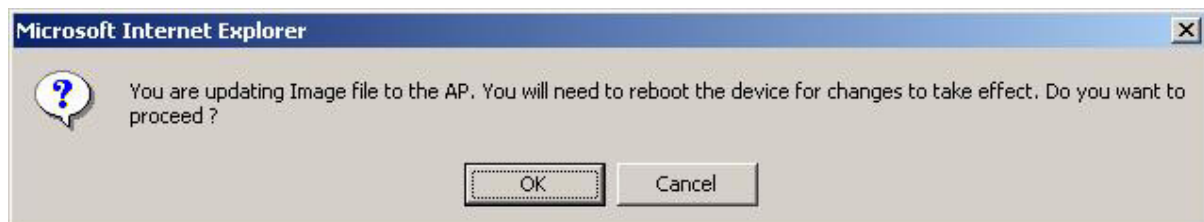
The **Update AP via HTTP** tab shows version information and allows you to enter HTTP information as described below.

- Select the File Type that needs to be updated from the drop-down box. Choices include:
 - **Config** for configuration information, such as System Name, Contact Name, and so on.
 - **Image** for the AP Image (executable program).
 - **Upgrade BSPBL**: for the Bootloader software.
 - **SSL Certificate**: the digital certificate for authentication in SSL communications.
 - **SSL Private Key**: the private key for encryption in SSL communications.
 - **SSH Public Key**: the public key in SSH communications. Refer to Secure Shell (SSH) for more information.
 - **SSH Private Key**: the private key in SSH communications. Refer to Secure Shell (SSH) for more information.
 - **CLI Batch File**: a CLI Batch file that contains CLI commands to configure the AP. This file will be executed by the AP immediately after being uploaded. Refer to [CLI Batch File](#) for more information.

Use the **Browse** button or manually type in the name of the file to be downloaded (including the file extension) in the File Name field. If typing the file name, you must include the full path and the file extension in the file name text box.

To initiate the HTTP Update operation, click the **Update AP** button.

A warning message gets displayed that advises the user that a reboot of the device will be required for changes to take effect.



Performing Commands

Figure 6-5 Warning Message

Click **OK** to continue with the operation or **Cancel** to abort the operation.



NOTE

An HTTP file transfer using SSL may take extra time.

If the operation completes successfully the following screen appears.

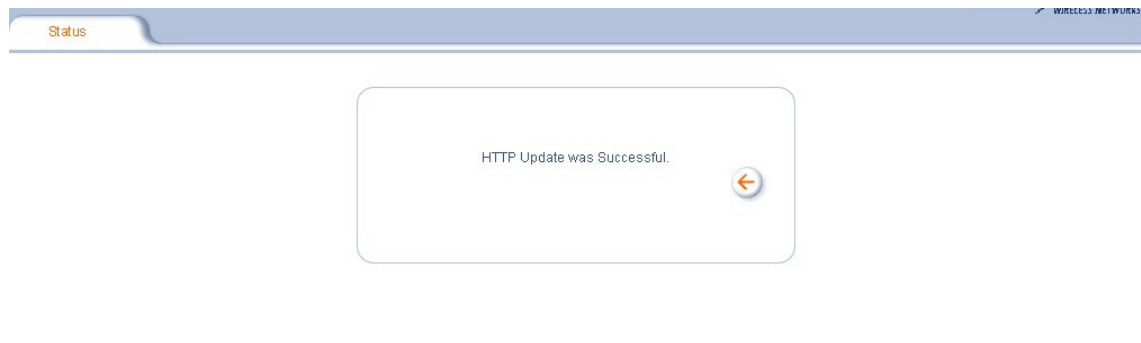


Figure 6-6 Update AP Successful

If the operation did not complete successfully the following screen appears, and the reason for the failure is displayed.

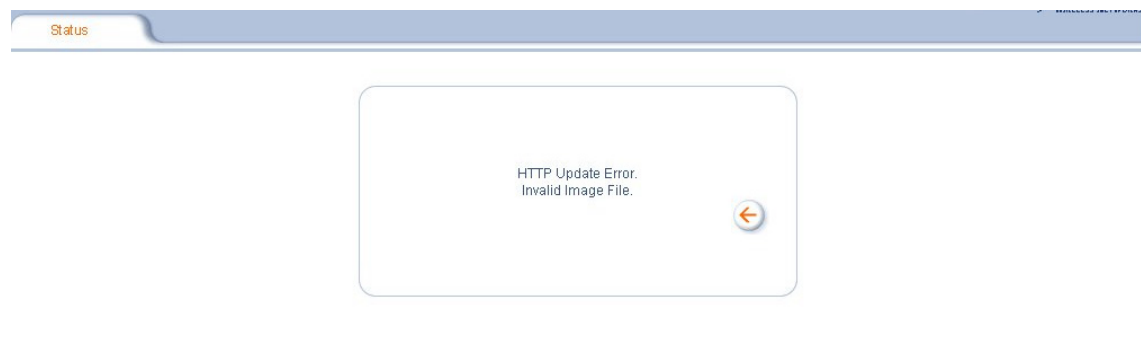


Figure 6-7 Update AP Unsuccessful

Performing Commands

Retrieve File via TFTP

Use the **Retrieve File via TFTP** tab to upload files from the AP to the TFTP server. The TFTP server must be running and configured to point to the directory to which you want to copy the uploaded file. We suggest you assign the file a meaningful name, which may include version or location information.

If you don't have a TFTP server installed on your system, install the TFTP server from the ORiNOCO CD. You can either install the TFTP server from the CD Wizard or run **OEM-TFTP-Server.exe** found in the CD's *Xtras/SolarWinds* sub-directory.

The **Retrieve AP via TFTP** tab shows version information and allows you to enter TFTP information as described below.

- **Server IP Address:** Enter the TFTP server IP Address.
 - Double-click the TFTP server icon on your desktop and locate the IP address assigned to the TFTP server.
- **File Name:** Enter the name of the file to be uploaded.
- **File Type:** Select the type of file to be uploaded: Config file, CLI Batch File, or CLI Batch (Error) Log.

➤ NOTE

Use the following procedure to retrieve a file from an AP to a TFTP server:

1. If retrieving a Configuration file, configure all the required parameters in their respective tabs. Reboot the device.
2. Retrieve and store the file. Click the **Retrieve File** button to initiate the upload of the file from the AP to the TFTP server.
3. If you retrieved a Configuration file, update the file as necessary.
4. If you retrieved a CLI Batch File or CLI Batch Log, you can examine the file using a standard text editor. For more information on CLI Batch Files, refer to [CLI Batch File](#).

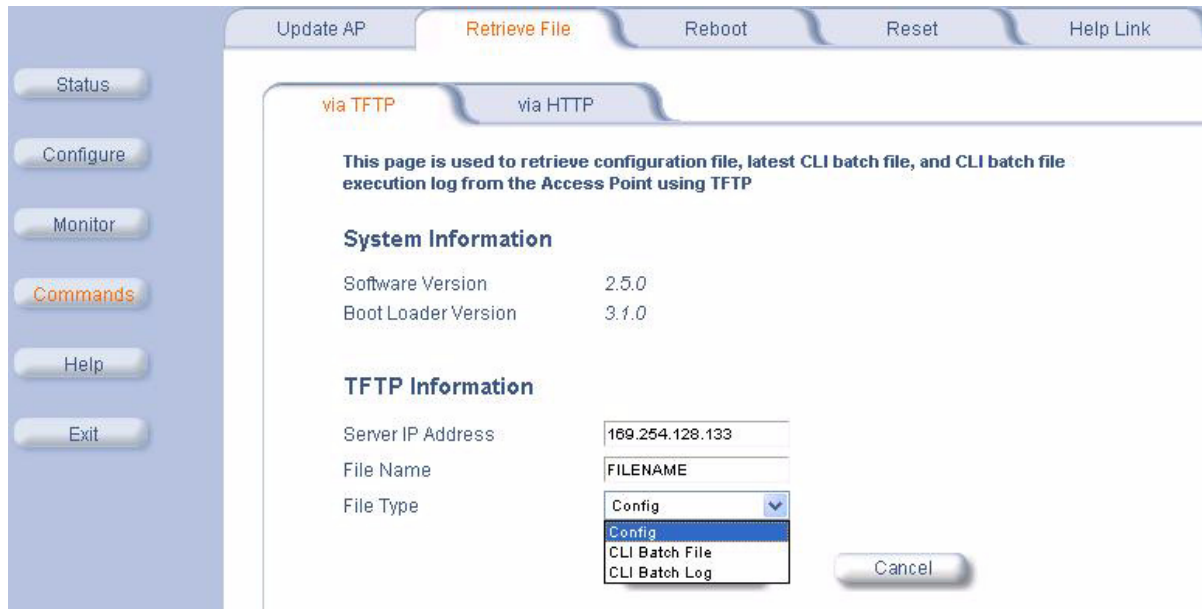


Figure 6-8 Retrieve File via TFTP Command Screen

Performing Commands

Retrieve File via HTTP

Use the **Retrieve File via HTTP** tab to retrieve configuration files, CLI Batch Files, or CLI Batch Logs from the AP. Select the type of file (Config, CLI Batch File, or CLI Batch Log) from the **File Type** drop-down menu.

For more information on CLI Batch Files and CLI Batch Logs refer to [CLI Batch File](#).

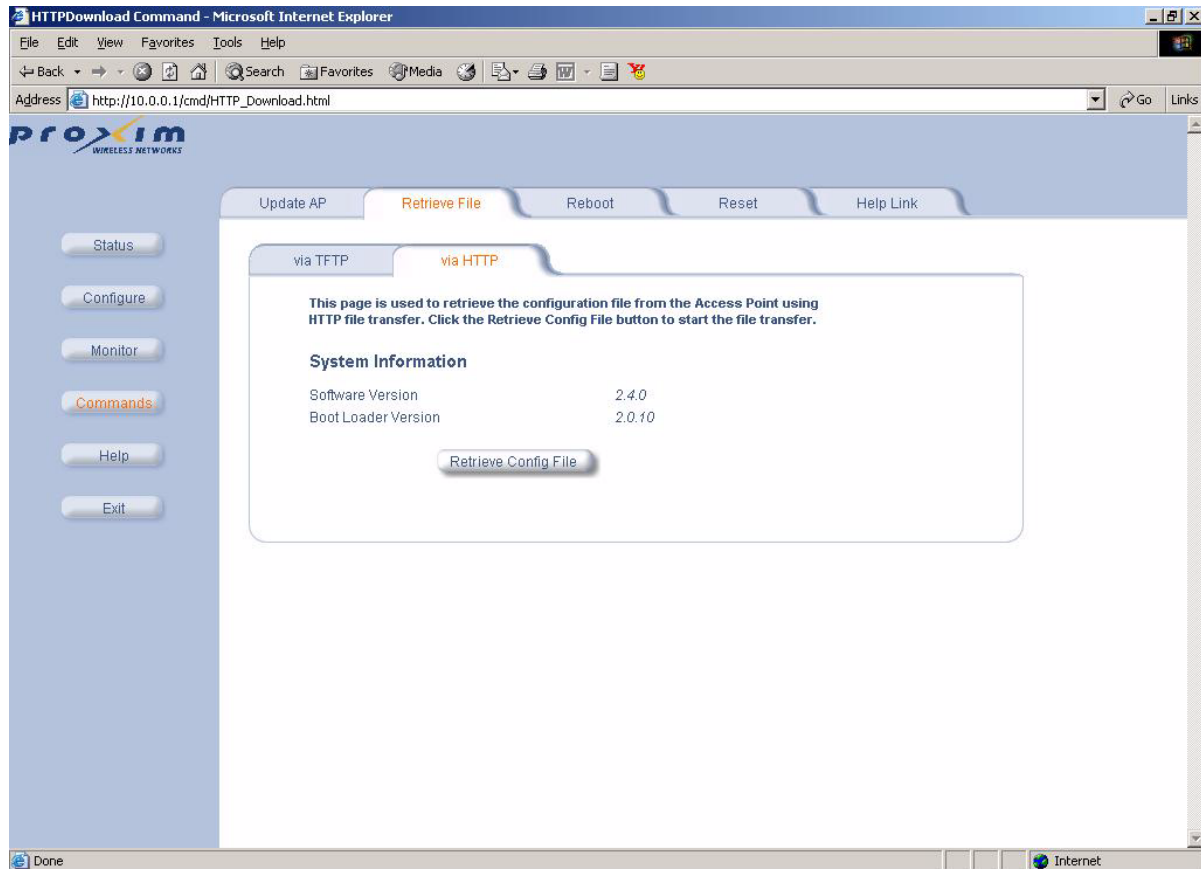


Figure 6-9 Retrieve File via HTTP Command Screen

A confirmation message gets displayed that asks if the user wants to proceed with retrieving the file. Click **OK** to continue with the operation or **Cancel** to abort the operation.

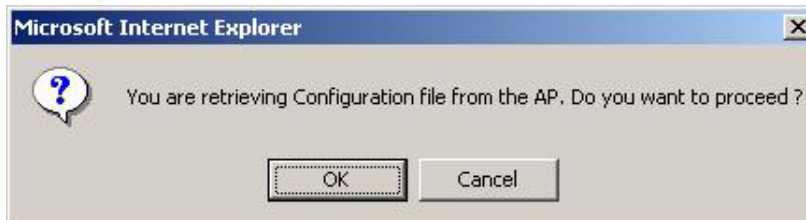


Figure 6-10 Retrieve File Confirmation Dialog

Performing Commands

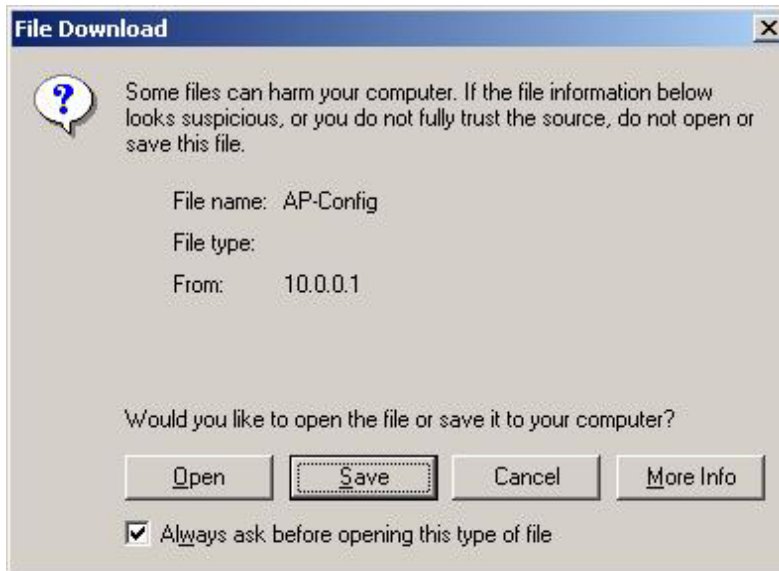


Figure 6-11 File Download Dialog Box

On clicking the **Save** button the following Save As window displays, where the user is prompted to choose the filename and location where the file is to be downloaded. Select an appropriate filename and location and click **OK**.

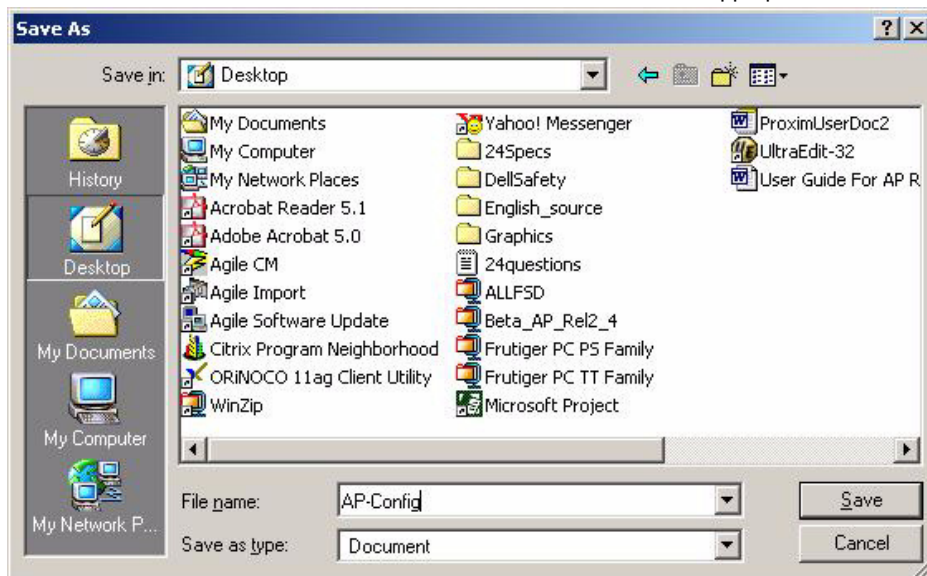


Figure 6-12 Retrieve File Save As Dialog

Performing Commands

Reboot

Use the **Reboot** tab to save configuration changes (if any) and reset the AP. Entering a value of 0 (zero) seconds causes an immediate reboot. Note that **Reset**, described below, does not save configuration changes.



CAUTION

Rebooting the AP will cause all users who are currently connected to lose their connection to the network until the AP has completed the restart process and resumed operation.

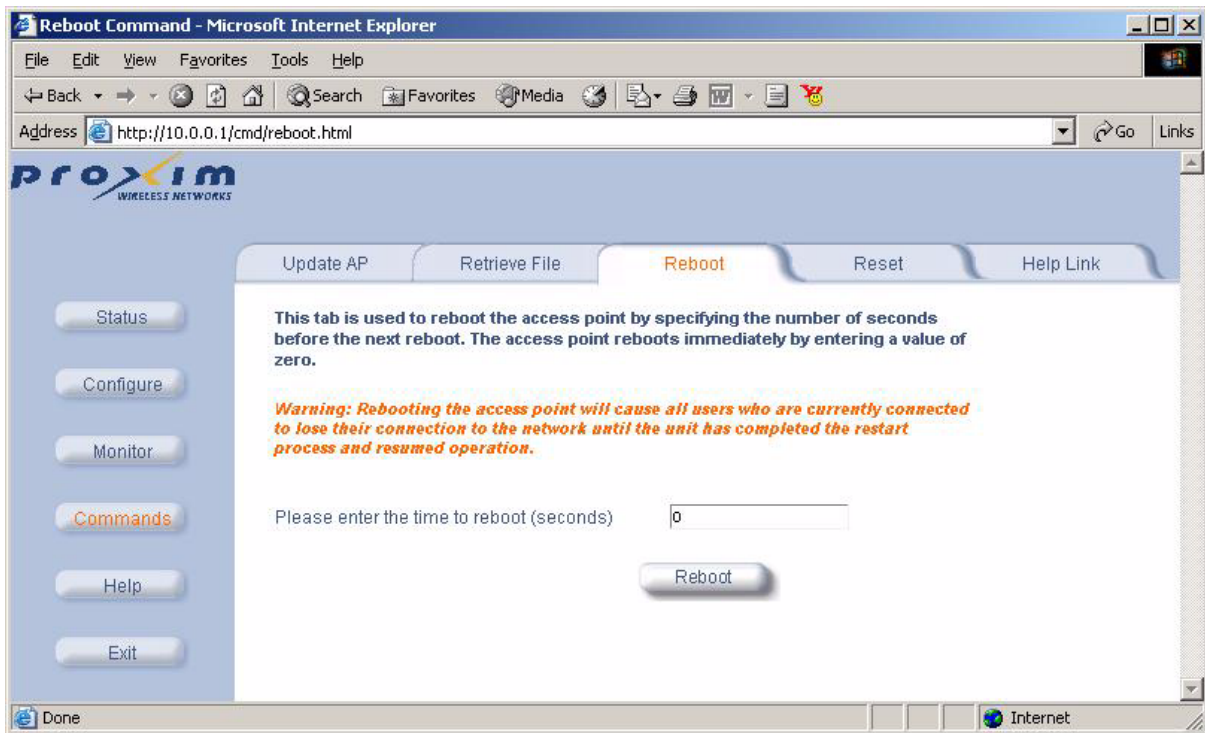


Figure 6-13 Reboot Command Screen

Performing Commands

Reset

Use the **Reset** tab to restore the AP to factory default conditions. The AP may also be reset from the **RESET** button located on the side of the unit. Since this will reset the Access Point's current IP address, a new IP address must be assigned. Refer to [Recovery Procedures](#) for more information.



CAUTION

Resetting the AP to its factory default configuration will permanently overwrite all changes that have made to the unit. The AP will reboot automatically after this command has been issued.

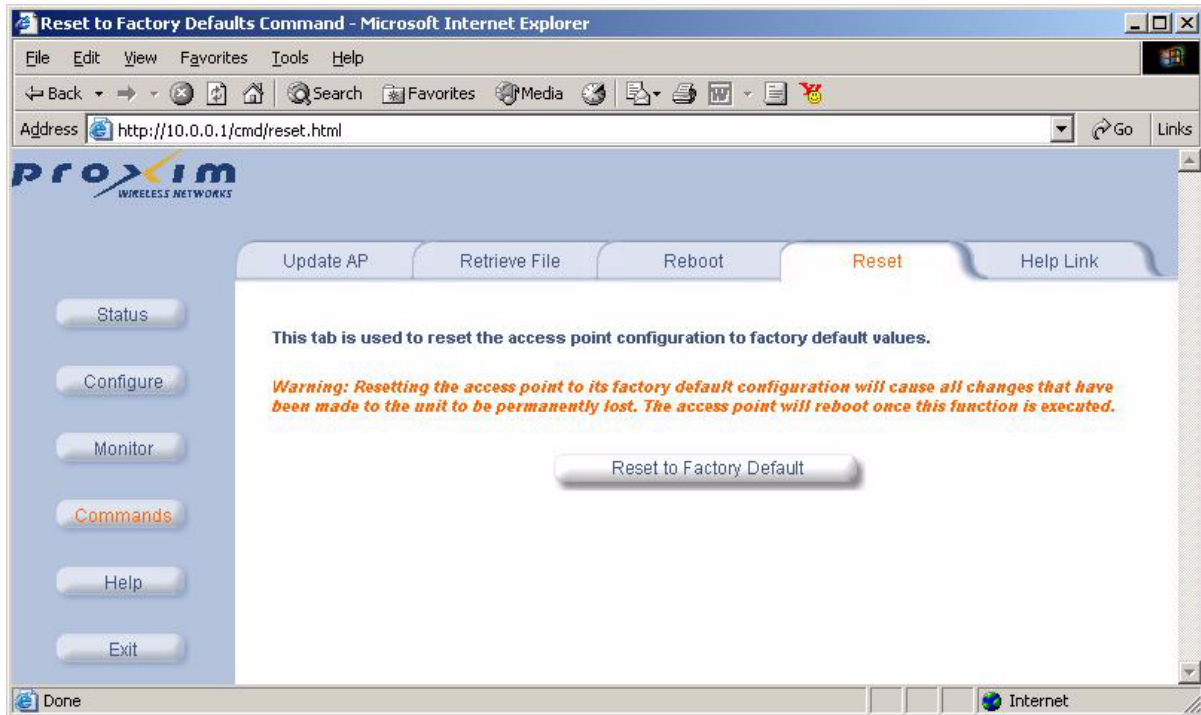


Figure 6-14 Reset to Factory Defaults Command Screen

Performing Commands

Help Link

To open **Help**, click the **Help** button on any display screen.

During initialization, the AP on-line help files are downloaded to the default location:

C:\Program Files\ORiNOCO\AP\HTML\index.htm.

⇒ NOTE

Use the forward slash character ("/") rather than the backslash character ("\") when configuring the **Help Link** location.

⇒ NOTE

Add the AP's management IP address into the Internet Explorer list of Trusted Sites.

The ORiNOCO AP Help information is available in English, French, German, Italian, Spanish, and Japanese. The Help files are copied to your computer in one language only.

If you want to place these files on a shared drive, copy the Help Folder to the new location, and then specify the new path in the **Help Link** box.

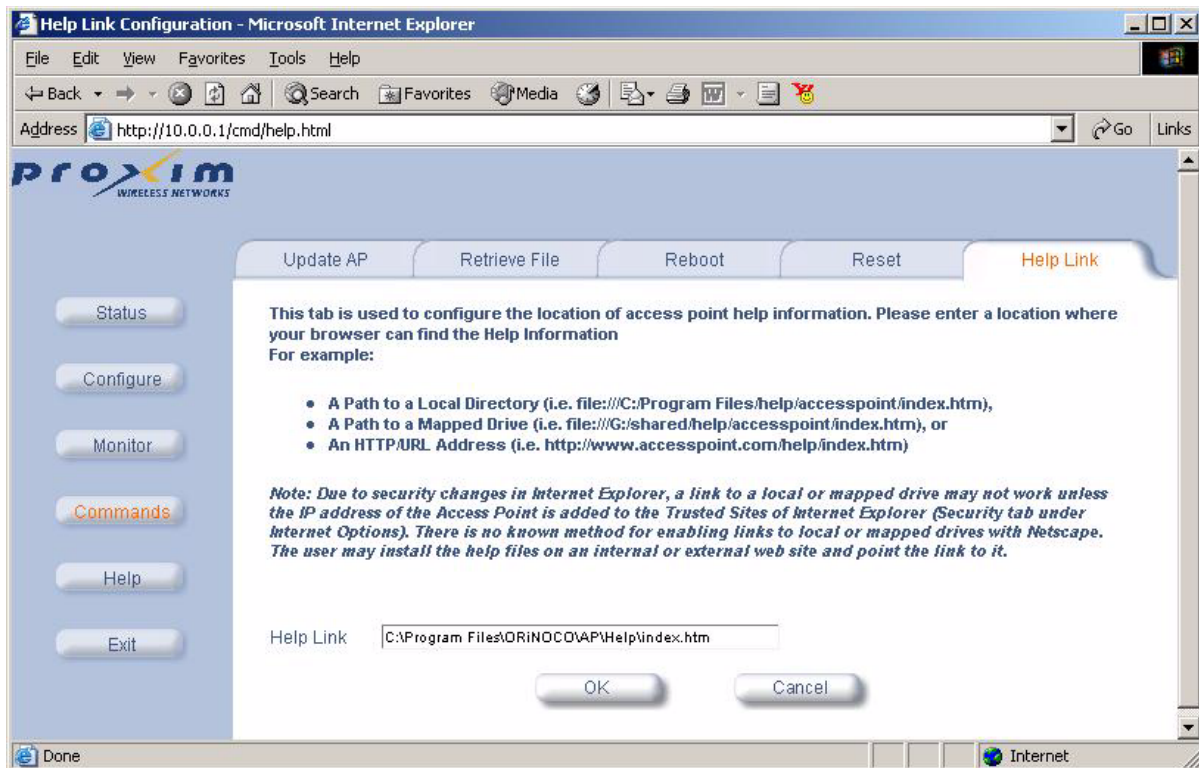


Figure 6-15 Help Link Configuration Screen

Troubleshooting the AP-2000

- [Troubleshooting Concepts](#)
- [Symptoms and Solutions](#)
- [Recovery Procedures](#)
- [Related Applications](#)

⇒ NOTE

This section helps you locate problems related to the AP device setup. For details about RADIUS, TFTP, serial communication programs (such as HyperTerminal), Telnet applications, or web browsers, please refer to the documentation that came with the application for assistance.

Troubleshooting Concepts

The following list identifies important troubleshooting concepts and topics. The most common initialization and installation problems relate to IP addressing. For example, you must have valid IP addresses for both the AP and the management computer to access the unit's HTTP interface.

- **IP Address management is fundamental.**
- **Factory default units are set for “Dynamic” (DHCP) IP Address assignment.** The default IP address for the AP is 10.0.0.1 if your network does not have a DHCP server. If you connect the AP to a network with an active DHCP server, then use ScanTool to locate the IP address of your unit. If a DHCP server is not active on your subnet, then use ScanTool to assign a static IP address to the unit.
- **The Trivial File Transfer Protocol (TFTP) provides a means to download and upload files.** These files include the AP Image (executable program) and configuration files.
- **If the AP password is lost or forgotten, you will need to reset to default values.** The [Reset to Factory Default Procedure](#) resets configuration, but does not change the current AP Image.
- **If all else fails...** Use the [Forced Reload Procedure](#) to erase the current AP Image and then download a new image. Once the new image is loaded, use the [Reset to Factory Default Procedure](#) to set the unit to factory default values and reconfigure the unit.
- **The AP Supports a Command Line Interface (CLI).** If you are having trouble locating your AP on the network, connect to the unit directly using the serial interface and refer to [Using the Command Line Interface \(CLI\)](#) for CLI command syntax and parameter names.

Troubleshooting the AP-2000

Symptoms and Solutions

Connectivity Issues

Connectivity issues include any problem that prevents you from powering up or connecting to the AP.

AP Unit Will Not Boot - No LED Activity

1. Make sure your power source is operating.
2. Make sure all cables are connected to the AP correctly.
3. If you are using Active Ethernet, make sure you are using a Category 5, foiled, twisted pair cable to power the AP.

Serial Link Does Not Work

1. Make sure you are using a standard, straight-through, 9-pin serial cable.
2. Double-check the physical network connections.
3. Make sure your PC terminal program (such as HyperTerminal) is active and configured to the following values:
 - Com Port: (COM1, COM2, etc. depending on your computer);
 - Baud rate: 9600; Data bits: 8; Stop bits: 1; Flow Control: None; Parity: None;
 - Line Feeds with Carriage Returns
(In HyperTerminal select:
File -> Properties -> Settings -> ASCII Setup -> Send Line Ends with Line Feeds)

Ethernet Link Does Not Work

1. Double-check the physical network connections. Use a known-good unit to make sure the network connection is present. Once you have the AP IP address, you can use the “Ping” command over Ethernet to test the IP Address. If the AP responds to the Ping, then the Ethernet Interface is working properly.
2. By default, the Access Point will attempt to automatically detect the Ethernet settings. However, if you are having problems with the Ethernet link, manually configure the Access Point's Ethernet settings. For example, if your switch operates at 100 Mbits/sec/Full Duplex, manually configure the Access Point to use these settings (see [Ethernet](#)). If you cannot access the unit over Ethernet, then use the CLI interface over the serial port to configure the Ethernet port (see [Using the Command Line Interface \(CLI\)](#) and [Set Ethernet Speed and Transmission Mode](#)).
3. Perform network infrastructure troubleshooting (check switches, routers, etc.).

Basic Software Setup and Configuration Problems

Lost AP, Telnet, or SNMP Password

1. Perform the [Reset to Factory Default Procedure](#) in this guide. This procedure resets system and network parameters, but does not affect the AP Image.
The default AP HTTP password is “public”, and the default Telnet password is also “public”.

Client Computer Cannot Connect

1. Client computers should have the same Network Name and security settings as the AP.
2. Network Names should be allocated and maintained by the Network Administrator.
3. Refer to the documentation that came with your client card for additional troubleshooting suggestions.

AP Has Incorrect IP Address

1. Default IP Address Assignment mode is dynamic (DHCP). If you do not have a DHCP server on your network, the default IP Address is 10.0.0.1. If you have more than one uninitialized AP connected to the network, they will all have the same default IP address and you will not be able to communicate with them (due to an IP address conflict). In this case, assign each AP a static IP address via the serial cable or turn off all units but one and change the IP address using ScanTool one at a time.

Troubleshooting the AP-2000

2. The AP only contacts a DHCP server during boot-up. If your network's DHCP server is not available while the AP is booting, the device will retain the last IP Address it had. Reboot the AP once your DHCP server is on-line again or use the ScanTool to find the Access Point's current IP address.
3. To find the unit's current IP address if using DHCP, open the IP Client Table in the DHCP Server and match the Access Point's IP address to its MAC address (found on the product label). Alternatively, use ScanTool to identify an Access Point's current IP address.
4. Once you have the current IP address, use the HTTP or CLI Interface to change the unit's IP settings, if necessary.
5. If you use static IP Address assignments, and cannot access the unit over Ethernet, use the [Initializing the IP Address using CLI](#) procedure. Once the IP Address is set, you can use the Ethernet Interface to complete configuration.
6. Perform the [Reset to Factory Default Procedure](#) in this guide. This will reset the unit to "DHCP" mode. If there is a DHCP Server on the network, the DHCP Server will assign an IP Address to the AP.

HTTP (browser) or Telnet Interface Does Not Work

1. Make sure you are using a compatible browser:
 - Microsoft Internet Explorer 6 with Service Pack 1 or later
 - Netscape 6.1 or later
2. Make sure you have the proper IP address. Enter your Access Point's IP Address in the browser address bar, similar to this example:
http://192.168.1.100
When the **Enter Network Password** window appears, leave the **User Name** field empty and enter the HTTP password in the **Password** field. The default HTTP password is "public".
3. Use the CLI over the serial port to check the IP Access Table, which can be restricting access to Telnet and HTTP.

HTML Help Files Do Not Appear

1. Verify that the HTML Help files are installed in the default directory:
C:\Program Files\ORINOCO\AP\HTML
2. If the Help files are not located in this folder, contact your network administrator to find out where the Help files are located on your server.
3. Perform the following steps to verify the location or to enter the pathname for the Help files:
 - a. Click the **Commands** button in the HTTP interface.
 - b. Select the **Help** tab located at the top of the screen.
 - c. Enter the pathname where the Help files are located in the **Help Link** box.
 - d. Click **OK** when finished.

Telnet CLI Does Not Work

1. Make sure you have the proper IP Address. Enter your **AP** IP address in the Telnet connection dialog, from a DOS prompt, type:
C:\> telnet <AP IP Address>
2. Confirm that your computer has an IP address in the same IP subnet as your Access Point.
3. Use the CLI over the serial port to check the IP Access Table, which can be restricting access to Telnet and HTTP.

TFTP Server Does Not Work

1. Make sure the TFTP Server has been started.
2. Verify the IP address of the TFTP Server. The server may be local or remote, so long as it has a valid IP address.
3. Configure the TFTP Server to "point" to the folder containing the file to be downloaded (or to the folder in which the file is to be uploaded).
4. Verify that you have entered the proper AP Image file name (including the file extension) and directory path.
5. If you have a problem uploading a file, verify that the TFTP server is configured to allow uploads (typically the default setting is to allow only downloads).

Troubleshooting the AP-2000

Client Connection Problems

Client Software Finds No Connection

Make sure you have configured your client software with the proper Network Name and Security settings. Network Names and WEP Keys are typically allocated and maintained by your network administrator.

Client PC Card Does Not Work

1. Make sure you are using the latest PC Card driver software.
2. Download and install the latest ORINOCO client software from <http://www.proxim.com>.

Intermittent Loss of Connection

1. Make sure you are within range of an active AP.
2. You can check the signal strength using the signal strength gauge on your client software.

Client Does Not Receive an IP Address - Cannot Connect to Internet

1. If the AP is configured as a DHCP server, open the Web-browser Interface and select the **Configure** button and then the **Network** tab to make sure the proper DHCP settings are being used.
2. If you are not using the DHCP server feature on the AP, then make sure that your local DHCP server is accessible from the Access Point's subnet.
3. From the client computer, use the "ping" network command to test the connection with the AP. If the AP responds, but you still cannot connect to the Internet, there may be a physical network configuration problem (contact your network support staff).
4. If using Active Ethernet, make sure you are not using a crossover Ethernet cable between the AP and the hub.

VLAN Operation Issues

Verifying Proper Operation of the VLAN Feature

The correct VLAN configuration can be verified by "pinging" both wired and wireless hosts from both sides of the AP device and the network switch. Traffic can be "sniffed" on both the wired (Ethernet) and wireless (WDS) backbones (if configured). Bridge frames generated by wireless clients and viewed on one of the backbones should contain IEEE 802.1Q compliant VLAN headers or tags. The VLAN ID in the headers should correspond to one of the VLAN User IDs configured for the AP.

NOTE

16 VLAN/SSID pairs are available for 802.11b/g APs and APs with an 11a Upgrade Kit. 802.11b APs and APs with a 5 GHz Upgrade Kit only support one VLAN/SSID pair.

VLAN Workgroups

The correct VLAN assignment can be verified by pinging the AP to ensure connectivity, by pinging the switch to ensure VLAN properties, and by pinging hosts past the switch to confirm the switch is functional. Ultimately, traffic can be "sniffed" on the Ethernet or WDS interfaces (if configured) using third-party packages. Most problems can be avoided by ensuring that 802.1Q compliant VLAN tags containing the proper VLAN ID have been inserted in the bridged frames. The VLAN ID in the header should correspond to the user's assigned network name.

What if network traffic is being directed to a nonexistent host?

- All sessions are disconnected, traffic is lost, and a manual override is necessary
- Workaround: you can configure the switch to mimic the nonexistent host

Troubleshooting the AP-2000

I have just configured the Management ID and now I can't manage the AP?

- Check to ensure your password is correct. If your password is incorrect or all inbound packets do NOT have the correct tag, then a manual override is necessary.



CAUTION

The manual override process disconnects all users and resets all values to factory defaults.

Active Ethernet (AE)

The AP Does Not Work

1. Verify that you are using a standard UTP Category 5 cable.
2. Try a different port on the same AE hub (remember to move the input port accordingly) – if it works, there is probably a faulty port or bad RJ-45 port connection.
3. If possible, try to connect the AP to a different AE hub.
4. Try using a different Ethernet cable – if it works, there is probably a faulty connection over the long cable, or a bad RJ-45 connection.
5. Check power plug and hub.
6. If the Ethernet link goes down, check the cable, cable type, switch, and hub.

There Is No Data Link

1. Verify that the indicator for the port is “on.”
2. Verify that the AE hub is connected to the Ethernet network with a good connection.
3. Verify that the Ethernet cable is Category 5 or better and is less than 100 meters (approximately 325 feet) in length from the Ethernet source to the AP.
4. Try to connect a different device to the same port on the AE hub – if it works and a link is established, there is probably a faulty data link in the AP.
5. Try to re-connect the AP to a different output port (remember to move the input port accordingly) – if it works, there is probably a faulty output or input port in the AE hub or a bad RJ-45 connection.

“Overload” Indications

1. Verify that you are not using a cross-over cable between the AE output port and the AP.
2. Verify that there is no short over any of the twisted pair cables.
3. Move the device into a different output port – if it works, there is probably a faulty port or bad RJ-45 connection.

Recovery Procedures

The most common installation problems relate to IP addressing. For example, without the TFTP server IP Address, you will not be able to download a new AP Image to the AP. IP Address management is fundamental. We suggest you create a chart to document and validate the IP addresses for your system.

If the password is lost or forgotten, you will need to reset the AP to default values. The [Reset to Factory Default Procedure](#) resets configuration settings, but does not change the current AP Image.

If the AP has a corrupted software image, follow the [Forced Reload Procedure](#) to erase the current AP Image and download a new image.

Troubleshooting the AP-2000

Reset to Factory Default Procedure

Use this procedure to reset the network configuration values, including the Access Point's IP address and subnet mask. The current AP Image is not deleted. Follow this procedure if you forget the Access Point's password:

1. Press and hold the **RELOAD** button for 10 seconds.

⇒ NOTE

See [RELOAD and RESET Buttons](#) to identify the buttons. You need to use a pin or the end of a paperclip to press a button.

Result: The AP reboots, and the factory default network values are restored.

2. If not using DHCP, use the ScanTool or CLI over a serial connection to set the IP address, subnet mask, and other IP parameters. See [Using the Command Line Interface \(CLI\)](#) for CLI information.

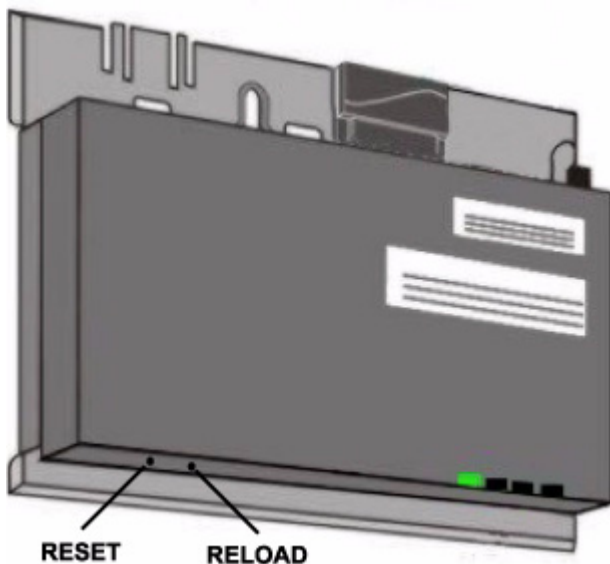


Figure 7-1 RELOAD and RESET Buttons

Forced Reload Procedure

Use this procedure to erase the current AP Image and download a new AP Image. In some cases, specifically when a missing or corrupted AP Image prevents successful booting, you may need to use ScanTool or the Bootloader CLI to download a new executable AP Image.

⇒ NOTE

This does not delete the AP's configuration (in other words, the Forced Reload Procedure does not reset to device to factory defaults). If you need to force the AP to the factory default state after loading a new AP image, use the [Reset to Factory Default Procedure](#) above.

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For this procedure, you will first erase the AP Image currently installed on the unit and then use either ScanTool or the Bootloader CLI (over the serial port) to set the IP address and download a new AP Image. Follow these steps:

1. While the unit is running, press the **RESET** button.

NOTE

See [RELOAD and RESET Buttons](#) to identify the buttons. You need to use a pin or the end of a paperclip to press a button.

Result: The AP reboots and the indicators begin to flash.

CAUTION

By completing Step 2, the firmware in the AP will be erased. You will need an Ethernet connection, a TFTP server, and a serial cable (if using the Bootloader CLI) to reload firmware.

2. Press and hold the **RELOAD** button for about 20 seconds until the **POWER LED** turns amber.
Result: The AP deletes the current AP Image.
3. Follow one of the procedures below to load a new AP Image to the Access Point:
 - [Download a New Image Using ScanTool](#)
 - [Download a New Image Using the Bootloader CLI](#)

Download a New Image Using ScanTool

To download the AP Image, you will need an Ethernet connection to the computer on which the TFTP server resides and to a computer that is running ScanTool (this is either two separate computers connected to the same network or a single computer running both programs).

ScanTool detects if an Access Point does not have a valid software image installed. In this case, the **TFTP Server** and **Image File Name** parameters are enabled in the ScanTool's **Change** screen so you can download a new image to the unit. (These fields are grayed out if ScanTool does not detect a software image problem.)

Preparing to Download the AP Image

Before starting, you need to know the Access Point's IP address, subnet mask, the TFTP Server IP Address, and the AP Image file name. Make sure the TFTP server is running and configured to point to the folder containing the image to be downloaded.

Download Procedure

Follow these steps to use ScanTool to download a software image to an Access Point with a missing image:

1. Download the latest software from <http://www.proxim.com>.
2. Copy the latest software updates to your TFTP server.
3. Launch ScanTool.
4. Highlight the entry for the AP you want to update and click **Change**.
5. Set **IP Address Type** to **Static**.

NOTE

You need to assign static IP information temporarily to the Access Point since its DHCP client functionality is not available when no image is installed on the device.

6. Enter an unused IP address that is valid on your network in the **IP Address** field. You may need to contact your network administrator to get this address.
7. Enter the network's **Subnet Mask** in the field provided.
8. Enter the network's **Gateway IP Address**, if necessary. You may need to contact your network administrator to get this address. You should only need to enter the default gateway address if the Access Point and the TFTP server are separated by a router.
9. Enter the IP address of your TFTP server in the field provided.
10. Enter the **Image File Name** (including the file extension). Enter the full directory path and file name. If the file is located in the default TFTP directory, you need enter only the file name.

Troubleshooting the AP-2000

11. Click **OK**.
 - Result: The Access Point will reboot and the download will begin automatically. You should see downloading activity begin after a few seconds within the TFTP server's status screen.
12. Click **OK** when prompted that the device has been updated successfully to return to the **Scan List** screen.
13. Click **Cancel** to close the ScanTool.
14. When the download process is complete, configure the AP as described in [Getting Started](#) and [Performing Advanced Configuration](#).

Download a New Image Using the Bootloader CLI

To download the AP Image, you will need an Ethernet connection to the computer on which the TFTP server resides. This can be any computer on the LAN or connected to the AP with a cross-over Ethernet cable.

You must also connect the AP to a computer with a standard serial cable and use a terminal client, such as HyperTerminal. From the terminal, enter CLI Commands to set the IP address and download an AP Image.

Preparing to Download the AP Image

Before starting, you need to know the Access Point's IP address, subnet mask, the TFTP Server IP Address, and the AP Image file name. Make sure the TFTP server is running and configured to point to the folder containing the image to be downloaded.

Download Procedure

1. Download the latest software from <http://www.proxim.com>.
2. Copy the latest software updates to your TFTP server's default directory.
3. Use a straight-through serial cable to connect the Access Point's serial port to your computer's serial port.

NOTE

You must remove the Access Point's cable cover and front cover to access the serial port.

4. Open your terminal emulation program (like HyperTerminal) and set the following connection properties:
 - Com Port: <COM1, COM2, etc., depending on your computer>
 - Baud rate: 9600
 - Data Bits: 8
 - Stop bits: 1
 - Flow Control: None
 - Parity: None
5. Under **File -> Properties -> Settings -> ASCII Setup**, enable the **Send line ends with line feeds** option.
Result: HyperTerminal sends a line return at the end of each line of code.
6. Press the **RESET** button on the AP.
Result: The terminal display shows Power On Self Tests (POST) activity. After approximately 30 seconds, a message indicates: **Sending Traps to SNMP manager periodically**. After this message appears, press the **ENTER** key repeatedly until the following prompt appears:

```
[Device name]>
```


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7. Enter only the following statements:

```
[Device name]> set ipaddrtype static
[Device name]> set ipaddr <Access Point IP Address>
[Device name]> set ipsubmask <IP Mask>
[Device name]> set tftpipaddr <TFTP Server IP Address>
[Device name]> set tftpfilename <AP Image File Name, including file extension>
[Device name]> set ipgw <Gateway IP Address>
[Device name]> show ip (to confirm your new settings)
[Device name]> show tftp (to confirm your new settings)
[Device name]> reboot 0
```

Example:

```
[Device name]> set ipaddrtype static
[Device name]> set ipaddr 10.0.0.12
[Device name]> set ipsubmask 255.255.255.0
[Device name]> set tftpipaddr 10.0.0.20
[Device name]> set tftpfilename MyImage.bin
[Device name]> set ipgw 10.0.0.30
[Device name]> show ip
[Device name]> show tftp
[Device name]> reboot 0
```

Result: The AP will reboot and then download the image file. You should see downloading activity begin after a few seconds within the TFTP server's status screen.

8. When the download process is complete, configure the AP as described in [Getting Started](#) and [Performing Advanced Configuration](#).

Setting IP Address using Serial Port

Use the following procedure to set an IP address over the serial port using the CLI. The network administrator typically provides the AP IP address.

Hardware and Software Requirements

- Standard straight-through serial data (RS-232) cable with a one male DB-9 connector and one female DB-9 connector. The AP comes with a female 9-pin serial port.
- ASCII Terminal software, such as HyperTerminal.

Attaching the Serial Port Cable

1. Unlock and remove the cable cover from the AP.
2. Remove the front cover from the AP to reveal the serial port.
3. Connect one end of the serial cable to the AP and the other end to a serial port on your computer.
4. Power on the computer and AP, if necessary.

Initializing the IP Address using CLI

After installing the serial port cable, you may use the CLI to communicate with the AP. CLI supports most generic terminal emulation programs, such as HyperTerminal (which is included with the Windows operating systems). In addition, many web sites offer shareware or commercial terminal programs you can download. Once the IP address has been assigned, you can use the HTTP interface or the CLI over Telnet to complete configuration.

Troubleshooting the AP-2000

Follow these steps to assign the AP an IP address:

1. Open your terminal emulation program (like HyperTerminal) and set the following connection properties:
 - Com Port: <COM1, COM2, etc., depending on your computer>
 - Baud rate: 9600
 - Data Bits: 8
 - Stop bits: 1
 - Flow Control: None
 - Parity: None
2. Under **File -> Properties -> Settings -> ASCII Setup**, enable the **Send line ends with line feeds** option.
Result: HyperTerminal sends a line return at the end of each line of code.
3. Press the **RESET** button on the AP (see [RELOAD and RESET Buttons](#) to identify the location of the **RESET** button).
Result: The terminal display shows Power On Self Tests (POST) activity, and then displays a CLI prompt, similar to the example below. This process may take up to 90 seconds.
[Device name]> Please enter password:
4. Enter the CLI password (default is **public**).
Result: The terminal displays a welcome message and then the CLI Prompt:
[Device name]>
5. Enter **show ip**. Result: Network parameters appear:

```
[Device Name]> show ip
IP/Network Group Parameters
=====
ipaddr      :      10.0.0.1
ipsubmask   :      255.0.0.0
ipgw        :      10.0.0.1
ipttl       :      64
ipaddrtype  :      static
[Device Name]> _
```

Figure 7-2 Result of “show ip” CLI Command

6. Change the IP address and other network values using **set** and **reboot** CLI commands, similar to the example below (use your own IP address and subnet mask). Note that IP Address Type is set to Dynamic by default. If you have a DHCP server on your network, you should not need to manually configure the Access Point’s IP address; the Access Point will obtain an IP address from the network’s DHCP server during boot-up.
Result: After each entry the CLI reminds you to reboot; however wait to reboot until all commands have been entered.
[Device name]> **set ipaddrtype static**
[Device name]> **set ipaddr <IP Address>**
[Device name]> **set ipsubmask <IP Subnet Mask>**
[Device name]> **set ipgw <Default Gateway IP Address>**
[Device name]> **show ip** (to confirm your new settings)
[Device name]> **reboot 0**
7. After the AP reboots, verify the new IP address by reconnecting to the CLI and enter a **show ip** command. Alternatively, you can ping the AP from a network computer to confirm that the new IP address has taken effect.
8. When the proper IP address is set, use the HTTP interface or CLI over Telnet to configure the rest of the unit’s operating parameters.

Troubleshooting the AP-2000

Related Applications

RADIUS Authentication Server

If you enabled RADIUS Authentication on the AP, make sure that your network's RADIUS servers are operational. Otherwise, clients will not be able to log in. There are several reasons the authentication server services might be unavailable, here are two typical things to check:

- Make sure you have the proper RADIUS authentication server information setup configured in the AP. Check the RADIUS Authentication Server's Shared Secret and Destination Port number (default is 1812; for RADIUS Accounting, the default is 1813).
- Make sure the RADIUS authentication server RAS setup matches the AP.

TFTP Server

The "Trivial File Transfer Protocol" (TFTP) server allows you to transfer files across a network. You can upload configuration files from the AP for backup or copying, and you can download configuration files or new software images. The TFTP software is located on the ORINOCO AP Installation CD-ROM.

If a TFTP server is not configured and running, you will not be able to download and upload images and configuration files to/from the AP. Remember that the TFTP server does not have to be local, so long as you have a valid TFTP IP address. Note that you do not need a TFTP server running unless you want to transfer files to or from the AP.

After the TFTP server is installed:

- Check to see that TFTP is configured to point to the directory containing the AP Image.
- Make sure you have the proper TFTP server IP Address, the proper AP Image file name, and that the TFTP server is connected.
- **Make sure the TFTP server is configured to both send and receive, with no time-out.**



Using the Command Line Interface (CLI)

This section describes the AP's Command Line (CLI) Interface. CLI commands can be used to initialize, configure, and manage the Access Point.

- CLI commands may be entered in real time through a keyboard or submitted with CLI scripts.
- A *CLI Batch file* is a user-editable configuration file that provides a user-friendly way to change the AP configuration through a file upload. The CLI Batch file is an ASCII file that facilitates Auto Configuration because it does not require the user to access one of the AP's management interfaces to make configuration changes as is required with the proprietary TLV format configuration file.
- The CLI is available through both the Serial Port interface and over the Ethernet interface using Telnet.

NOTE

All CLI commands and parameters are case-sensitive.

- [General Notes](#)
- [Command Line Interface \(CLI\) Variations](#)
- [CLI Command Types](#)
- [Using Tables & User Strings](#)
- [Configuring the AP using CLI commands](#)
- [Set Basic Configuration Parameters using CLI Commands](#)
- [Other Network Settings](#)
- [CLI Monitoring Parameters](#)
- [Parameter Tables](#)
- [CLI Batch File](#)

General Notes

Prerequisite Skills and Knowledge

To use this document effectively, you should have a working knowledge of Local Area Networking (LAN) concepts, network access infrastructures, and client-server relationships. In addition, you should be familiar with software setup procedures for typical network operating systems and servers.

Notation Conventions

- Computer prompts are shown as constant width type. For example: `[Device-Name]>`
- Information that you input as shown is displayed in bold constant width type. For example:
`[Device name]> set ipaddr 10.0.0.12`
- The names of keyboard keys, software buttons, and field names are displayed in bold type. For example: Click the **Configure** button.
- Screen names are displayed in bold italics. For example, the ***System Status*** screen.

Important Terminology

- Configuration Files - Database files containing the current Access Point configuration. Configuration items include the IP Address and other network-specific values. Config files may be downloaded to the Access Point or uploaded for backup or troubleshooting.

Using the Command Line Interface (CLI)

- Download vs. Upload - Downloads transfer files to the Access Point. Uploads transfer files from the Access Point. The TFTP server performs file transfers in both directions.
- Group - A logical collection of network parameter information. For example, the System Group is composed of several related parameters. Groups can also contain Tables. All items for a given Group can be displayed with a **show <Group>** CLI Command.
- Image File - The Access Point software executed from RAM. To update an Access Point you typically download a new Image File. This file is often referred to as the "AP Image".
- Parameter - A fundamental network value that can be displayed and may be changeable. For example, the Access Point must have a unique IP Address and the Wireless interface must be assigned an SSID. Change parameters with the CLI **set** Command, and view them with the CLI **show** Command.
- Table - Tables hold parameters for several related items. For example, you can add several potential managers to the SNMP Table. All items for a given Table can be displayed with a **show <Table>** CLI Command.
- TFTP - Refers to the TFTP Server, used for file transfers.

Navigation and Special Keys

This CLI supports the following navigation and special key functions to move the cursor along the prompt line.

Key Combination	Operation
Delete or Backspace	Delete previous character
Ctrl-A	Move cursor to beginning of line
Ctrl-E	Move cursor to end of line
Ctrl-F	Move cursor forward one character
Ctrl-B	Move cursor back one character
Ctrl-D	Delete the character the cursor is on
Ctrl-U	Delete all text to left of cursor
Ctrl-P	Go to the previous line in the history buffer
Ctrl-N	Go to the next line in the history buffer
Tab	Complete the command line
?	List available commands

CLI Error Messages

The following table describes the error messages associated with improper inputs or expected CLI behavior.

Error Message	Description
Syntax Error	Invalid syntax entered at the command prompt.
Invalid Command	A non-existent command has been entered at the command prompt.
Invalid Parameter Name	An invalid parameter name has been entered at the command prompt.
Invalid Parameter Value	An invalid parameter value has been entered at the command prompt.
Invalid Table Index	An invalid table index has been entered at the command prompt.
Invalid Table Parameter	An invalid table parameter has been entered at the command prompt.
Invalid Table Parameter Value	An invalid table parameter value has been entered at the command prompt.
Read Only Parameter	User is attempting to configure a read-only parameter.
Incorrect Password	An incorrect password has been entered in the CLI login prompt.
Download Unsuccessful	The download operation has failed due to incorrect TFTP server IP Address or file name.
Upload Unsuccessful	The upload operation has failed due to incorrect TFTP server IP Address or file name.

Command Line Interface (CLI) Variations

Administrators use the CLI to control Access Point operation and monitor network statistics. The AP supports two types of CLI: the Bootloader CLI and the normal CLI. The Bootloader CLI provides a limited command set, and is used when the current AP Image is bad or missing. The Bootloader CLI allows you to assign an IP Address and download a new image. Once the image is downloaded and running, the Access Point uses the normal CLI. This guide covers the normal CLI unless otherwise specified.

Using the Command Line Interface (CLI)

Bootloader CLI

The Bootloader CLI is a minimal subset of the normal CLI used to perform initial configuration of the AP. This interface is only accessible via the serial interface if the AP does not contain a software image or a download image command over TFTP has failed.

The Bootloader CLI provides you with the ability to configure the initial setup parameters as well as download a software image to the device.

The following functions are supported by the Bootloader CLI:

- configuration of initial device parameters using the **set** command
- **show** command to view the device's configuration parameters
- **help** command to provide additional information on all commands supported by the Bootloader CLI
- **reboot** command to reboot the device

The parameters supported by the Bootloader CLI (for viewing and modifying) are:

- System Name
- IP Address Assignment Type
- IP Address
- IP Mask
- Gateway IP Address
- TFTP Server IP Address
- Image File Name (including the file extension)

The following lists display the results of using the **help** command in the Bootloader CLI:

```
[Device name]> help
Command List      Description
=====
set               Set system parameters
show             Show running system information
help            Description of commands, command usage and parameters
reboot          reboot the target

Command Usage
=====
set <parameter name> <parameter value> <cr>
show <cr>
help <cr>
reboot <cr>

Parameter List   Description
=====
sysname         System Name
ipaddr         System IP Address
ipsubmask       System Subnet Mask
ipgw           System Default Gateway IP Address
tftpipaddr     TFTP Server IP Address
tftpfilename    Image or Binary File name
ipaddrtype     System IP Address Type - STATIC or DYNAMIC

[Device name]>
```

Figure A-1 Results of “help” bootloader CLI command

The following lists display the results of using the **show** command in the Bootloader CLI:

```
[Device name]> show
sysname         Device name      System Name
ipaddr         10.0.0.1         System IP Address
ipsubmask      255.0.0.0        System Subnet Mask
ipgw           10.0.0.1         System Default Gateway IP Address
ipaddrtype     DYNAMIC          IP Address type
tftpipaddr     10.0.0.2         TFTP Server IP Address
tftpfilename    FILENAME         Image or Binary File Name

[Device name]>
```

Figure A-2 Results of “show” bootloader CLI command

Using the Command Line Interface (CLI)

CLI Command Types

This guide divides CLI Commands into two categories: Operational and Parameter Controls.

Operational CLI Commands

These commands affect Access Point behavior, such as downloading, rebooting, and so on. After entering commands (and parameters, if any) press the **Enter** key to execute the Command Line.

Operational commands include:

- **?**: Typing a question mark lists CLI Commands or parameters, depending on usage (you do not need to type Enter after typing this command)
- **done, exit, quit**: Terminates the CLI session
- **download**: Uses a TFTP server to download “image” files, “config” files, “bootloader upgrade” files, “SSL certificates”, “SSL private keys”, “SSH public keys”, “SSH private keys”, or “CLI Batch Files” to the Access Point
- **help**: Displays general CLI help information or command help information, such as command usage and syntax
- **history**: Remembers commands to help avoid re-entering complex statements
- **passwd**: Sets the Access Point’s CLI password
- **reboot**: Reboots the Access Point in the specified time
- **search**: Lists the parameters in a specified Table
- **upload**: Uses TFTP server to upload “config” files from Access Point to TFTP default directory or specified path

? (List Commands)

This command can be used in a number of ways to display available commands and parameters.

The following table lists each operation and provides a basic example. Following the table are detailed examples and display results for each operation.

Operation	Basic Example
Display the Command List (Example 1)	[Device-Name]>?
Display commands that start with specified letters (Example 2)	[Device-Name]>s?
Display parameters for set and show Commands (Examples 3a and 3b)	[Device-Name]>set ? [Device-Name]>show ipa?
Prompt to enter successive parameters for Commands (Example 4)	[Device-Name]>download ?

Example 1. Display Command list

To display the Command List, enter ?.

```
[Device-Name]>?
```

```
[Device Name]>
show
set
download
upload
reboot
passwd
help
quit
done
exit
history
search
[Device Name]> _
```

Figure A-3 Result of “?” CLI command

Example 2. Display specific Commands

To show all commands that start with specified letters, enter one or more letters, then ? with no space between letters and ?.

```
[Device-Name]>s?
```

Using the Command Line Interface (CLI)

```
[Device Name] s
show          set          search
```

Figure A-4 Result of “s?” CLI command

Example 3. Display parameters for set and show

Example 3a allows you to see every possible parameter for the set (or show) commands. Notice from example 3a that the list is very long. Example 3b shows how to display a subset of the parameters based on initial parameter letters.

Example 3a. Display every parameter that can be changed

```
[Device-Name]>set ?
```

```
[Device Name] set
Command Description:
The set command modifies the value of a given scalar parameter or table entry.

Command Usage:
set <parameter> <parameter value> <CR>
set <table> <index> <arg1> <value1> ..... <argN> <valueN> <CR>

Example:
set sysname "My Wireless Device" <CR>
set mgmtipaccess tbl 0 ipaddr 10.0.0.10 ipmask 255.255.0.0 cmt "Test WorkStation"
<CR>

[Device Name] set
broadcastfltbl
dncpgw
dncpippooltbl
dncppridnsipaddr
dncpsecdnsipaddr
dncpstatus
dncdomainname
dncprisoripaddr
dncsecsvripaddr
dncstatus
etherfltifbitmask
.
.
.
.
telsessiontout
tftpfilename
tftpf filetype
tftpipaddr
vlanidtbl
vlanngmtid
vlanstatus
wdstbl
wif
wifsec
[Device Name] set _
```

Figure A-5 Result of “set ?” CLI command

Example 3b. Display parameters based on letter sequence

This example shows entries for parameters that start with the letter “i”. The more letters you enter, the fewer the results returned. Notice that there is no space between the letters and the question mark.

```
[Device-Name]> show ipa?
```

```
[Device Name] show ipa
ipaddr          ipaddrtype      iparp
iparpfltaddr   iparpfltstatus  iparpfltsubmask
```

Figure A-6 Result of “show ipa?” CLI command

```
[Device-Name]> show iparp?
```

```
[Device Name] show iparp
iparp          iparpfltaddr   iparpfltstatus
iparpfltsubmask
[Device Name] show iparp_
```

Figure A-7 Result of “show iparp?” CLI command

Using the Command Line Interface (CLI)

Example 4. Display Prompts for Successive Parameters

Enter the command, a space, and then ?. Then, when the parameter prompt appears, enter the parameter value. Result: The parameter is changed and a new CLI line is echoed with the new value (in the first part of the following example, the value is the IP Address of the TFTP server).

After entering one parameter, you may add another ? to the new CLI line to see the next parameter prompt, and so on until you have entered all of the required parameters. The following example shows how this is used for the **download** Command. The last part of the example shows the completed **download** Command ready for execution.

```
[Device-Name]> download ?  
<TFTP IP Address>  
[Device-Name]> download 192.168.0.101 ?  
<File Name>  
[Device-Name]> download 192.168.0.101 apimage ?  
<file type (config/img/bootloader)>  
[Device-Name]> download 192.168.0.101 apimage img <CR>
```

done, exit, quit

Each of the following commands ends a CLI session:

```
[Device-Name]> done  
[Device-Name]> exit  
[Device-Name]> quit
```

download

Downloads the specified file from a TFTP server to the Access Point. Executing **download** in combination with the asterisks character (“*”) will make use of the previously set TFTP parameters. Executing **download** without parameters will display command help and usage information.

1. Syntax to download a file:

```
Device-Name]>download <tftp server address> <path and filename> <file type>
```

Example:

```
[Device-Name]>download 192.168.1.100 APImage2 img
```

2. Syntax to display help and usage information:

```
[Device-Name]>download
```

3. Syntax to execute the download Command using previously set (stored) TFTP Parameters:

```
[Device-Name]>download *
```

help

Displays instructions on using control-key sequences for navigating a Command Line and displays command information and examples.

1. Using help as the only argument:

```
[Device-Name]>help
```

Using the Command Line Interface (CLI)

```
[Device Name]> help
Type ? at the command prompt for a command list.

Complete command description and command usage can be provided by:
help <command name> <CR>
<command name> help <CR>

Special keys supported:
Arrow Keys
DEL, BS .... delete previous character
Ctrl-A .... go to beginning of line
Ctrl-E .... go to end of line
Ctrl-F .... go forward one character
Ctrl-B .... go backward one character
Ctrl-D .... delete current character
Ctrl-U, X .... delete to beginning of line
Ctrl-K .... delete to end of line
Ctrl-W .... delete previous word
Ctrl-T .... transpose previous character
Ctrl-P .... go to previous line in history buffer
Ctrl-N .... go to next line in history buffer

Tab .... will attempt command completion
# .... Comment Character
? .... will provide command listing

Examples:
'? ' .... list all the supported commands
'sh?' .... list all commands that start with sh
'show ?' .... list all arguments to the show command
'sh<TAB>' .... complete the 'show' command

[Device Name]>
```

Figure A-8 Results of “help” CLI command

- Complete command description and command usage can be provided by:

```
[Device-Name]>help <command name>
[Device-Name]><command name> help
```

history

Shows content of Command History Buffer. The Command History Buffer stores command statements entered in the current session. To avoid re-entering long command statements, use the keyboard “up arrow” (Ctrl-P) and “down arrow” (Ctrl-N) keys to recall previous statements from the Command History Buffer. When the desired statement reappears, press the **Enter** key to execute, or you may edit the statement before executing it.

```
[Device-Name]> history
```

passwd

Changes the CLI Password.

```
[Device-Name]> passwd oldpassword newpassword newpassword
```

reboot

Reboots Access Point after specified number of seconds. Specify a value of 0 (zero) for immediate reboot.

```
[Device-Name]> reboot 0
[Device-Name]> reboot 30
```

search

Lists the parameters supported by the specified table. This list corresponds to the table information displayed in the HTTP interface. In this example, the CLI returns the list of parameters that make up an entry in the IP Access Table.

```
[Device-Name]> search mgmtipaccesstbl
```

```
[Device Name]> search mgmtipaccesstbl
The supported elements are:
index
ipaddr
ipmask
cnt
status
```

Figure A-9 Results of “search mgmtipaccesstbl” CLI command

Using the Command Line Interface (CLI)

upload

Uploads a text-based configuration file from the AP to the TFTP Server. Executing **upload** with the asterisk character (“*”) will make use of the previously set/stored TFTP parameters. Executing **upload** without parameters will display command help and usage information.

1. Syntax to upload a file:

```
[Device-Name]>upload <tftp server address> <path and filename> <filetype>
```

Example:

```
[Device-Name]>upload 192.168.1.100 APconfig.sys config
```

2. Syntax to display help and usage information:

```
[Device-Name]>help upload
```

3. Syntax to execute the upload command using previously set (stored) TFTP Parameters:

```
[Device-Name]>upload *
```

Parameter Control Commands

The following sections cover the two Parameter Control Commands (**show** and **set**) and include several tables showing parameter properties. These commands allow you to view (**show**) all parameters and statistics and to change (**set**) parameters.

- **show**: To see any Parameter or Statistic value, you can specify a single parameter, a Group, or a Table.
- **set**: Use this CLI Command to change parameter values. You can use a single CLI statement to modify Tables, or you can modify each parameter separately.

“show” CLI Command

Displays the value of the specified parameter, or displays all parameter values of a specified group (parameter table). Groups contain Parameters and Tables. Tables contain parameters for a series of similar entities.

To see a definition and syntax example, type only **show** and then press the **Enter** key. To see a list of available parameters, enter a question mark (?) after **show** (example: **show ?**).

Syntax:

```
[Device-Name]>show <parameter>
[Device-Name]>show <group>
[Device-Name]>show <table>
```

Examples:

```
[Device-Name]>show ipaddr
[Device-Name]>show network
[Device-Name]>show mgmtipaccesstbl
```

“set” CLI Command

Sets (modifies) the value of the specified parameter. To see a definition and syntax example, type only **set** and then press the **Enter** key. To see a list of available parameters, enter a space, then a question mark (?) after **set** (example: **set?**).

Syntax:

```
[Device-Name]>set <parameter> <value>
[Device-Name]>set <table> <index> <argument 1> <value 1> ... <argument N> <value N>
```

Example:

```
[Device-Name]>set sysloc "Main Lobby"
[Device-Name]>set mgmtipaccesstbl 0 ipaddr 10.0.0.10 ipmask 255.255.0.0
```

Using the Command Line Interface (CLI)

Configuring Objects that Require Reboot

Certain objects supported by the Access Point require a device reboot in order for the changes to take effect. In order to inform the end-user of this behavior, the CLI provides informational messages when the user has configured an object that requires a reboot. The following messages are displayed as a result of the configuring such object or objects.

Example 1: Configuring objects that require the device to be rebooted

The following message is displayed every time the user has configured an object that requires the device to be rebooted.

```
[Device-Name]>set ipaddr 135.114.73.10
```

The following elements require reboot

ipaddr

Example 2: Executing the “exit”, “quit”, or “done” commands when an object that requires reboot has been configured

In addition to the above informational message, the CLI also provides a message as a result of the **exit**, **quit**, or **done** command if changes have been made to objects that require reboot. If you make changes to objects that require reboot and execute the exit command the following message is displayed:

```
[Device-Name]>exit<CR> OR quit<CR> OR done<CR>
```

Modifications have been made to parameters that require the device to be rebooted. These changes will only take effect after the next reboot.

“set” and “show” Command Examples

In general, you will use the CLI **show** Command to view current parameter values and use the CLI **set** Command to change parameter values. As shown in the following examples, parameters may be set individually or all parameters for a given table can be set with a single statement.

Example 1 - Set the Access Point IP Address Parameter

Syntax:

```
[Device-Name]>set <parameter name> <parameter value>
```

Example:

```
[Device-Name]> set ipaddr 10.0.0.12
```

Result: IP Address will be changed when you reboot the Access Point. The CLI reminds you when rebooting is required for a change to take effect. To reboot immediately, enter **reboot 0** (zero) at the CLI prompt.

Example 2 - Create a table entry or row

Use 0 (zero) as the index to a table when creating an entry. When creating a table row, only the mandatory table elements are required (comment is usually an optional table element). For optional table elements, the default value is generally applied if you do not specify a value.

Syntax:

```
[Device-Name]>set <table name> <table index> <element 1> <value 1> ...  
                  <element n> <value n>
```

Example:

```
[Device-Name]> set mgmtipaccesstbl 0 ipaddr 10.0.0.10 ipmask 255.255.0.0
```

Result: A new table entry is created for IP address 10.0.0.10 with a 255.255.0.0 subnet mask.

Using the Command Line Interface (CLI)

Example 3 - Modify a table entry or row

Use the index to be modified and the table elements you would like to modify. For example, suppose the IP Access Table has one entry and you wanted to modify the IP address:

```
[Device-Name]>set mgmtipaccesstbl 1 ipaddr 10.0.0.11
```

You can also modify several elements in the table entry. Enter the index number and specific table elements you would like to modify. (Hint: Use the search Command to see the elements that belong to the table.)

```
[Device-Name]>set mgmtipaccesstbl 1 ipaddr 10.0.0.12 ipmask 255.255.255.248
cmt "First Row"
```

Example 4 - Enable, Disable, or Delete a table entry or row

The following example illustrates how to manage the second entry in a table.

Syntax:

```
[Device-Name]>set <Table> index status <enable, disable, delete>
[Device-Name]>set <Table> index status <1=enable, 2=disable, 3=delete>
```

Example:

```
[Device-Name]>set mgmtipaccesstbl 2 status enable
[Device-Name]>set mgmtipaccesstbl 2 status disable
[Device-Name]>set mgmtipaccesstbl 2 status delete
[Device-Name]>set mgmtipaccesstbl 2 status 2
```

⇒ NOTE

You may need to enable a disabled table entry before you can change the entry's elements.

Example 5 - Show the Group Parameters

This example illustrates how to view all elements of a group or table.

Syntax:

```
[Device-Name]> show <group name>
```

Example:

```
[Device-Name]>show network
```

Result: The CLI displays network group parameters. Note `show network` and `show ip` return the same data.

```
[Device Name]> show network
IP/Network Group Parameters
=====
ipaddr      :      10.0.0.1
ipsubmask   :      255.0.0.0
ipgw        :      10.0.0.1
ipttl       :      64
ipaddrtype  :      static

[Device Name]> show ip
IP/Network Group Parameters
=====
ipaddr      :      10.0.0.1
ipsubmask   :      255.0.0.0
ipgw        :      10.0.0.1
ipttl       :      64
ipaddrtype  :      static

[Device Name]> _
```

Figure A-10 Results of “show network” and “show ip” CLI Commands

Using the Command Line Interface (CLI)

Example 6 - Show Individual and Table Parameters

1. View a single parameter.

Syntax:

```
[Device-Name]>show <parameter name>
```

Example:

```
[Device-Name]> show ipaddr
```

Result: Displays the Access Point IP address.

```
[Device Name]> show ipaddr
ipaddr
10.0.0.1
[Device Name]> _
```

Figure A-11 Result of “show ipaddr” CLI Command

2. View all parameters in a table.

Syntax:

```
[Device-Name]> show <table name>
```

Example: [Device-Name]> show mgmtipaccesstbl

Result: Displays the IP Access Table and its entries.

Using Tables & User Strings

Working with Tables

Each table element (or parameter) must be specified, as in the example below.

```
[Device-Name]>set mgmtipaccesstbl 0 ipaddr 10.0.0.10 ipmask 255.255.0.0
```

Below are the rules for creating, modifying, enabling/disabling, and deleting table entries.

- Creation
 - The table name is required.
 - The table index is required – for table entry/instance creation the index is always zero (0).
 - The order in which the table arguments or objects are entered in not important.
 - Parameters that are not required can be omitted, in which case they will be assigned the default value.
- Modification
 - The table name is required.
 - The table index is required – to modify the table, “index” must be the index of the entry to be modified.
 - Only the table objects that are to be modified need to be specified. Not all the table objects are required.
 - If multiple table objects are to be modified the order in which they are entered is not important.
 - If the entire table entry is to be modified, all the table objects have to be specified.
- Enabling/Disabling
 - The table name is required.
 - The table index is required – for table enabling/disabling the index should be the index of the entry to be enabled/disabled.
 - The entry’s new state (either “enable” or “disable”) is required.
- Deletion
 - The table name is required.
 - The table index is required – for table deletion the index should be the index of the entry to be deleted.
 - The word “delete” is required.

Using the Command Line Interface (CLI)

Using Strings

Since there are several string objects supported by the AP, a string delimiter is required for the strings to be interpreted correctly by the command line parser. For this CLI implementation, the single quote or double quote character can be used at the beginning and at the end of the string.

For example:

```
[Device-Name] > set sysname Lobby - Does not need quote marks
[Device-Name] > set sysname "Front Lobby" - Requires quote marks.
```

The scenarios supported by this CLI are:

"My Desk in the office"	Double Quotes
'My Desk in the office'	Single Quotes
"My 'Desk' in the office"	Single Quotes within Double Quotes
'My "Desk" in the office'	Double Quotes within Single Quotes
"Daniel's Desk in the office"	One Single Quote within Double Quotes
'Daniel's Desk in the office'	One Double Quote within Single Quotes

The string delimiter does not have to be used for every string object. The single quote or double quote only has to be used for string objects that contain blank space characters. If the string object being used does not contain blank spaces, then the string delimiters, single or double quotes, mentioned in this section are not required.

Configuring the AP using CLI commands

Log into the AP using HyperTerminal

1. Open your terminal emulation program (like HyperTerminal) and set the following connection properties:
 - Com Port: <COM1, COM2, etc., depending on your computer>
 - Baud rate: 9600
 - Data Bits: 8
 - Stop bits: 1
 - Flow Control: None
 - Parity: None
2. Under **File -> Properties -> Settings -> ASCII Setup**, enable the **Send line ends with line feeds** option. Result: HyperTerminal sends a line return at the end of each line of code.
3. Enter the CLI password (default is **public**).



NOTE

Proxim recommends changing your default passwords immediately. To perform this operation using CLI commands, refer to [Change Passwords](#).

Log into the AP using Telnet

The CLI commands can be used to access, configure, and manage the AP using Telnet. Follow these steps:

1. Confirm that your computer's IP address is in the same IP subnet as the AP.



NOTE

If you have not previously configured the Access Point's IP address and do not have a DHCP server on the network, the Access Point will default to an IP address of 10.0.0.1.

2. Go to the DOS command prompt on your computer.
3. Type **telnet <IP Address of the unit>**.
4. Enter the CLI password (default is **public**).

Using the Command Line Interface (CLI)

⇒ NOTE

Proxim recommends changing your default passwords immediately. To perform this operation using CLI commands, refer to [Change Passwords](#).

Set Basic Configuration Parameters using CLI Commands

There are a few basic configuration parameters that you may want to setup right away when you receive the AP. For example:

- [Set System Name, Location and Contact Information](#)
- [Set Static IP Address for the AP](#)
- [Download an AP Configuration File from your TFTP Server](#)
- [Set up Auto Configuration](#)
- [Set Network Names for the Wireless Interface](#)
- [Enable and Configure TX Power Control for the Wireless Interface\(s\)](#)
- [Configure SSID \(Network Name\) and VLAN Pairs, and Profiles](#)
- [Download an AP Configuration File from your TFTP Server](#)
- [Backup your AP Configuration File](#)

Set System Name, Location and Contact Information

```
[Device-Name]>set sysname <system name> sysloc <Unit Location>
[Device-Name]>set sysctname <Contact Name (person responsible for system)>
[Device-Name]>set sysctphone <Contact Phone Number> sysctemail <Contact E-mail address>
[Device-Name]>show system
```

```
[Device Name]> show system
System Parameters
=====
sysname           : Device Name
sysloc            : System Location
sysctname         : Contact Name
sysctemail        : name@organization.com
sysctphone        : Contact Phone Number
sysuptime <DD:HH:MM:SS> : 0:11: 6:40
sysoid            : 1.3.6.1.4.1.11898.2.4.6
sysdescr          : AP v2.1.0 SN-02UT16570004 v2.0.10
syservices        : 2
sysflashupdate    : 0
sysflashbkint     : 120
sysresetdefaults : 0

[Device Name]> _
```

Figure A-12 Result of “show system” CLI Command

Set Static IP Address for the AP

⇒ NOTE

The IP Subnet Mask of the AP must match your network’s Subnet Mask.

```
[Device-Name]>set ipaddrtype static
[Device-Name]>set ipaddr <fixed IP address of unit>
[Device-Name]>set ipsubmask <IP Mask>
[Device-Name]>set ipgw <gateway IP address>
[Device-Name]>show network
```

Change Passwords

```
[Device-Name]>passwd <Old Password> <New Password> <Confirm Password> (CLI password)
[Device-Name]>set httppasswd <New Password> (HTTP interface password)
[Device-Name]>set snmppasswd <New Password> (SNMP read password)
[Device-Name]>set snmprpasswd <New Password> (SNMP read/write)
[Device-Name]>set snmpv3authpasswd <New Password> (SNMPv3 authentication password)
```


Using the Command Line Interface (CLI)

```
[Device-Name]>set snmpv3privpasswd <New Password> (SNMPv3 privacy password)
[Device-Name]>reboot 0
```



CAUTION

Proxim strongly urges you to change the default passwords to restrict access to your network devices to authorized personnel. If you lose or forget your password settings, you can always perform the [Reset to Factory Default Procedure](#).

Set Network Names for the Wireless Interface

```
[Device-Name]>set wif <index 3 (Slot A) or 4 (Slot B)> netname <Network Name (SSID) for wireless interface>
[Device-Name]>show wif
```

```
[Device Name]> show wif
Wireless Interface Table
=====
Index                :      3
Network Name         :      My Wireless Network A
Distance Between APs :      large
Interference Robustness :      disable
DTIM Period          :      1
Automatic Channel Selection :      enable
Frequency Channel     :      56
RTS/CTS Medium Reservation :      2347
Multicast Rate        :      2 MBps
Closed System         :      disable
Load Balancing        :      enable
Medium Density Distribution :      disable
MAC Address           :      00:30:F1:65:09:E9
Supported Data Rates  :      6 9 12 18 24 36 48 54
Supported Frequency Channels :      52 56 60 64 36 40 44 48 149 153 157 161
Physical Layer Type   :      OFDM
Regulatory Domain List :      USA (FCC)
Transmit Rate         :      0
TurboMode             :      disable
```

Figure A-13 Results of “show wif” CLI command for an AP

Enable and Configure TX Power Control for the Wireless Interface(s)

The TX Power Control feature lets the user configure the transmit power level of the card in the AP at one of four levels:

- 100% of the maximum transmit power level of the card
- 50%
- 25%
- 12.5%

Perform the following commands to enable TX Power Control and set the transmit power level:

```
[Device-Name]>set txpowercontrol enable
```

```
[Device-Name]>set wif <interface number> currenttxpowerlevel <value>
```

Allowed values are: 1 (100%), 2 (50%), 3 (25%), 4 (12.5%)

Configure SSID (Network Name) and VLAN Pairs, and Profiles

Perform the following command to configure an SSID/VLAN pair, and to assign a Security Profile and RADIUS Profiles to it.

```
[Device-Name]>set wifssidtbl <Index.subindex> ssid <Network Name> vlanid <-1 to 1094>
ssidauth <enable/disable> acctstatus <enable/disable> secprofile <Security Profile
Nmuber> radmacprofile <MAC Authentication Profile Name> radeaprofile <EAP
Authentication Profile Name> radacctprofile <Accounting Profile Name> radmacauthstatus
<enable/disable> aclstatus <enable/disable> denynonencrypted <enable/disable>
```

Using the Command Line Interface (CLI)

Examples:

```
[Device-Name]>set wifssidtbl 3.1 ssid accesspt1 vlanid 22 ssidauth enable acctstatus  
enable secprofile 1 radmacprofile "MAC Authentication" radeaprofile "EAP  
Authentication" radacctprofile "Accounting" radmacauthstatus enable aclstatus enable
```

```
set wifssidtbl 4.1 ssid accesspt1 vlanid 22 ssidauth enable acctstatus enable  
secprofile 1 radmacprofile "MAC Authentication" radeaprofile "EAP Authentication"  
radacctprofile "Accounting" radmacauthstatus enable aclstatus enable
```

Using the Command Line Interface (CLI)

Download an AP Configuration File from your TFTP Server

Begin by starting your TFTP program. It must be running and configured to transmit and receive.

```
[Device-Name]>set tftpfilename <file name> tftpfiletype config  
tftpipaddr <IP address of your TFTP server>  
[Device-Name]>show tftp (to ensure the filename, file type, and the IP address are correct)  
[Device-Name]>download *  
[Device-Name]>reboot 0
```

After following the complete process (above) once, you can download a file of the same name (so long as all the other parameters are the same), with the following command:

```
[Device-Name]>download *
```

Backup your AP Configuration File

Begin by starting your TFTP program. It must be running and configured to transmit and receive.

```
[Device-Name]>upload <TFTP Server IP address> <tftpfilename (such as "config.sys")> config  
[Device-Name]>show tftp (to ensure the filename, file type, and the IP address are correct)
```

After setting the TFTP parameters, you can backup your current file (so long as all the other parameters are the same), with the following command:

```
[Device-Name]>upload *
```

Set up Auto Configuration

The Auto Configuration feature which allows an AP to be automatically configured by downloading a specific configuration file from a TFTP server during the boot up process.

Perform the following commands to enable and set up automatic configuration:

NOTE

The configuration filename and TFTP server IP address are configured only when the AP is configured for Static IP. If the AP is configured for Dynamic IP these parameters are not used and obtained from DHCP. The default filename is "config". The default TFTP IP address is "10.0.0.2" for AP-2000.

```
[Device-Name]>set autoconfigstatus <enable/disable>
```

```
[Device-Name]>set autoconfigfilename <filename>
```

Enter the filename of the configuration file that is used if the AP is configured for Static IP.

```
[Device-Name]>set autoconfigTFTPaddr <IP address>
```

Enter the TFTP server address that is used if the AP is configured for Static IP.

Other Network Settings

There are other configuration settings that you may want to set for the AP. Some of them are listed below.

- [Configure the AP as a DHCP Server](#)
- [Configure the DNS Client](#)
- [Maintain Client Connections using Link Integrity](#)
- [Change your Wireless Interface Settings](#)
- [Set Ethernet Speed and Transmission Mode](#)
- [Set Interface Management Services](#)
- [Configure MAC Access Control](#)
- [Set RADIUS Parameters](#)
- [Set Rogue Access Point Detection \(RAD\) Parameters](#)
- [Set VLAN/SSID Parameters](#)

Using the Command Line Interface (CLI)

➤ NOTE

Refer to [Performing Advanced Configuration](#) for more information on these settings.

Configure the AP as a DHCP Server

➤ NOTE

You must have at least one entry in the DHCP Server IP Address Pool Table before you can set the DHCP Server Status to Enable.

```
[Device-Name]>set dhcpstatus disable
[Device-Name]>set dhcpiptooltbl 0 startipaddr <start ip address>
                    endipaddr <end ip address>
[Device-Name]>set dhcpgw <gateway ip address>
[Device-Name]>set dhcppridnsipaddr <primary dns ip address>
[Device-Name]>set dhcpsecdnsipaddr <secondary dns ip address>
[Device-Name]>set dhcpstatus enable
[Device-Name]>reboot 0
```



CAUTION

Before enabling this feature, confirm that the IP address pools you have configured are valid addresses on the network and do not overlap the addresses assigned by any other DHCP server on the network. Enabling this feature with incorrect address pools will cause problems on your network.

Configure the DNS Client

```
[Device-Name]>set dnsstatus enable
[Device-Name]>set dnsprisvripaddr <IP address of primary DNS server>
[Device-Name]>set dnssecsvripaddr <IP address of secondary DNS server>
[Device-Name]>set dnsdomainname <default domain name>
[Device-Name]>show dns
```

```
[Device Name]> show dns
DNS Client Group
-----
dnsstatus          :      disable
dnsprisvripaddr   :      0.0.0.0
dnssecsvripaddr   :      0.0.0.0
dnsdomainname     :
```

Figure A-14 Results of “show dns” CLI command

Maintain Client Connections using Link Integrity

```
[Device-Name]>show linkinttbl (this shows the current links)
[Device-Name]>set linkinttbl <1-5 (depending on what table row you wish to address)>
                    ipaddr <ip address of the host computer you want to check>
[Device-Name]>set linkintpollint <the interval between link integrity checks>
[Device-Name]>set linkintpollretx <number of times to retransmit before considering
                    the link down>
[Device-Name]>set linkintstatus enable
[Device-Name]>show linkinttbl (confirm new settings)
[Device-Name]>reboot 0
```

Change your Wireless Interface Settings

See [Interfaces](#) for information on the parameters listed below. Dual-radio APs use index 3 for Slot A and index 4 for Slot B.

Using the Command Line Interface (CLI)

Operational Mode

```
[Device-Name]>set wif <index> mode <see table>
```

mode	Operational Mode
1	dot11b-only
2	dot11g-only
3	dot11bg
4	dot11a-only
5	dot11g-wifi

Autochannel Select (ACS)

ACS is enabled by default. Reboot after disabling or enabling ACS.

```
[Device-Name]>set wif <index> autochannel <enable/disable>
[Device-Name]>reboot 0
```

Enable/Disable Closed System

```
[Device-Name]>set wif <index> closedsys <enable/disable>
```

Shutdown/Resume Wireless Service

```
[Device-Name]>set wif <index> wssstatus <1 (resume)/2 (shutdown)>
```

Enable/Disable Interference Robustness (802.11b Only)

```
[Device-Name]>set wif <index> interrobust <enable/disable>
```

Enable/Disable Load Balancing (802.11b Only)

```
[Device-Name]>set wif <index> ldbalance <enable/disable>
```

Enable/Disable Medium Density Distribution (802.11b Only)

```
[Device-Name]>set wif <index> meddendistrib <enable/disable>
```

Set the Distance Between APs (802.11b Only)

```
[Device-Name]>set wif <index> distaps <large, medium, small, minicell, microcell>
[Device-Name]>reboot 0
```

NOTE

The distance between APs should not be approximated. It is calculated by means of a manual Site Survey, in which an AP is set up and clients are tested throughout the area to determine signal strength and coverage, and local limits such as physical interference are investigated. From these measurements the appropriate cell size and density is determined, and the optimum distance between APs is calculated to suit your particular business requirements.

Using the Command Line Interface (CLI)

Set the Multicast Rate (802.11b Only)

```
[Device-Name]>set wif <index> multrate <1,2,5.5,11 (Mbits/sec)>
```

⇒ NOTE

The Distance Between APs **must be set before** the Multicast Rate.

Enable/Disable Super Mode (802.11a/g only)

```
[Device-Name]>set wif 3 super <enable/disable>
```

Enable/Disable Turbo Mode (802.11a/g only)

```
[Device-Name]>set wif 3 turbo <enable/disable>
```

⇒ NOTE

Super mode must be enabled on the interface before Turbo mode can be enabled.

Set Ethernet Speed and Transmission Mode

```
[Device-Name]>set etherspeed <value (see below)>
[Device-Name]>reboot 0
```

Ethernet Speed and Transmission Mode	Value
10 Mbits/sec - half duplex	10halfduplex
10 Mbits/sec - full duplex	10fullduplex
10 Mbits/sec - auto duplex	10autoduplex
100 Mbits/sec - half duplex	100halfduplex
100 Mbits/sec - full duplex	100fullduplex
Auto Speed - half duplex	autohalfduplex
Auto Speed - auto duplex	autoautoduplex (default)

Set Interface Management Services

Edit Management IP Access Table

```
[Device-Name]>set mgmtipaccessstbl <index> ipaddr <IP address> ipmask <subnet mask>
```

Configure Management Ports

```
[Device-Name]>set snmpifbitmask <(see below)>
[Device-Name]>set httpifbitmask <(see below)>
[Device-Name]>set telifbitmask <(see below)>
```

Choose from the following values:

Interface bitmask	Description
0 or 2 = disable (all interfaces)	All management channels disabled
1 or 3 = Ethernet only	Ethernet only enabled
4 or 6 = Wireless A only	Wireless A only enabled
8 or 10 = Wireless B only	Wireless B only enabled
12 = Wireless A and Wireless B	Wireless A and Wireless B enabled
13 or 15 = all interfaces	All management channels enabled

Set Communication Ports

```
[Device-Name]>set httpport <HTTP port number (default is 80)>
[Device-Name]>set telport <Telnet port number (default is 23)>
```

Using the Command Line Interface (CLI)

Configure Secure Socket Layer (HTTPS)

Enabling SSL and configuring a passphrase allows encrypted Secure Socket Layer communications to the AP through the HTTPS interface.

```
[Device-Name]>set sslstatus <enable/disable>
```

The user must change the SSL passphrase when uploading a new certificate/private key pair, which will have a corresponding passphrase.

```
[Device-Name]>set sslpassphrase <SSL certificate passphrase>
```

```
[Device-Name]>show http
```

To view all HTTP configuration information including SSL.

```
HTTP Group Parameters
```

```
=====
```

```
httpifbitmask      :      15
httppasswd         :      *****
httpport           :      80
httphelpink        :      file:///C:/Program Files/ORiNOCO/AP2000/HTML/home.htm
httpsetupwiz       :      disable
sslstatus          :      enable
sslpassphrase      :      *****
```

Set Telnet Session Timeouts

```
[Device-Name]>set tellogintout <time in seconds between 1 and 300 (default is 30)>
```

```
[Device-Name]>set telsessionout <time in seconds between 1 and 36000 (default is 900)>
```

Configure Serial Port Interface

⇒ NOTE

To avoid unexpected performance issues, leave Flow Control at the default setting (none) unless you are sure what this setting should be.

```
[Device-Name]>set serbaudrate <2400, 4800, 9600, 19200, 38400, 57600>
```

```
[Device-Name]>set serflowctrl <none, xonxoff>
```

```
[Device-Name]>show serial
```

```
[Device Name]> show serial
Serial Interface Group Parameters
=====
serbaudrate        :      9600
serdatabits        :      8
serparity          :      none
serstopbits        :      1
serflowctrl        :      none
```

Figure A-15 Result of “show serial” CLI Command

Configure Syslog

```
[Device-Name]>set syslogpriority <1-7 (default is 6)>
```

```
[Device-Name]>set syslogstatus <enable/disable>
```

```
[Device-Name]>set sysloghbstatus <enable/disable> (default is disable)
```

```
[Device-Name]>set syslogbinterval <1 - 604800> (default is 900 seconds)
```

```
[Device-Name]>set sysloghosttbl <index> ipaddr <ipaddress> cmt <comment> status
<enable/disable>
```

Configure Intra BSS

```
[Device-Name]>set intrabssoptype <passthru (default)/block>
```

Using the Command Line Interface (CLI)

Configure MAC Access Control

Setup MAC (Address) Access Control

```
[Device-Name]>set macaclstatus enable  
[Device-Name]>set macacloptype <passthru, block>  
[Device-Name]>reboot 0
```

Add an Entry to the MAC Access Control Table

```
[Device-Name]>set macacltbl <index> macaddr <MAC Address> status enable  
[Device-Name]>show macacltbl
```

Disable or Delete an Entry in the MAC Access Control Table

```
[Device-Name]>set macacltbl <index> status <disable/delete>  
[Device-Name]>show macacltbl
```

NOTE

For larger networks that include multiple Access Points, you may prefer to maintain this list on a centralized location using the RADIUS parameters (see [Set RADIUS Parameters](#)).

Using the Command Line Interface (CLI)

Set RADIUS Parameters

Configure RADIUS Authentication servers

Perform the following command to configure a RADIUS Server and assign it to a VLAN. The RADIUS Server Profile index is specified by the index parameter and the subindex parameter specifies whether you are configuring a primary or secondary RADIUS server.

```
[Device-Name]>set radiustbl <Index> profname <Profile Name> seraddrfmt <1 - IP Address
2 - Name> sernameorip <IP Address or Name> port <value> ssecret <value> responsetm
<value> maxretx <value> acctupdtintrvl <value> macaddrfmt <value> authlifetm <value>
radaccinactivetmr <value> vlanid <vlan id -1 to 4094> status enable
```

Examples of Configuring Primary and Secondary RADIUS Servers and Displaying the RADIUS Configuration

Primary server configuration:

```
set radiustbl 1.1 profname "MAC Authentication" seraddrfmt 1 sernameorip 20.0.0.20 port
1812 ssecret public responsetm 3 maxretx 3 acctupdtintrvl 0 macaddrfmt 1 authlifetm 900
radaccinactivetmr 5 vlanid 22 status enable
```

Secondary server configuration:

```
set radiustbl 1.2 profname "MAC Authentication" seraddrfmt 1 sernameorip 20.0.0.30 port
1812 ssecret public responsetm 3 maxretx 3 acctupdtintrvl 0 macaddrfmt 1 authlifetm 900
radaccinactivetmr 5 vlanid 33 status enable
```

```
[Device-Name]>show radiustbl
```

```
Index : 1
Primary/Backup : Primary
Profile Name : MAC Authentication
Server Status : notReady
Server Addressing Format : ipaddr
IP Address/Host Name : 0.0.0.0
Destination Port : 1812
VLAN Identifier : -1
MAC Address Format : dashdelimited
Response Time : 3
Maximum Retransmission : 3
Authorization Lifetime : 0
Accounting Update Interval : 0
Accounting Inactivity Timer : 5
```

```
Index : 1
Primary/Backup : Backup
Profile Name : MAC Authentication
Server Status : notReady
Server Addressing Format : ipaddr
IP Address/Host Name : 0.0.0.0
Destination Port : 1812
VLAN Identifier : -1
MAC Address Format : dashdelimited
Response Time : 3
Maximum Retransmission : 3
Authorization Lifetime : 0
Accounting Update Interval : 0
Accounting Inactivity Timer : 5
```

Using the Command Line Interface (CLI)

```

Index : 2
Primary/Backup : Primary
Profile Name : EAP Authentication
Server Status : notReady
Server Addressing Format : ipaddr
IP Address/Host Name : 0.0.0.0
Destination Port : 0
VLAN Identifier : -1
MAC Address Format : dashdelimited
Response Time : 3
Maximum Retransmission : 3
Authorization Lifetime : 0
Accounting Update Interval : 0
Accounting Inactivity Timer : 5

```

```

Index : 2
Primary/Backup : Backup
Profile Name : EAP Authentication
Server Status : notReady
Server Addressing Format : ipaddr
IP Address/Host Name : 0.0.0.0
Destination Port : 0
VLAN Identifier : -1
MAC Address Format : dashdelimited
Response Time : 3
Maximum Retransmission : 3
Authorization Lifetime : 0
Accounting Update Interval : 0
Accounting Inactivity Timer : 5

```

```

Index : 3
Primary/Backup : Primary
Profile Name : Accounting
Server Status : notReady
Server Addressing Format : ipaddr
IP Address/Host Name : 0.0.0.0
Destination Port : 1813
VLAN Identifier : -1
MAC Address Format : dashdelimited
Response Time : 3
Maximum Retransmission : 3
Authorization Lifetime : 0
Accounting Update Interval : 0
Accounting Inactivity Timer : 5

```

```

Index : 3
Primary/Backup : Backup
Profile Name : Accounting
Server Status : notReady
Server Addressing Format : ipaddr
IP Address/Host Name : 0.0.0.0
Destination Port : 1813
VLAN Identifier : -1
MAC Address Format : dashdelimited
Response Time : 3
Maximum Retransmission : 3
Authorization Lifetime : 0

```

Using the Command Line Interface (CLI)

```

Accounting Update Interval      : 0
Accounting Inactivity Timer    : 5

Index                          : 4
Primary/Backup                 : Primary
Profile Name                   : Management Access
Server Status                  : notReady
Server Addressing Format       : ipaddr
IP Address/Host Name          : 0.0.0.0
Destination Port               : 1812
VLAN Identifier                : -1
MAC Address Format              : dashdelimited
Response Time                  : 3
Maximum Retransmission        : 3
Authorization Lifetime         : 0
Accounting Update Interval     : 0
Accounting Inactivity Timer    : 5

Index                          : 4
Primary/Backup                 : Backup
Profile Name                   : Management Access
Server Status                  : notReady
Server Addressing Format       : ipaddr
IP Address/Host Name          : 0.0.0.0
Destination Port               : 1812
VLAN Identifier                : -1
MAC Address Format              : dashdelimited
Response Time                  : 3
Maximum Retransmission        : 3
Authorization Lifetime         : 0
Accounting Update Interval     : 0
Accounting Inactivity Timer    : 5

```

Set Rogue Access Point Detection (RAD) Parameters

The Rogue AP Detection (RAD) feature enables an additional security level for wireless LAN deployments. The RAD feature provides a mechanism for detecting Rogue Access Points by utilizing the coverage of the trusted Access Point deployment.

The Rogue AP Scan employs background scanning using low-level 802.11 scanning functions for effective wireless detection of Access Points in its coverage area with minimal impact on the normal operation of the Access Point.

The **set radstatus** command enables Rogue Access Point Detection. The scan repetition duration (**radscanint**) is also configurable. If the Access Point uses directional antennas to provide directional coverage, then the interface bitmask (**radifbitmask**) can be configured to maximize the scanning coverage area.

```

[Device-Name]>set radstatus enable
[Device-Name]>set radscanint <15-1440>
[Device-Name]>set radifbitmask <4 (WiF A), 8 (WiF B), or 12 (both interfaces)>
[Device-Name]>show rad

```

```

[OC0-AP-2000]> show rad
Rogue AP Detect Group
=====
radstatus      :      disable
radifbitmask   :          4
radscanint     :          15

```

Figure A-16 Results of “show rad” CLI command

Using the Command Line Interface (CLI)

Set Hardware Configuration Reset Parameters

The Hardware Configuration Reset commands allows you to enable or disable the hardware reset functionality and to change the password to be used for configuration reset during boot up.

To disable hardware configuration reset, enter:

```
[Device-Name]>set hwconfigresetstatus disable
```

To enable hardware configuration reset, enter:

```
[Device-Name]>set hwconfigresetstatus enable
```

To define the Configuration Reset Password to be used for configuration reset during boot up, enter the following command

```
[Device-Name]>set configresetpasswd <password>
```

It is important to safely store the configuration reset password. If a user forgets the configuration reset password, the user will be unable to reset the AP to factory default configuration if the AP becomes inaccessible and the hardware configuration reset functionality is disable.

Set VLAN/SSID Parameters

Enable VLAN Management

```
[Device-Name]>set vlanstatus enable
[Device-Name]>set vlanmgmtid <-1-4094>
[Device-Name]>show wifssidtbl (to review your settings)
[Device-Name]>reboot 0
```

Disable VLAN Management

```
[Device-Name]>set vlanstatus disable or 2
[Device-Name]>set vlanmgmtid 0
[Device-Name]>reboot 0
```

CLI Monitoring Parameters

Using the **show** command with the following table parameters will display operating statistics for the AP (these are the same statistics that are described in [Monitoring the AP-2000](#) for the HTTP Web interface).

- **staticmp**: Displays the ICMP Statistics.
- **statarptbl**: Displays the IP ARP Table Statistics.
- **statbridgetbl**: Displays the Learn Table.
- **statiapp**: Displays the IAPP Statistics.
- **statradius**: Displays the RADIUS Authentication Statistics.
- **statif**: Displays information and statistics about the Ethernet and wireless interfaces.
- **stat802.11**: Displays additional statistics for the wireless interfaces.
- **statethernet**: Displays additional statistics for the Ethernet interface.
- **statmss**: Displays station statistics and Wireless Distribution System links.

Parameter Tables

Objects contain groups that contain both parameters and parameter tables. Use the following Tables to configure the Access Point. Columns used on the tables include:

- Name - Parameter, Group, or Table Name
- Type - Data type
- Values - Value range, and default value, if any
- Access = access type, R = Read Only (show), RW = Read-Write (can be "set"), W = Write Only
- CLI Parameter - Parameter name as used in the Access Point

Using the Command Line Interface (CLI)

Access Point network objects are associated with Groups. The network objects are listed below and associated parameters are described in the following Parameter Tables:

- [System Parameters](#) - Access Point system information
 - [Inventory Management Information](#) - Hardware, firmware, and software version information
- [Network Parameters](#) - IP and Network Settings
 - [IP Configuration Parameters](#) - Configure the Access Point's IP settings
 - [DNS Client for RADIUS Name Resolution](#) - Configure the Access Point as a DNS client
 - [DHCP Server Parameters](#) - Enable or disable dynamic host configuration
 - [Link Integrity Parameters](#) - Monitor link status
- [Interface Parameters](#) - Configure Wireless and Ethernet settings
 - [Wireless Interface Parameters](#)
 - [Wireless Distribution System \(WDS\) Parameters](#) - Configure the WDS partnerships
 - [Wireless Interface SSID/VLAN/Profile Parameters](#) - Configure the SSID and VLAN pairs and the security and RADIUS profiles for each pair. Up to 16 pairs can be configured per wireless interface.
 - [Wireless Distribution System \(WDS\) Security Table Parameters](#)
 - [Ethernet Interface Parameters](#) - Set the speed and duplex of the Ethernet port
- [Management Parameters](#) - Control access to the AP's management interfaces
 - [SNMP Parameters](#) - Set read and read/write passwords
 - [HTTP \(web browser\) Parameters](#) - Set up the graphical web browser interface. If required, enable SSL and configure the SSL certificate passphrase.
 - [Telnet Parameters](#) - Telnet Port setup
 - [Serial Port Parameters](#) - Serial Port setup
 - [RADIUS Based Management Access Parameters](#) - Configure RADIUS Based Management Access for HTTP and Telnet access.
 - [SSH Parameters](#) - Enable SSH and configure the host key.
 - [TFTP Server Parameters](#) - Set up for file transfers; specify IP Address, file name, and file type
 - [IP Access Table Parameters](#) - Configure range of IP addresses that can access the AP
 - [Auto Configuration Parameters](#) - Configure the Auto Configuration feature which allows an AP to be automatically configured by downloading a configuration file from a TFTP server during boot up.
- [Filtering Parameters](#)
 - [Ethernet Protocol Filtering Parameters](#) - Control network traffic based on protocol type
 - [Static MAC Address Filter Table](#) - Enable and disable specific addresses
 - [Proxy ARP Parameters](#) - Enable or disable proxy ARP for wireless clients
 - [IP ARP Filtering Parameters](#) - Control which ARP messages are sent to wireless clients based on IP settings
 - [Broadcast Filtering Table](#) - Control the type of broadcast packets forwarded to the wireless network
 - [TCP/UDP Port Filtering](#) - Filter IP packets based on TCP/UDP port
- [Alarms Parameters](#)
 - [SNMP Table Host Table Parameters](#) - Enter the list of IP addresses that will receive alarms from the AP
 - [Syslog Parameters](#) - Configure the AP to send Syslog information to network servers
- [Bridge Parameters](#)
 - [Spanning Tree Parameters](#) - Used to help prevent network loops
 - [Storm Threshold Parameters](#) - Set threshold for number of broadcast packets
 - [Intra BSS Subscriber Blocking](#) - Enable or disable peer to peer traffic on the same AP
 - [Packet Forwarding Parameters](#) - Redirect traffic from wireless clients to a specified MAC address
- [RADIUS Parameters](#)
 - [Set RADIUS Parameters](#) - Configure RADIUS Servers and assign them to VLANs.
- [Security Parameters](#) - Access Point security settings
 - [MAC Access Control Parameter](#) - Control wireless access based on MAC address
 - [Rogue Access Point Detection \(RAD\) Parameters](#) - Enable and configure Rogue Access Point Detection.
 - [Hardware Configuration Reset](#) - Disable or enable hardware configuration reset and configure a configuration reset password.

Using the Command Line Interface (CLI)

- [VLAN/SSID Parameters](#) - Enable the configuration of multiple subnetworks based on VLAN ID and SSID pairs.
- [Security Profile Table](#) - Configure Security Profiles that define allowed security modes (wireless clients), and encryption and authentication mechanisms.
- [Other Parameters](#)
 - [IAPP Parameters](#) - Enable or disable the Inter-Access Point Protocol.
 - [Spectralink VoIP Parameters \(802.11b and bg Modes Only\)](#) - Enable or disable Spectralink Voice over IP feature.

System Parameters

Name	Type	Values	Access	CLI Parameter
System	Group	N/A	R	system
Name	DisplayString	User Defined	RW	sysname
Location	DisplayString	User Defined	RW	sysloc
Contact Name	DisplayString	User Defined	RW	sysctname
Contact E-mail	DisplayString	User Defined	RW	sysctemail
Contact Phone	DisplayString	User Defined max 254 characters	RW	sysctphone
FLASH Backup Interval	Integer	0 - 65535 seconds	RW	sysflashbckint
Flash Update		0 1	RW	sysflashupdate
System OID	DisplayString	N/A	R	sysoid
Descriptor	DisplayString	System Name, flash version, S/N, bootloader version	R	sysdescr
Up Time	Integer	dd:hh:mm:ss dd – days hh – hours mm – minutes ss – seconds	R	sysuptime
Emergency Restore to defaults		Resets all parameters to default factory values	RW	sysresettodefaults Note: You must enter the following command twice to reset to defaults: set sysresettodefaults 1

Using the Command Line Interface (CLI)

Inventory Management Information

Name	Type	Values	Access	CLI Parameter
System Inventory Management	Subgroup	N/A	R	sysinvmgmt
Component Table	Subgroup	N/A	R	sysinvmgmtcmptbl
Component Interface Table	Subgroup	N/A	R	sysinvmgmtcmpiftbl

⇒ NOTE

The inventory management commands display advanced information about the AP's installed components. You may be asked to report this information to a representative if you contact customer support.

Network Parameters

IP Configuration Parameters

Name	Type	Values	Access	CLI Parameter
Network	Group	N/A	R	network
IP Configuration	Group	N/A	R	ip (Note: The network and ip parameters display the same information)
IP Address	IpAddress	User Defined	RW	ipaddr
IP Mask	IpAddress	User Defined	RW	ipmask
Default Router IP Address	IpAddress	User Defined	RW	ipgw
Default TTL	Integer	User Defined (seconds) 64 (default)	RW	ipttl
Address Type	Integer	static dynamic (default)	RW	ipaddrtype

⇒ NOTE

The IP Address Assignment Type (ipaddrtype) must be set to static before the IP Address (ipaddr), IP Mask (ipmask) or Default Gateway IP Address (ipgw) values can be entered.

DNS Client for RADIUS Name Resolution

Name	Type	Values	Access	CLI Parameter
DNS Client	Group	N/A	R	dns
DNS Client status	Integer	enable disable (default)	RW	dnsstatus
Primary DNS Server IP Address	IpAddress	User Defined	RW	dnspridnsipaddr
Secondary DNS Server IP Address	IpAddress	User Defined	RW	dnssecdnsipaddr
Default Domain Name	Integer32	User Defined (up to 254 characters)	RW	dnsdomainname

Using the Command Line Interface (CLI)

DHCP Server Parameters

Name	Type	Values	Access	CLI Parameter
DHCP Server	Group	N/A	R	dhcp
DHCP Server Status	Integer	enable (1) (default) disable (2) delete (3)	RW	dhcpstatus
Gateway IP Address	IpAddress	User Defined	RW	dhcpgw
Primary DNS IP Address	IpAddress	User Defined	RW	dhcppridnsipaddr
Secondary DNS IP Address	IpAddress	User Defined	RW	dhcpcsdnsipaddr
Number of IP Pool Table Entries	Integer32	N/A	R	dhcpiptooltblent

⇒ NOTE

The DHCP Server (dhcpstatus) can only be enabled after a DHCP IP Pool table entry has been created.

DHCP Server table for IP pools

Name	Type	Values	Access	CLI Parameter
DHCP Server IP Address Pool Table	Table	N/A	R	dhcpiptooltbl
Table Index	Integer	User Defined	N/A	index
Start IP Address	IpAddress	User Defined	RW	startipaddr
End IP Address	IpAddress	User Defined	RW	endipaddr
Width	Integer	User Defined	RW	width
Default Lease Time (optional)	Integer32	3600- 86400 sec (default)	RW	defleasetm
Maximum Lease Time (optional)	Integer32	3600- 86400 sec (default)	RW	maxleasetm
Comment (optional)	DisplayString	User Defined	RW	cmt
Status (optional)	Integer	enable (1) disable (2) delete (3)	RW	status

⇒ NOTE

Set either End IP Address or Width (but not both) when creating an IP address pool.

Using the Command Line Interface (CLI)

Link Integrity Parameters

Name	Type	Values	Access	CLI Parameter
Link Integrity	Group	N/A	R	linkint
Link Integrity Status	Integer	enable disable (default)	RW	linkintstatus
Link Integrity Poll Interval	Integer	500 - 15000 ms (in increments of 500ms) 500 ms (default)	RW	linkintpollint
Link Integrity Poll Retransmissions	Integer	0 - 255 5 (default)	RW	linkintpollretx

Link Integrity IP Target Table

Name	Type	Values	Access	CLI Parameter
Link Integrity IP Target Table	Table	N/A	R	linkinttbl
Table Index	Integer	1-5	N/A	index
Target IP Address	IpAddress	User Defined	RW	ipaddr
Comment (optional)	DisplayString	User Defined (up to 254 characters)	RW	cmt
Status (optional)	Integer	enable disable (default) delete	RW	status

Using the Command Line Interface (CLI)

Interface Parameters

Wireless Interface Parameters

The wireless interface group parameter is **wif**. For Dual-radio APs, Slot A uses table index 3 and Slot B uses table index 4.

Common Parameters to 802.11a, 802.11b, and 802.11b/g APs

Name	Type	Values	Access	CLI Parameter
Wireless Interfaces	Group	N/A	R	wif
Table Index	Integer	3 (Slot A) or 4 (Slot B)	R	index
Network Name	DisplayString	2 – 31 characters My Wireless Network (default)	RW	netname
Auto Channel Select (ACS) ¹	Integer	enable (default) disable	RW	autochannel
DTIM Period	Integer	1 – 255 1 = default	RW	dtimperiod
RTS/CTS Medium Reservation	Integer	0 – 2347 Default is 2347 (off)	RW	medres
MAC Address	PhyAddress	12 hex digits	R	macaddr
Closed System	Integer	enable disable (default)	RW	closedsys
Wireless Service Status	Integer	1 = resume 2 = shutdown	RW	wssstatus
Supported Frequency Channels	Octet String	Depends on Regulatory Domain	R	suppchannels
Load Balancing	Integer	enable (default) disable	RW	ldbalance

Note 1: For 802.11a APs in Europe, Auto Channel Select is a read-only parameter; it is always enabled.

802.11a Only Parameters

Name	Type	Values	Access	CLI Parameter
Operating Frequency Channel	Integer	Varies by regulatory domain and country. See 802.11a Channel Frequencies	RW	channel
Supported Data Rates	Octet String	See Transmit Rate , below	R	suppdatarates
Transmit Rate	Integer32	0 - Auto Fallback (default) 6 Mbits/sec 9 Mbits/sec 12 Mbits/sec 18 Mbits/sec 24 Mbits/sec 36 Mbits/sec 48 Mbits/sec 54 Mbits/sec	RW	txrate
Physical Layer Type	Integer	ofdm (orthogonal frequency division multiplexing) for 802.11a	R	phytype
SuperMode	Integer	enable disable (default)	RW	supermode
TurboMode	Integer	enable disable (default)	RW	turbomode

Note 1: Super Mode must be enabled first on the wireless interface before Turbo Mode can be enabled.

Using the Command Line Interface (CLI)

802.11b Only Parameters

Name	Type	Values	Access	CLI Parameter
Distance between APs	Integer	large (default) medium small minicell microcell	RW	distaps
Interference Robustness	Integer	enable (default) disable	RW	interrobust
Operating Frequency Channel	Integer	1 - 14; available channels vary by regulatory domain/country; see 802.11b Channel Frequencies	RW	channel
Multicast Rate	Integer	1 Mbits/sec (1) 2 Mbits/sec (2) (default) 5.5 Mbits/sec (3) 11 Mbits/sec (4)	RW	multirate
Closed Wireless System	Integer	enable disable (default)	RW	closedsys
Medium Distribution	Integer	enable (default) disable	RW	meddendistrib
MAC Address	PhyAddress	12 hex digits	R	macaddr
Supported Data Rates	Octet String	1 Mbits/sec 2 Mbits/sec 5.5 Mbits/sec 11 Mbits/sec	R	suppdatarates
Transmit Rate	Integer32	0 (auto fallback - default) 1 Mbits/sec 2 Mbits/sec 5.5 Mbits/sec 11 Mbits/sec	RW	txrate
Supported Frequency Channels	Octet String	Depends on Regulatory Domain	R	suppchannels
Physical Layer Type	Integer	dsSS (direct sequence spread spectrum) for 802.11b	R	phytype
Regulatory Domain List	DisplayString	U.S./Canada -- FCC Europe -- ETSI Japan -- MKK	R	regdomain

NOTE

There is an inter-dependent relationship between the Distance between APs and the Multicast Rate. In general, larger systems operate a lower average transmit rates.

Distance between APs	Multicast Rate
Large	1 and 2 Mbits/sec
Medium	1, 2, and 5.5 Mbits/sec
Small	1, 2, 5.5 and 11 Mbits/sec
Minicell	1, 2, 5.5 and 11 Mbits/sec
Microcell	1, 2, 5.5 and 11 Mbits/sec

Using the Command Line Interface (CLI)

802.11b/g Only Parameters

Name	Type	Values	Access	CLI Parameter
Wireless Operational Mode	Integer	dot11b-only dot11g-only dot11bg (default) dot11g-wifi	RW	mode
Operating Frequency Channel	Integer	1 - 14; available channels vary by regulatory domain/country; see 802.11g Channel Frequencies	RW	channel
Supported Data Rates	Octet String	See Transmit Rate , below	R	suppdatarates
Transmit Rate	Integer32	For 802.11b-only mode: 0 (auto fallback - default) 1 Mbits/sec 2 Mbits/sec 5.5 Mbits/sec 11 Mbits/sec For 802.11g-only mode: 0 (auto fallback - default) 6 Mbits/sec 9 Mbits/sec 12 Mbits/sec 18 Mbits/sec 24 Mbits/sec 36 Mbits/sec 48 Mbits/sec 54 Mbits/sec For 802.11g-wifi and 802.11bg modes: 0 (auto fallback - default) 1 Mbits/sec 2 Mbits/sec 5.5 Mbits/sec 11 Mbits/sec 6 Mbits/sec 9 Mbits/sec 12 Mbits/sec 18 Mbits/sec 24 Mbits/sec 36 Mbits/sec 48 Mbits/sec 54 Mbits/sec	RW	txrate
Physical Layer Type	Integer	ERP (Extended Rate Protocol)	R	phytype
SuperMode	Integer	enable disable (default)	RW	supermode
TurboMode	Integer	enable disable (default)	RW	turbomode

Note 1: Super Mode must be enabled first on the wireless interface before Turbo Mode can be enabled.

Wireless Distribution System (WDS) Parameters

Name	Type	Values	Access	CLI Parameter
WDS Table	Table	N/A	R	wdstbl
Port Index	Integer	3.1 - 3.6 (Wireless)	R	portindex
Status	Integer	enable, disable	RW	status
Partner MAC Address	PhysAddress	User Defined	RW	partnernmacaddr

Using the Command Line Interface (CLI)

Wireless Interface SSID/VLAN/Profile Parameters

The Wireless Interface SSID table manages the SSID/VLAN pairs, and the Security Profile and RADIUS Profiles associated to the VLAN

⇒ NOTE

The ability to configure up to 16 VLAN/SSID pairs and to configure security and RADIUS profiles per SSID is available only for 802.11b/g APs and 802.11a Upgrade Kit APs.

802.11b APs do not support multiple VLAN/SSID pairs. APs with the 802.11a card support multiple VLAN/SSID pairs, but do not support the security profile per SSID capability.

Name	Type	Values	Access	CLI Parameter
Wireless Interface SSID Table	Table	N/A	R	wifssidtbl
Table Index	Integer	Primary Wireless Interface = 3 Secondary Wireless Interface = 4	R	index
Table Index	Integer	1 - 16 (SSID index)	R	ssidindex
SSID	DisplayString	0 - 32 characters	RW	ssid
VLAN ID	VlanId	-1 - 4094	RW	vlanid
Table Row Status	RowStatus	Enable Disable	RW	status
SSID Authorization Status per VLAN	Integer	Enable Disable	RW	ssidauth
RADIUS Accounting Status per VLAN	Integer	Enable Disable	RW	acctstatus
MAC ACL Status per VLAN	Integer	Enable Disable	RW	macaclstatus
Security Profile	Integer	1-32	RW	secprofile
RADIUS MAC Profile	Integer		RW	radmacprofile
RADIUS EAP Profile	Integer		RW	radeaprofile
RADIUS Accounting Profile	Integer		RW	radacctprofile
Deny Non Encrypted Data	Integer	Enable Disable	R/W	denynonencrypted

Wireless Distribution System (WDS) Security Table Parameters

The WDS Security Table manages WDS related security objects.

Name	Type	Values	Access	CLI Parameter
WDS Security Table	Table	N/A	R	wdssectbl
Table Index	Integer	Primary Wireless Interface = 3 Secondary Wireless Interface = 4	R	index
Security Mode	Integer	none, wep	RW	secmode
Encryption Key 0	WEKeyType	N/A	WO	encryptkey0

Using the Command Line Interface (CLI)

Ethernet Interface Parameters

Name	Type	Values	Access	CLI Parameter
Ethernet Interface	Group	N/A	R	ethernet
Speed	Integer	10halfduplex 10fullduplex 10autoduplex 100halfduplex 100fullduplex autohalfduplex autoautoduplex (default)	RW	etherspeed
MAC Address	PhyAddress	N/A	R	ethermacaddr

Management Parameters

Secure Management Parameters

Name	Type	Values	Access	CLI Parameter
Secure Management	Integer	Enable/Disable	RW	securemgmtstatus

SNMP Parameters

Name	Type	Values	Access	CLI Parameter
SNMP	Group	N/A	R	snmp
SNMP Management Interface Bitmask	Interface Bitmask	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	snmpifbitmask
Read Password	DisplayString	User Defined public (default) max 63 characters	W	snmprpasswd
Read/Write Password	DisplayString	User Defined public (default) max 63 characters	W	snmprwpasswd
SNMPv3 Authentication Password	DisplayString	User Defined public (default) max 63 characters	W	snmpv3authpasswd
SNMPv3 Privacy Password	DisplayString	User Defined public (default) max 63 characters	W	snmpv3privpasswd

HTTP (web browser) Parameters

Name	Type	Values	Access	CLI Parameter
HTTP	Group	N/A	R	http
HTTP Management Interface Bitmask	Interface Bitmask	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	httpifbitmask

Using the Command Line Interface (CLI)

HTTP Password	DisplayString	User Defined max 64 characters	W	httppasswd
HTTP Port	Integer	User Defined Default = 80	RW	httpport
Help Link	DisplayString	User Defined	RW	httphelplink
SSL Status	Integer	Enable/Disable	RW	sslstatus
SSL Certificate Passphrase	DisplayString	User Defined	Write-only	sslpassphrase

⇒ NOTE

The default path for the Help files is **C:/Program Files/ORiNOCO/AP/HTML/index.htm**. (Use the forward slash character ("/") rather than the backslash character ("\") when configuring the **Help Link** location.) The AP Help information is available in English, French, German, Italian, Spanish, and Japanese.

Telnet Parameters

Name	Type	Values	Access	CLI Parameter
Telnet	Group	N/A	R	telnet
Telnet Management Interface Bitmask	Interface Bitmask	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	telifbitmask
Telnet Port	Integer	User Defined 23 (default)	RW	telport
Telnet Login Inactivity Time-out	Integer	1 – 300 seconds 30 sec (default)	RW	tellogintout
Telnet Session Idle Time-out	Integer	1 - 900 seconds 900 sec (default)	RW	telsessiontout

Serial Port Parameters

Name	Type	Values	Access	CLI Parameter
Serial	Group	N/A	R	serial
Baud Rate	Integer	2400, 4800, 9600 (default), 19200, 38400, 57600	RW	serbaudrate
Data Bits	Integer	8	R	serdatabits
Parity	Integer	none	R	serparity
Stop Bits	Integer	1	R	serstopbits
Flow Control	Value	none (default) xonxoff	RW	serflowctrl

Using the Command Line Interface (CLI)

RADIUS Based Management Access Parameters

The RADIUS Based Management Access parameters allow you to enable HTTP or Telnet Radius Management Access, enable or disable local user access, and configure the local user password.

The default local user ID is root and the default local user password is public. "Root" cannot be configured as a valid user for RADIUS based management access when local user access is enabled.

Name	Type	Values	Access	CLI Parameter
Radius Local User Status	Integer	Enable Disable	RW	radlocaluserstatus
Radius Local User Password	DisplayString	User Defined	RW	radlocaluserpasswd
HTTP Radius Management Access	Integer	Enable Disable	RW	httpradiusmgmtaccess
Telnet Radius Management Access	Integer	Enable Disable	RW	telradiusmgmtaccess

SSH Parameters

The following commands enable or disable SSH and set the SSH host key.

Name	Type	Values	Access	CLI Parameter
SSH Status	Integer	Enable Disable	RW	sshstatus
SSH Public Host Key Fingerprint	DisplayString	User Defined	RW	sshkeyfprint
SSH Host Key Status	Integer	Create Delete	RW	sshkeystatus

The AP SSH feature, open-SSH, conforms to the SSH protocol, and supports SSH version 2.

The following SSH clients have been verified to interoperate with the AP's server. The following table lists the clients, version number, and the website of the client.

Clients	Version	Website
OpenSSH	V3.4-2	http://www.openssh.com
Putty	Rel 0.53b	http://www.chiark.greenend.org.uk
Zoc	5.00	http://www.emtec.com
Axessh	V2.5	http://www.labf.com

For key generation, only the OpenSSH client has been verified.

Using the Command Line Interface (CLI)

Auto Configuration Parameters

These parameters relate to the Auto Configuration feature which allows an AP to be automatically configured by downloading a specific configuration file from a TFTP server during the boot up process.

Name	Type	Values	Access	CLI Parameter
Auto Configuration	Group	N/A	R	autoconfig
Auto Configuration Status	Integer	enable (default) disable	RW	autoconfigstatus
Auto Config File Name	DisplayString	User Defined	RW	autoconfigfilename
Auto Config TFTP Server IP Address	IpAddress	User Defined	RW	autoconfigTFTPaddr

TFTP Server Parameters

These parameters relate to upload and download commands.

When a user executes an upload and/or download Command, the specified arguments are stored in TFTP parameters for future use. If nothing is specified in the command line when issuing subsequent upload and/or download commands, the stored arguments are used.

Name	Type	Values	Access	CLI Parameter
TFTP	Group	N/A	R	tftp
TFTP Server IP Address	IpAddress	User Defined	RW	tftpipaddr
TFTP File Name	DisplayString	User Defined	RW	tftpfilename
TFTP File Type	Integer	img config bootloader sslcertificate sslprivatekey sshprivatekey sshpublickey clibatchfile (CLI Batch File) cbflog (CLI Batch Error Log)	RW	tftpfiletype

IP Access Table Parameters

When creating table entries, you may either specify the argument name followed by argument value or simply entering the argument value. When only the argument value is specified, then enter the values in the order depicted by the following table. CLI applies default values to the omitted arguments. Due to the nature of the information, the only argument that can be omitted is the "comment" argument.

Name	Type	Values	Access	CLI Parameter
IP Access Table	Table	N/A	R	mgmtipaccesstbl
Table Index	Integer	User Defined	N/A	index
IP Address	IpAddress	User Defined	RW	ipaddr
IP Mask	IpAddress	User Defined	RW	ipmask
Comment (optional)	DisplayString	User Defined	RW	cmt
Status (optional)	Integer	enable (default) disable delete	RW	status

Using the Command Line Interface (CLI)

Filtering Parameters

Ethernet Protocol Filtering Parameters

Name	Type	Values	Access	CLI Parameter
Ethernet Filtering	Group	N/A	R	etherflt
Filtering Interface Bitmask	Interface Bitmask	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	etherfltifbitmask
Operation Type		passthru block	RW	etherfltoptype

Ethernet Protocol Filtering Table

Identify the different filters by using the table index.

Name	Type	Values	Access	CLI Parameter
Ethernet Protocol Filtering Table	Table	N/A	R	etherflttbl
Table Index	N/A	N/A	R	index
Protocol Number	Octet String	N/A	RW	protonumber
Protocol Name (optional)	DisplayString		RW	protoname
Status (optional)	Integer	enable (1) disable (2) delete (3)	RW	status

⇒ NOTE

The filter Operation Type (passthru or block) applies **only** to the protocol filters that are **enabled** in this table.

⇒ NOTE

The AP requires a reboot for changes to the Ethernet Protocol Filtering Table to take effect.

Static MAC Address Filter Table

Name	Type	Values	Access	CLI Parameter
Static MAC Address Filter Table	Table	N/A	R	staticmactbl
Table Index	N/A	N/A	R	index
Static MAC Address on Wired Network	PhysAddress	User Defined	RW	wiredmacaddr
Static MAC Address Mask on Wired Network	PhysAddress	User Defined	RW	wiredmask
Static MAC Address on Wireless Network	PhysAddress	User Defined	RW	wirelessmacaddr
Static MAC Address Mask on Wireless Network	PhysAddress	User Defined	RW	wirelessmask
Comment (optional)	DisplayString	max 255 characters	RW	cmt
Status (optional)	Integer	enable (default) disable delete	RW	status

Using the Command Line Interface (CLI)

Proxy ARP Parameters

Name	Type	Values	Access	CLI Parameter
Proxy ARP	Group	N/A	R	parp
Status	Integer	enable disable (default)	RW	parpstatus

IP ARP Filtering Parameters

Name	Type	Values	Access	CLI Parameter
IP ARP Filtering	Group	N/A	R	iparp
Status	Integer	enable disable (default)	RW	iparpfltstatus
IP Address	IpAddress	User Defined	RW	iparpfltaddr
Subnet Mask	IpAddress	User Defined	RW	iparpfltsubmask

Broadcast Filtering Table

Name	Type	Values	Access	CLI Parameter
Broadcast Filtering Table	Table	N/A	R	broadcastflttbl
Index	Integer	1-5	N/A	index
Protocol Name	DisplayString	N/A	R	protoname
Direction	Integer	ethertowireless wirelesstoether both (default)	RW	direction
Status	Integer	enable disable (default)	RW	status

TCP/UDP Port Filtering

The following parameters are used to enable/disable the Port filter feature.

Name	Type	Values	Access	CLI
Port Filtering	Group	N/A	R	portflt
Port Filter Status	Integer	enable (default) disable	RW	portfltstatus

TCP/UDP Port Filtering Table

The following parameters are used to configure TCP/UDP Port filters.

Name	Type	Values	Access	CLI
Port Filtering Table	Table	N/A	R	portflttbl
Table Index	N/A	User Defined (there are also 4 pre-defined indices, see Port Number below for more information)	R	index
Port Type	Octet String	tcp udp tcp/udp	RW	porttype

Using the Command Line Interface (CLI)

Port Number	Octet String	User Defined (there are also 4 pre-defined protocols: Index 1: NetBios Name Service – 137, Index 2: NetBios Datagram Service – 138, Index 3: NetBios Session Service – 139, Index 4: SNMP Service – 161)	RW	portnum
Protocol Name	DisplayString	User Defined (there are also 4 pre-defined protocols, see Port Number above)	RW	protoname
Interface Bitmask	Integer32	0 or 2 - no interfaces (disable) 1 or 3 - Ethernet 4 or 6 - Wireless A 8 or 10 - Wireless B 12 = Wireless A & B 13 or 15 - all interfaces (default is 15)	RW	ifbitmask
Status (optional)	Integer	enable (default for new entries) disable (default for pre-defined entries) delete	RW	status

Alarms Parameters

SNMP Table Host Table Parameters

When creating table entries, you may either specifying the argument name followed by argument value. CLI applies default values to the omitted arguments. Due to the nature of the information, the only argument that can be omitted is the “comment” argument.

➤ NOTE

Up to 10 entries can be added to the SNMP Trap Host Table.

Name	Type	Values	Access	CLI Parameter
SNMP Trap Host Table	Table	N/A	R	snmptraphosttbl
Table Index	Integer	User Defined	N/A	index
IP Address	IpAddress	User Defined	RW	ipaddr
Password	DisplayString	User Defined (up to 64 characters)	W	passwd
Comment (optional)	DisplayString	User Defined (up to 254 characters)	RW	cmt
Status (optional)	Integer	enable (default) disable delete	RW	status

Syslog Parameters

The following parameters configure the Syslog settings.

Name	Type	Values	Access	CLI
Syslog	Group	N/A	R	syslog
Syslog Status	Integer	enable disable (default)	RW	syslogstatus
Syslog Port	Octet String	514	R	syslogport

Using the Command Line Interface (CLI)

Syslog Lowest Priority Logged	Integer	1 – 7 1 = LOG_ALERT 2 = LOG_CRIT 3 = LOG_ERR 4 = LOG_WARNING 5 = LOG_NOTICE 6 = LOG_INFO (default) 7 = LOG_DEBUG	RW	syslogprilog
Heartbeat Status	Integer	enable (1) disable (2) (default)	RW	sysloghstatus
Heartbeat Interval (seconds)	Integer	1 – 604800 seconds; 900 sec. (default)	RW	sysloghinterval

⇒ NOTE

The Heartbeat parameters are advanced settings not available via the HTTP interface. When Heartbeat is enabled, the AP periodically sends a message to the Syslog server to indicate that it is active. The frequency with which the heartbeat message is sent depends upon the setting of the Heartbeat Interval.

Syslog Host Table

The table described below configures the Syslog hosts that will receive message from the AP. You can configure up to ten Syslog hosts.

Name	Type	Values	Access	CLI Parameter
Syslog Host Table	Table	N/A	R	sysloghosttbl
Table Index	Integer	1 – 10	N/A	index
IP Address	IpAddress	User Defined	RW	ipaddr
Comment (optional)	DisplayString	User Defined	RW	cmt
Status (optional)	Integer	enable disable delete	RW	status

Bridge Parameters

Spanning Tree Parameters

Name	Type	Values	Access	CLI Parameter
Spanning Tree	Group	N/A	R	stp
Spanning Tree Status	Integer	enable (default) disable	RW	stpstatus
Bridge Priority	Integer	0 – 65535 32768 (default)	RW	stp priority
Maximum Age	Integer	600 – 4000 (in 0.01 sec intervals; i.e., 6 to 40 seconds) 2000 (default)	RW	stp maxage
Hello Time	Integer	100 – 1000 (in 0.01 sec intervals; i.e., 1 to 10 seconds) 200 (default)	RW	stp hello time
Forward Delay	Integer	400 – 3000 (in 0.01 sec intervals; i.e., 4 to 30 seconds) 1500 (default)	RW	stp fwd delay

Spanning Tree Priority and Path Cost Table

Name	Type	Values	Access	CLI Parameter
Spanning Tree Table	Table	N/A	R	stpbl
Table Index (Port)	N/A	1 – 15	R	index

Using the Command Line Interface (CLI)

Priority	Integer	0 – 255 128 (default)	RW	priority
Path Cost	Integer	1 – 65535 100 (default)	RW	pathcost
State	Integer	disable blocking listening learning forwarding broken	R	state
Status	Integer	enable disable	RW	status

Storm Threshold Parameters

Name	Type	Values	Access	CLI Parameter
Storm Threshold	Group	N/A	N/A	stmthres
Broadcast Threshold	Integer	0 – 255 packets/sec (default is 0)	RW	stmbrdthres
Multicast Threshold	Integer	0 – 255 packets/sec (default is 0)	RW	stmmlthres

Storm Threshold Table

Name	Type	Values	Access	CLI Parameter
Storm Threshold Table	Table	N/A	R	stmthresbl
Table Index	Integer	1 = Ethernet 3 = Wireless	R	index
Broadcast Threshold	Integer	0 – 255 packets/sec (default is 0)	RW	bcast
Multicast Threshold	Integer	0 – 255 packets/sec (default is 0)	RW	mcast

Intra BSS Subscriber Blocking

The following parameters control the Intra BSS traffic feature, which prevent wireless clients that are associated with the same AP from communicating with each other:

Name	Type	Values	Access	CLI
Intra BSS Traffic	Group	N/A	R	intrabss
Intra BSS Traffic Operation	Integer	pass thru (default) block	RW	intrabssoptype

Packet Forwarding Parameters

The following parameters control the Packet Forwarding feature, which redirects wireless traffic to a specific MAC address:

Name	Type	Values	Access	CLI
Packet Forwarding MAC Address	Group	N/A	R	pktfwd
Packet Forwarding MAC Address	MacAddress	User Defined	RW	pktfwdmacaddr
Packet Forwarding Status	Integer	enable disable (default)	RW	pktfwdstatus
Packet Forwarding Interface Port	Integer	0 (any) (default) 1 (Ethernet) 2 (WDS 1) 3 (WDS 2) 4 (WDS 3) 5 (WDS 4) 6 (WDS 5) 7 (WDS 6)	RW	pktfwdif

Using the Command Line Interface (CLI)

⇒ NOTE

The Wireless Distribution System (WDS) feature is not available for 802.11a or 802.11b/g APs at this time.

Security Parameters

MAC Access Control Parameter

Name	Type	Values	Access	CLI Parameter
MAC Address Control	Group	N/A	R	macacl
Status	Integer	enable disable (default)	RW	macaclstatus
Operation Type	Integer	passthru (default) block	RW	macacloptype

MAC Access Control Table

Name	Type	Values	Access	CLI Parameter
MAC Address Control Table	Table	N/A	R	macacitbl
Table Index	N/A	N/A	R	index
MAC Address	PhysAddress	User Defined	RW	macaddr
Comment (optional)	DisplayString	User Defined max 254 characters	RW	cmt
Status (optional)	Integer	enable (default) disable delete	RW	status

RADIUS Parameters

General RADIUS Parameters

Name	Type	Values	Access	CLI Parameter
RADIUS	Group	N/A	R	radius
Client Invalid Server Address	Counter32	N/A	R	radcliinvsradd

RADIUS Server Configuration Parameters

⇒ NOTE

Use a server name only if you have enabled the DNS Client functionality. See [DNS Client for RADIUS Name Resolution](#).

Name	Type	Values	Access	CLI Parameter
RADIUS Authentication	Table	N/A	R	radiustbl
Table Index (Profile Index)	Integer	N/A	R	index
Primary/Secondary Index	Integer	Primary (1) Secondary (2)	R	subindex
Status	Integer	Enable Disable	RW	status
Server Address Format	Integer	Ipaddr Name	RW	seraddrfmt

Using the Command Line Interface (CLI)

Server IP Address or Name	IpAddress DisplayString	User defined (enter an IP address if seraddrfmt is ipaddr or a name if set to name; up to 254 characters if using a name)	RW	ipaddr
Port (optional)	Integer	User Defined 1812 (default)	RW	port
Shared Secret	DisplayString	User Defined 6-32 characters	W	ssecret
Response Time (optional)	Integer	1 – 10 seconds 3 (default)	RW	responsetm
Maximum Retransmissions (optional)	Integer	0 – 4 3 (default)	RW	maxretx
RADIUS MAC Address Format	Integer	dashdelimited colondelimited singledashdelimited nodelimiter	RW	radmacaddrformat
RADIUS Accounting Inactivity Timer	Integer32	1-60 minutes	RW	radaccinactivetmr
Authorization Lifetime	Integer32	900-43200 seconds	W	radauthlifetm
RADIUS Accounting Update Interval	Integer32	10-3600 minutes	RW	radacctupdinterval
VLAN ID	vlanID		RW	radvlanid

Rogue Access Point Detection (RAD) Parameters

Name	Type	Values	Access	CLI Parameter
Rogue Access Point Detection (RAD)	Group	N/A	R	rad
Status	Integer	enable disable (default)	RW	radstatus
Scan Interval	Integer	15-1440 (minutes)	RW	radscanint
Interface Bitmask	Interface Bitmask	4 (WiF A), 8 (WiF B), or 12 (both).	RW	radifbitmask

Hardware Configuration Reset

The Hardware Configuration Reset commands allows you to enable or disable the feature and to change the password to be used for configuration reset during boot up.

Name	Type	Values	Access	CLI Parameter
Hardware Configuration Reset Status	Integer	Enable (1) Disable (2)	R	hwconfigresetstatus
Configuration Reset Password	DisplayString	User Defined	RW	configresetpasswd

VLAN/SSID Parameters

Name	Type	Values	Access	CLI Parameter
VLAN	Group	N/A	R	vlan
Status	Integer	enable disable (default)	RW	vlanstatus
Management ID	VlanId	-1 (untagged) or 1-4094	RW	vlanmgmtid

Using the Command Line Interface (CLI)

Security Profile Table

The Security Profile Table allows you to configure security profiles. A maximum of 16 security profiles are supported per wireless interface.

Each security profile can be enable and configure one or more security modes (None Secure Station, WEP Station, 802.1x Station, WPA Station, WPA-PSK Station). The WEP/PSK parameters are separately configurable for each security mode.

Name	Type	Values	Access	CLI Parameter
Security Profile Table	Table	N/A	R	secprofiletbl
Table Index	Integer	1.1 to 5.5	R	index
Security Mode	Integer	nonsecsta wepsta 802.1xsta wpasta wpapsksta	R	secmode
Authentication Mode	Integer	none 802.1x radius acl psk	RW	authmode
Cipher	Integer	none wep tkip aes	R	ciphersuite
Encryption Key 1	Integer	User defined	RW	secprofileencryptkey1
Encryption Key 2	Integer	User defined	RW	secprofileencryptkey2
Encryption Key 3	Integer	User defined	RW	secprofileencryptkey3
Encryption Key 4	Integer	User defined	RW	secprofileencryptkey4
Encryption Transmit Key	Integer	1-4	RW	encryptkeytx
Encryption Key Length	Integer		RW	encryptkeylength
Rekey Interval	Integer		RW	rekeyint
WPA PSK Value	Integer		RW	pskkey
WPA PSK Pass Phrase	Integer		RW	passphrase
RADIUS EAP Profile	Integer		RW	radeaprofile

Command Syntax and Examples of Configuring Security Profiles:

Configuring a Security Profile with Non Secure Security Mode

set secprofiletbl <index> secmode nonsecure status enable

Example: `set secprofiletbl 2 secmode nonsecure status enable`

Configuring a Security Profile with WEP Security Mode

set secprofiletbl <index> secmode wep encryptkey0 <value> encryptkeylength <value> encryptkeytx <value> status enable

Example: `set secprofiletbl 3 secmode wep encryptkey0 12345 encryptkeylength 1 encryptkeytx 0 status enable`

Configuring a Security Profile with 802.1x Security Mode

set secprofiletbl <index> secmode 802.1x rekeyint 900 status enable

Example: `set secprofiletbl 4 secmode 802.1x rekeyint 900 status enable`

Configuring a Security Profile with WPA Security Mode

set secprofiletbl <index> secmode wpa rekeyint 900 status enable

Example: `set secprofiletbl 5 secmode wpa rekeyint 900 status enable`

Using the Command Line Interface (CLI)

Configuring a Security Profile with WPA-PSK Security Mode

set secprofiletbl <index> secmode wpa-psk passphrase <value> status enable

Example: `set secprofiletbl 6 secmode wpa-psk passphrase 12345678 status enable`

Configuring a Security Profile with 802.11i Security Mode

set secprofiletbl <index> secmode 802.11i rekeyint <value> status enable

Example: `set secprofiletbl 7 secmode 802.11i rekeyint 900 status enable`

Configuring a Security Profile with 802.11i-PSK Security Mode

set secprofiletbl <index> secmode 802.11i-psk passphrase <value> status enable

Example: `set secprofiletbl 8 secmode 802.11i-psk passphrase 12345678 status enable`

Other Parameters

IAPP Parameters

Name	Type	Values	Access	CLI Parameter
IAPP	Group	N/A	R	iapp
IAPP Status	Integer	enable (default) disable	RW	iappstatus
Periodic Announce Interval (seconds)	Integer	80 120 (default) 160 200	RW	iappannint
Announce Response Time	Integer	2 seconds	R	iappannresp
Handover Time-out	Integer	410 ms 512 ms (default) 614 ms 717 ms 819 ms	RW	iapphandtout
Max. Handover Retransmissions	Integer	1 - 4 (default 4)	RW	iapphandretx
Send Announce Request on Startup	Integer	enable (default) disable	RW	iappannreqstart

⇒ NOTE

These parameters configure the Inter Access Point Protocol (IAPP) for roaming. Leave these settings at their default value unless a technical representative asks you to change them.

SpectraLink VoIP Parameters (802.11b and bg Modes Only)

These parameters enable or disable the SpectraLink Voice over IP feature.

The Spectralink Legacy Support parameter should be enabled if the AP is operating in 802.11bg mode and legacy 802.11 Spectralink telephones are used. This parameter will set the basic rates of the AP to be 1 and 2 Mbps in 802.11bg mode and will allow old telephones that operate only at the 1 and 2 Mbps basic rate to connect to the AP.

Name	Type	Values	Access	CLI Parameter
Spectralink VoIP	Group	N/A	R	spectralink
Spectralink VoIP Status	Integer	enable disable (default)	RW	speclinkstatus
Spectralink Legacy Support	Integer	enable disable (default)	RW	speclinklegacysupport

Using the Command Line Interface (CLI)

CLI Batch File

A CLI Batch file is a user-editable configuration file that provides a user-friendly way to change the AP configuration through a file upload. The CLI Batch file is an ASCII file that facilitates Auto Configuration because it does not require the user to access one of the AP's management interfaces to make configuration changes as is required with the proprietary TLV format configuration file.

The CLI Batch file does not replace the existing TLV format configuration file, which continues to define the configuration of the AP.

The CLI Batch file contains a list of CLI commands that the AP will execute. The AP performs the commands in the file immediately after the file is uploaded to the AP manually or during Auto Configuration.

The AP parses the file and executes the CLI commands. Commands that do not require a reboot take effect immediately, while commands that require a reboot (typically commands affecting a wireless interface) will take effect after reboot.

Auto Configuration and the CLI Batch File

The Auto Configuration feature allows download of the TLV format configuration file or the CLI Batch file. The AP detects whether the file uploaded is TLV format or a CLI Batch file. If the AP detects a CLI Batch file (a file with extension .cli), the AP executes the file immediately.

The AP will reboot after executing the CLI Batch file. Auto Configuration will not result in repeated reboots if the CLI Batch file contains rebootable parameters.

CLI Batch File Format and Syntax

The CLI Batch file must be named with a .cli extension to be recognized by the AP. The maximum file size allowed is 100 Kbytes, and files with larger sizes cannot be uploaded to the AP. The CLI commands supported in the CLI Batch File are a subset of the legal AP CLI commands.

The follow commands are supported:

- Set commands
- Reboot command (the reboot command ignores the argument (time))
- Passwd command

Each command must be separated by a new line. Refer to Appendix A, CLI Command Reference for detailed command syntax.

NOTE

The following commands are not supported: Show command, Debug command, Undebug command, Upload command, Download command, Kill command, and the Exit, Quit, and Done commands.

Sample CLI Batch File

The following is a sample CLI Batch File:

```
set sysname system1
set sysloc sunnyvale
set sysctname contact1
set sysctphone 1234567890
set sysctemail email@domain.com
set ipaddr 11.0.0.66
set ipaddrtype static
set ipsubmask 255.255.255.0
set ipgw 11.0.0.1
set wif 4 autochannel disable
set wif 4 mode 1
set syslogstatus enable
set sysloghbstatus enable
set sysloghbinterval 5
set wif 4 netname london
reboot
```

Using the Command Line Interface (CLI)

Reboot Behavior

When a CLI Batch file contains a reboot command, the reboot will occur only after the entire CLI Batch file has been executed.

There are two methods of uploading the CLI Batch File:

- Upload
- Upload and reboot (this option is to be used for a CLI Batch file containing the configuration parameters that require a reboot)

CLI Batch File Error Log

If there is any error during the execution of the CLI Batch file, the AP will stop executing the file. The AP generates traps for all errors and each trap contains the following information:

- Start of execution
- Original filename of the uploaded file
- End of execution (along with the status of execution)
- Line number and description of failures that occurred during execution

The AP logs all the errors during execution and stores them in the Flash memory in a CLI Batch File Error Log named "CBFERR.LOG". The CLI Batch File Error Log can be downloaded through TFTP, HTTP, or CLI file transfer to a specified host.

B

ASCII Character Chart

You can configure WEP Encryption Keys in either Hexadecimal or ASCII format. Hexadecimal digits are 0-9 and A-F (not case sensitive). ASCII characters are 0-9, A-F, a-f (case sensitive), and punctuation marks. Each ASCII character corresponds to two hexadecimal digits.

The table below lists the ASCII characters that you can use to configure WEP Encryption Keys. It also lists the Hexadecimal equivalent for each ASCII character.

ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent
!	21	9	39	Q	51	i	69
"	22	:	3A	R	52	j	6A
#	23	;	3B	S	53	k	6B
\$	24	<	3C	T	54	l	6C
%	25	=	3D	U	55	m	6D
&	26	>	3E	V	56	n	6E
'	27	?	3F	W	57	o	6F
(	28	@	40	X	58	p	70
)	29	A	41	Y	59	q	71
*	2A	B	42	Z	5A	r	72
+	2B	C	43	[	5B	s	73
,	2C	D	44	\	5C	t	74
-	2D	E	45	]	5D	u	75
.	2E	F	46	^	5E	v	76
/	2F	G	47	_	5F	w	77
0	30	H	48	`	60	x	78
1	31	I	49	a	61	y	79
2	32	J	4A	b	62	z	7A
3	33	K	4B	c	63	{	7B
4	34	L	4C	d	64	|	7C
5	35	M	4D	e	65	}	7D
6	36	N	4E	f	66	~	7E
7	37	O	4F	g	67		
8	38	P	50	h	68		

C

Specifications

- [Software Features](#)
- [Hardware Specifications](#)
- [Radio Specifications](#)

Software Features

The tables below compare the software features available depending on the card type in the Access Point:

- [Number of Stations per BSS](#)
- [Management Functions](#)
- [Advanced Bridging Functions](#)
- [Medium Access Control \(MAC\) Functions](#)
- [Security Functions](#)
- [Network Functions](#)
- [Advanced Wireless Functions](#)

Number of Stations per BSS

Feature	AP-2000 802.11b card	AP-2000 5GHz Kit	AP-2000 11a Kit	AP-2000 802.11b/g card
Without encryption	up to 250	up to 250	up to 250	up to 250
With WEP encryption	up to 250	up to 60	up to 120	up to 120
With 802.1x Authentication	up to 50	up to 44	up to 88	up to 88
With WPA	N/A	N/A	up to 27	up to 27

Management Functions

Feature	802.11b	802.11a	802.11b/g
Web User Interface	yes	yes	yes
Telnet / CLI	yes	yes	yes
SNMP Agent	yes	yes	yes
TFTP	yes	yes	yes

Specifications

Advanced Bridging Functions

Feature	802.11b	802.11a	802.11b/g
IEEE 802.1d Bridging	yes	yes	yes
WDS Relay	yes	yes	yes
Roaming	yes	yes	yes
Protocol Filtering	yes	yes	yes
Multicast/Broadcast Storm Filtering	yes	yes	yes
Proxy ARP	yes	yes	yes
TCP/UDP Port Filtering	yes	yes	yes
Blocking Intra BSS Clients	yes	yes	yes
Packet Forwarding	yes	yes	yes

Medium Access Control (MAC) Functions

Feature	802.11b	802.11a	802.11b/g
Automatic Channel Selection (ACS)	yes	yes	yes
Dynamic Frequency Selection (DFS) ¹	N/A	yes	N/A
Closed System Feature	yes	yes	yes
Wireless Service Shutdown	yes	yes	yes
TX Power Control	N/A	Available with 802.11a upgrade kit. Not available with 5Ghz upgrade kit.	yes

Note 1: A user cannot manually select a channel for products sold in Europe; these products require automatic channel selection using [Dynamic Frequency Selection \(DFS\)](#).

Security Functions

Feature	802.11b	802.11a	802.11b/g
Security Profiles per VLAN	yes	yes	yes
RADIUS Profiles per VLAN	yes	yes	yes
IEEE 802.11 WEP ¹	yes	yes	yes
MAC Access Control	yes	yes	yes
RADIUS Based Management Access Control	yes	yes	yes
RADIUS MAC-based Access Control	yes	yes	yes
IEEE 802.1x Authentication ²	yes	yes	yes
Multiple Authentication Server Support per VLAN ⁴	yes	yes	yes
Rogue Access Point Detection	no	yes	yes
Per User Per Session (PUPS) Encryption ³	N/A	yes	yes
Wi-Fi Protected Access (WPA)	N/A	Available with 11a Upgrade Kit Not available with 5 GHz Upgrade Kit	yes

Note 1: Key lengths supported by 802.11a: 64-bit, 128-bit, and 152-bit.

Key lengths supported by 802.11b: 64-bit and 128-bit.

Key lengths supported by 802.11b/g: 64-bit, 128-bit, and 152-bit.

Note 2: EAP-MD5, EAP-TLS, EAP-TTLS, and PEAP client supplicant supported.

Note 3: Use in conjunction with WPA or 802.1x Authentication.

Note 4: Support is provided for a primary and backup RADIUS authentication server for both MAC-based authentication and 802.1x authentication.

Specifications

Network Functions

Feature	802.11b	802.11a	802.11b/g
DHCP Client	yes	yes	yes
DHCP Server	yes	yes	yes
Inter Access Point Protocol (IAPP)	yes	yes	yes
Link Integrity	yes	yes	yes
System Logging (Syslog)	yes	yes	yes
RADIUS Accounting Support ¹	yes	yes	yes
DNS Client	yes	yes	yes
TCP/IP Protocol Support	yes	yes	yes
Virtual LAN Support	One VLAN ID per wireless interface	11a Upgrade Kit: Up to 16 VLAN IDs per wireless interface 5 GHz Upgrade Kit: One VLAN ID per wireless Interface	Up to 16 VLAN IDs per wireless interface

Note 1: Includes Fallback to Primary RADIUS Server, RADIUS Session Timeout, RADIUS Multiple MAC Address Formats, RADIUS DNS Host Name Support, RADIUS Start/Stop Accounting.

Advanced Wireless Functions

Feature	802.11b	802.11a	802.11b/g
WEP Plus (Weak Key Avoidance)	yes	—	—
Remote Link Test	yes	—	—
Link Test Responder ²	yes	yes	—
Load Balancing ²	yes	yes	—
AP List ²	yes	—	—
Medium Density Distribution ³	yes	—	—
Distance between APs ³	yes	—	—
Interference Robustness	yes	—	—
SpectraLink VoIP Support	yes	—	yes

Note 1: Available only one way (AP to client) if using an ORiNOCO ComboCard or a non-ORiNOCO client.

Note 2: No client support in 802.11a or 802.11b/g.

Note 3: This feature is not available if you are using an ORiNOCO ComboCard or a non-ORiNOCO client with an 802.11b AP.

Hardware Specifications

Physical Specifications

AP-2000 Unit

Dimensions (H x W x L) = 6.5 x 18.5 x 26 cm (2.5 x 7.25 x 10.25 in.)
Weight = 1.75 Kg (3.5 lb.)

802.11a Antenna Adapter

Dimensions (H x W x L) = 11.3 x 2.10 x 26.2 cm (4.5 x 0.83 x 10.3in.)
Weight = 0.18kg (0.4lb)

Specifications

Electrical Specifications

Without Active Ethernet Module

Voltage = 100 to 240 VAC (50-60 Hz)

Current = 0.2 amp

Power Consumption = 20 Watts

With Active Ethernet Module

Input Voltage = 42 to 60 VDC

Output Current = 200mA at 48V

Power Consumption = 9-10 Watts

Environmental Specifications

AP-2000 Unit

Operating = 0° to 40°C (32° to 104 °F) @ 20 to 90% relative humidity

Transport = -40° to 60°C (-40° to 140°F) @ 15 to 95% relative humidity (no condensation allowed)

Storage = -10° to 60°C (14° to 140°F) @ 10 to 90% relative humidity (no condensation allowed)

802.11a Antenna Adapter

Operating = 0° to 70°C (32° to 158 °F) @ 20 to 90% relative humidity

Transport = -40° to 75°C (-40° to 167 °F) @ 15 to 95% relative humidity

Storage = -20° to 75°C (-4° to 167 °F) @ 10 to 95% relative humidity

Ethernet Interface

10/100 Base-TX, RJ-45 female socket

Serial Port Interface

Standard RS-232C interface with DB-9, female connector

Active Ethernet Interface

Category 5, foiled, twisted pair cables must be used to ensure compliance with FCC Part 15, subpart B, Class B requirements

Standard 802.3af pin assignments

HTTP Interface

- Microsoft Internet Explorer 6 with Service Pack 1 or later
- Netscape 6.1 or later

Radio Specifications

- [802.11a Channel Frequencies](#)
- [802.11b Channel Frequencies](#)
- [802.11g Channel Frequencies](#)
- [Wireless Communication Range](#)



NOTE

Refer to the Regulatory Flyer included with the AP for the latest regulatory information.

Specifications

802.11a Channel Frequencies

The available 802.11a Channels varies by regulatory domain and/or country. 802.11a radio certification is available in the following regions:

- FCC: U.S., Canada, and Australia
- ETSI: Europe and the United Kingdom
- TELEC: Japan
- SG: Singapore
- ASIA: China, Hong Kong, and South Korea
- TW: Taiwan

There are five sets of frequency bands that determine the available channels depending on the regulatory domain.

Some countries restrict 802.11a operation to specific frequency bands. The Web interface and CLI display the available channels for a radio's particular regulatory domain. In the CLI, any channels that are not available are labeled "Not Supported".

NOTE

The original 5 GHz Upgrade Kit only supports the Lower and Middle U-NII bands. The 11a Upgrade Kit supports all of the frequency bands described below.

Frequency Band	Channel ID	FCC (GHz)	ETSI (GHz)	TELEC (GHz)	SG (GHz)	ASIA (GHz)	TW (GHz)
Lower Band (36 = default)	34	—	—	5.170 ¹	—	—	—
	36	5.180	5.180	—	5.180	—	—
	38	—	—	5.190	—	—	—
	40	5.200	5.200	—	5.200	—	—
	42	—	—	5.210	—	—	—
	44	5.220	5.220	—	5.220	—	—
	46	—	—	5.230	—	—	—
	48	5.240	5.240	—	5.240	—	—
Middle Band (52 = default)	52	5.260	5.260	—	—	—	5.260
	56	5.280	5.280	—	—	—	5.280
	58	5.300	5.300	—	—	—	5.300
	60	5.320	5.320	—	—	—	5.320
H Band	100	—	5.500	—	—	—	—
	104	—	5.520	—	—	—	—
	108	—	5.540	—	—	—	—
	112	—	5.560	—	—	—	—
	116	—	5.580	—	—	—	—
	120	—	5.600	—	—	—	—
	124	—	5.620	—	—	—	—
	128	—	5.640	—	—	—	—
	132	—	5.660	—	—	—	—
	136	—	5.680	—	—	—	—
	140	—	5.700	—	—	—	—
Upper Band (149 = default)	149	5.745	—	—	5.745	5.745	5.745
	153	5.675	—	—	5.675	5.675	5.675
	157	5.785	—	—	5.785	5.785	5.785
	161	5.805	—	—	5.805	5.805	5.805
ISM Band	165	5.825	—	—	5.825	—	5.825

Note 1: Channel 34 is the default channel for Japan

Specifications

802.11b Channel Frequencies

The available 802.11b channels vary by regulatory domain and/or country. 802.11b radio certification is available in the following regions:

- FCC - U.S./Canada, Mexico, and Australia
- ETSI - Most of Europe, including the United Kingdom and some Eastern block countries
- MKK - Japan
- IL - Israel

Some countries restrict 802.11b operation to specific frequency bands. The web interface will always display the available channels depending in the cards regulatory domain. In the CLI, any channels that are not available are labeled "Not Supported".

Channel ID	FCC (GHz)	ETSI (GHz)	TELEC (GHz)	IL (GHz)
1	2.412	2.412	2.412	-
2	2.417	2.417	2.417	-
3	2.422	2.422	2.422	-
4	2.427	2.427	2.427	2.427
5	2.432	2.432	2.432	2.432
6	2.437	2.437	2.437	2.437
7	2.442	2.442	2.442	2.442
8	2.447	2.447	2.447	2.447
9	2.452	2.452	2.452	-
10	2.457	2.457 ¹	2.457	-
11	2.462	2.462 ¹	2.462	-
12	-	2.467 ¹	2.467	-
13	-	2.472 ¹	2.472	-
14	-	-	2.484	-

Note 1: France is restricted to these four channels.

802.11g Channel Frequencies

The available 802.11g channels vary by regulatory domain and/or country. 802.11g radio certification is available in the following regions:

- FCC - U.S./Canada, Mexico, and Australia
- ETSI - Europe and the United Kingdom
- ETSI - Europe, including the United Kingdom, China, and South Korea
- TELEC - Japan
- IL - Israel

Some countries restrict 802.11g operation to specific frequency bands. The web interface will always display the available channels depending in the cards regulatory domain. In the CLI, any channels that are not available are labeled "Not Supported".

Channel ID	FCC (GHz)	ETSI (GHz)	TELEC (GHz)	IL (GHz)
1	2.412	2.412	2.412	-
2	2.417	2.417	2.417	-
3	2.422	2.422	2.422	-
4	2.427	2.427	2.427	2.427
5	2.432	2.432	2.432	2.432
6	2.437	2.437	2.437	2.437
7	2.442	2.442	2.442	2.442
8	2.447	2.447	2.447	2.447
9	2.452	2.452	2.452	-
10	2.457	2.457 ¹	2.457	-
11	2.462	2.462 ¹	2.462	-

Specifications

Channel ID	FCC (GHz)	ETSI (GHz)	TELEC (GHz)	IL (GHz)
12	-	2.467 ¹	2.467	-
13	-	2.472 ¹	2.472	-
14	-	-	2.484 ²	-

Note 1: France is restricted to these channels.

Note 2: Channel 14 is only available when using **802.11b only** mode.

Wireless Communication Range

The range of the wireless signal is related to the composition of objects in the radio wave path and the transmit rate of the wireless communication. Communications at a lower transmit range may travel longer distances. The range values listed in the Communications Range Chart are typical distances as calculated by Proxim's development team for FCC-certified products. These values provide a rule of thumb and may vary according to the actual radio conditions at the location where the product is used.

The range of your wireless devices can be affected when the antennas are placed near metal surfaces and solid high-density materials. Range is also impacted due to "obstacles" in the signal path of the radio that may either absorb or reflect the radio signal.

In Open Office environments, antennas can "see" each other (no physical obstructions between them). In Semi-open Office environments, workspace is divided by shoulder-height, hollow wall elements; antennas are at desktop level. In a Closed Office environment, solid walls and other obstructions may affect signal strength.

The following tables show typical range values for various environments for FCC-certified products (range may differ for products certified in other regulatory domains).

802.11b

Range	11 Mbits/s	5.5 Mbits/s	2 Mbits/s	1 Mbits/s
Open Office	142 m (466 ft.)	177 m (581 ft.)	219 m (718 ft.)	272 m (892 ft.)
Semi-Open Office	98 m (322 ft.)	122 m (400 ft.)	151 m (495 ft.)	187 m (614 ft.)
Closed Office	67 m (220 ft.)	84 m (276 ft.)	104 m (341 ft.)	129 m (423 ft.)
Tx Power (dBm)	15	15	15	15
Receiver Sensitivity (dBm)	-82	-85	-88	-91
Antenna Gain	0 dBi (integrated diversity antenna module; 2.4-2.5 GHz)			

Table C-1 802.11b Wireless communication ranges

Specifications

802.11a (5 GHz Upgrade Kit)

Range	54 Mbits/s	48 Mbits/s	36 Mbits/s	24 Mbits/s	18 Mbits/s	12 Mbits/s	9 Mbits/s	6 Mbits/s
Open Office	19 m (62 ft.)	33 m (108 ft.)	55 m (180 ft.)	74 m (243 ft.)	92 m (302 ft.)	106 m (348 ft.)	122 m (400 ft.)	131 m (430 ft.)
Semi-Open Office	13 m (43 ft.)	23 m (75 ft.)	38 m (125 ft.)	51 m (167 ft.)	63 m (207 ft.)	73 m (239 ft.)	84 m (276 ft.)	90 m (295 ft.)
Closed Office	9 m (30 ft.)	16 m (52 ft.)	26 m (85 ft.)	35 m (115 ft.)	43 m (141 ft.)	50 m (164 ft.)	58 m (190 ft.)	62 m (203 ft.)
Tx Power (dBm)	7	11	14	14	14	14	14	14
Receiver Sensitivity (dBm)	-65	-69	-73	-77	-80	-82	-84	-85
Antenna Gain	3.5 dBi (integrated diversity antennas; 5.15-5.35 GHz)							

Table C-2 802.11a (5 GHz Upgrade Kit) Wireless communication ranges

802.11a (11a Upgrade Kit)

Range	54 Mbits/s	48 Mbits/s	36 Mbits/s	24 Mbits/s	18 Mbits/s	12 Mbits/s	9 Mbits/s	6 Mbits/s
Open Office	46 m (151 ft.)	62 m (203 ft.)	82 m (269 ft.)	110 m (361 ft.)	136 m (446 ft.)	169 m (554 ft.)	181 m (594 ft.)	195 m (640 ft.)
Semi-Open Office	32 m (105 ft.)	42 m (138 ft.)	57 m (187 ft.)	75 m (246 ft.)	94 m (308 ft.)	116 m (381 ft.)	125 m (410 ft.)	134 m (440 ft.)
Closed Office	22 m (72 ft.)	29 m (95 ft.)	39 m (128 ft.)	52 m (171 ft.)	64 m (210 ft.)	80 m (262 ft.)	86 m (282 ft.)	92 m (302 ft.)
Tx Power (dBm)	15	15	15	15	15	15	15	15
Receiver Sensitivity (dBm)	-69	-73	-77	-81	-84	-87	-88	-89
Antenna Gain	4 dBi (integrated diversity antennas; 5.15-5.85 GHz)							

Table C-3 802.11a (11a Upgrade Kit) Wireless communication ranges

Specifications

802.11b/g

Range	54 Mbits/s	48 Mbits/s	36 Mbits/s	24 Mbits/s	18 Mbits/s	12 Mbits/s	9 Mbits/s	6 Mbits/s	11 Mbits/s	5.5 Mbits/s	2 Mbits/s	1 Mbits/s
Open Office	56 m (184 ft.)	69 m (226 ft.)	107 m (351 ft.)	164 m (538 ft.)	219 m (718 ft.)	272 m (892 ft.)	292 m (958 ft.)	314 m (1030 ft.)	204 m (669 ft.)	236 m (774 ft.)	253 m (830 ft.)	338 m (1109 ft.)
Semi-Open Office	38 m (125 ft.)	48 m (157 ft.)	73 m (239 ft.)	113 m (371 ft.)	151 m (495 ft.)	187 m (614 ft.)	201 m (659 ft.)	216 m (709 ft.)	140 m (459 ft.)	162 m (531 ft.)	174 m (571 ft.)	232 m (761 ft.)
Closed Office	26 m (85 ft.)	33 m (108 ft.)	51 m (167 ft.)	78 m (256 ft.)	104 m (341 ft.)	129 m (423 ft.)	138 m (453 ft.)	149 m (489 ft.)	97 m (318 ft.)	111 m (364 ft.)	120 m (394 ft.)	160 m (525 ft.)
Tx Power (dBm)	12	13	14	15	15	15	15	15	15	15	15	15
Receiver Sensitivity (dBm)	-68	-70	-75	-80	-84	-87	-88	-89	-83	-85	-86	-90
Antenna Gain	3 dBi (integrated diversity antenna module; 2.4-2.5 GHz)											

Table C-4 802.11b/g Wireless communication ranges

D

Technical Support

If you are having a problem using an AP and cannot resolve it with the information in [Troubleshooting the AP-2000](#), gather the following information and contact ORiNOCO Technical Support:

- List of ORiNOCO products installed on your network; include the following:
 - Product names and quantity
 - Part numbers (P/N)
 - Serial numbers (S/N)
- List of ORiNOCO software versions installed
 - Check the HTTP interface's [Version](#) screen
 - Include the source of the software version (e.g., pre-loaded on unit, installed from CD, downloaded from Proxim Web site, etc.)
- Information about your network
 - Network operating system (e.g., Microsoft Networking); include version information
 - Protocols used by network (e.g., TCP/IP, NetBEUI, IPX/SPX, AppleTalk)
 - Ethernet frame type (e.g., 802.3, Ethernet II), if known
 - IP addressing scheme (include address range and whether static or DHCP)
 - Network speed and duplex (10 or 100 Mbits/sec; full or half duplex)
 - Type of Ethernet device that the Access Points are connected to (e.g., Active Ethernet power injector, hub, switch, etc.)
 - Type of Security enabled on the wireless network (None, WEP Encryption, 802.1x, Mixed)
- A description of the problem you are experiencing
 - What were you doing when the error occurred?
 - What error message did you see?
 - Can you reproduce the problem?
 - For each ORiNOCO product, describe the behavior of the device's LEDs when the problem occurs

You can reach ORiNOCO Technical Support as described below.



NOTE

Online support is available, and the latest software and documentation is available for download at <http://support.proxim.com>

For the U.S. and Canada:

Phone: 1-866-ORiNOCO (1-866-674-6626)

International

Phone: +1 408-542-5390

Europe, the Middle East, and Africa (EMEA):

Your local supplier in the EMEA region is trained to give you the support you require. Local suppliers have direct access to the ORiNOCO Technical Support Center and will help you in every way they can.



Statement of Warranty

Warranty Coverage

Proxim Corporation warrants that its Products are manufactured solely from new parts, conform substantially to specifications, and will be free of defects in material and workmanship for a Warranty Period of **1 year** from the date of purchase.

Repair or Replacement

In the event a Product fails to perform in accordance with its specification during the Warranty Period, Proxim offers return-to-factory repair or replacement, with a thirty (30) business-day turnaround from the date of receipt of the defective Product at a Proxim Corporation Repair Center. When Proxim has reasonably determined that a returned Product is defective and is still under Warranty, Proxim shall, at its option, either: (a) repair the defective Product; (b) replace the defective Product with a refurbished Product that is equivalent to the original; or (c) where repair or replacement cannot be accomplished, refund the price paid for the defective Product. The Warranty Period for repaired or replacement Products shall be ninety (90) days or the remainder of the original Warranty Period, whichever is longer. This constitutes Buyer's sole and exclusive remedy and Proxim's sole and exclusive liability under this Warranty.

Limitations of Warranty

The express warranties set forth in this Agreement will not apply to defects in a Product caused; (i) through no fault of Proxim during shipment to or from Buyer, (ii) by the use of software other than that provided with or installed in the Product, (iii) by the use or operation of the Product in an application or environment other than that intended or recommended by Proxim, (iv) by modifications, alterations, or repairs made to the Product by any party other than Proxim or Proxim's authorized repair partners, (v) by the Product being subjected to unusual physical or electrical stress, or (vi) by failure of Buyer to comply with any of the return procedures specified in this Statement of Warranty.

Support Procedures

Buyer should return defective LAN Products¹ within the first 30 days to the merchant from which the Products were purchased. Buyer can contact a Proxim Customer Service Center either by telephone or via web. Calls for support for Products that are near the end of their warranty period should be made not longer than seven (7) days after expiration of warranty. Repair of Products that are out of warranty will be subject to a repair fee. Contact information is shown below. Additional support information can be found at Proxim's web site at <http://support.proxim.com>.

- LAN Products¹: Domestic calls: 866-674-6626 (24 hours per day, 7 days per week)
- International calls: 408-542-5390
- WAN Products²: Domestic calls: 800-674-6626 (8:00 A.M. – 5:00 P.M, M-F Pacific Time)
- International calls: 408-542-5390

When contacting the Customer Service for support, Buyer should be prepared to provide the Product description and serial number and a description of the problem. The serial number should be on the product.

In the event the Customer Service Center determines that the problem can be corrected with a software update, Buyer might be instructed to download the update from Proxim's web site or, if that's not possible, the update will be sent to Buyer. In the event the Customer Service Center instructs Buyer to return the Product to Proxim for repair or replacement, the Customer Service Center will provide Buyer a Return Material Authorization ("RMA") number and shipping instructions. Buyer must return the defective Product to Proxim, properly packaged to prevent damage, shipping prepaid, with the RMA number prominently displayed on the outside of the container.

¹ LAN products include: ORiNOCO

² WAN products include: Lynx, Tsunami, Tsunami MP, Tsunami Quickbridge

Statement of Warranty

Calls to the Customer Service Center for reasons other than Product failure will not be accepted unless Buyer has purchased a Proxim Service Contract or the call is made within the first thirty (30) days of the Product's invoice date. Calls that are outside of the 30-day free support time will be charged a fee of \$25.00 (US Dollars) per Support Call.

If Proxim reasonably determines that a returned Product is not defective or is not covered by the terms of this Warranty, Buyer shall be charged a service charge and return shipping charges.

Other Information

Search Knowledgebase

Proxim stores all resolved problems in a solution database at the following URL: <http://support.proxim.com>.

Ask a Question or Open an Issue

Submit a question or open an issue to Proxim technical support staff at the following URL:
<http://support.proxim.com/cgi-bin/proxim.cfg/php/enduser/ask.php>.

Other Adapter Cards

Proxim does not support internal mini-PCI devices that are built into laptop computers, even if identified as "ORiNOCO" devices. Customers having such devices should contact the laptop vendor's technical support for assistance.

For support for a PCMCIA card carrying a brand name other than Proxim, ORiNOCO, Lucent, Wavelan, or Skyline, Customer should contact the brand vendor's technical support for assistance.

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Regulatory Information

This regulatory flyer contains the following sections:

- [Information to the User](#)
Read this document prior to installation!
User Documentation is provided on the CD-ROM.
- [Informations pour l'utilisateur](#)
Lisez ce document avant l'installation !
La documentation utilisateur est fournie sur le CD-ROM.
- [Informazioni per l'utente](#)
Legga questo documento prima dell'installazione.
La documentazione nella sua lingua è contenuta nel CD-ROM.
- [Informationen für den Benutzer](#)
Bitte lesen Sie dieses Dokument vor der Installation sorgfältig durch!
Die CD-ROM enthält die erforderliche Benutzerdokumentation.
- [Información para el usuario](#)
Lea este documento antes de realizar la instalación!
Encontrará la documentación del usuario en su idioma en el CD-ROM.
- [ユーザー情報](#)
インストールを始める前に、このマニュアルをお読みください。
- [Radio Approvals](#)
[Certifications radio](#)
[Omologazioni radio](#)
[Funkgenehmigungen](#)
[Permisos de utilización](#)
[無線の承認](#)

Regulatory Information

Information to the User

This document provides regulatory information for the following products:

- Wireless Client products such as the PC Card.
- Wireless Base Station products such as the AP-200, AP-700, AP-1000, AP-4000, AP-4000 11a Upgrade Kit, AP-4000 11g Cardbus Kit, AP-600 11abg Upgrade Kit, AP-2500, AP-4000, ORINOCO AP-600, AP-600 11g Upgrade Kit.

Wireless Client and Base Station products are wireless network products based on IEEE 802.11 standards for wireless LANs as defined and approved by the Institute of Electrical and Electronics Engineers. Products designed according to the IEEE 802.11a and IEEE 802.11g standards standard use Orthogonal Frequency Division Multiplexing (OFDM) radio technology. Products designed according to the IEEE 802.11b standard use Direct Sequence Spread Spectrum (DSSS) radio technology. These products are designed to be interoperable with any other wireless product that complies with the corresponding standard.

The Wireless Fidelity (Wi-Fi) certification is defined by the Wi-Fi Alliance.

IMPORTANT SAFETY INSTRUCTIONS

When using this device, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:

- a. Do not use this product near water, for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement or near a swimming pool.
- b. Avoid using this product during an electrical storm. There may be a remote risk of electric shock from lightning.
- c. Do not use this product to report a gas leak in the vicinity of the leak.

Additional Installation Requirements for Base Station products

When installing Base Stations the placement of the device must also satisfy the following installation requirements:

- a. Connect the unit to an AC wall outlet (100-240 V AC) using only the standard power cord/adaptor provided with the product.
- b. Placement must allow for easily disconnecting the power cord/adaptor of the device from the AC wall-outlet.
- c. Do not cover the device, or block the airflow to the device with any other objects. Keep the device away from excessive heat and humidity and keep the device free from vibration and dust.
- d. Installation must at all times conform to local regulations.
- e. Always disconnect the cables before opening the equipment enclosure or touching an uninsulated cable, jack or internal component.
- f. Connections to Base Station products can be made with either Unshielded Twisted Pair (UTP) or Shielded Twisted Pair cabling (STP) cabling. When using the device in combination with Power over Ethernet, only use Shielded Twisted Pair cabling (STP).

SAVE THESE INSTRUCTIONS

Regulatory Information

Wireless LAN and your Health

Wireless LAN products, like other radio devices, emit radio frequency electromagnetic energy. The level of emitted energy however is far less than the electromagnetic energy emitted by other wireless devices like mobile phones, for example. Because Wireless LAN products operate within the guidelines found in radio frequency safety standards and recommendations, we believe that our Wireless LAN products are safe for use by consumers. These standards and recommendations reflect the consensus of the scientific community and result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature.

Regulatory Information

This device must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

For country-specific radio approvals or restrictions, please consult the section '[Radio Approvals](#)' of this flyer.

In some situations or environments, the use of wireless devices may be restricted by the proprietor of the building or responsible representatives of the organization. These situations may for example include:

- Using the wireless equipment on board of airplanes, or
- In any other environment where the risk of interference to other devices or services is perceived or identified as harmful.

If you are uncertain of the policy that applies on the use of wireless equipment in a specific organization or environment (e.g. airports), you are encouraged to ask for authorization to use this device prior to turning on the equipment.

The manufacturer is not responsible for any radio or television interference caused by unauthorized modification of the devices included with this kit, or the substitution or attachment of connecting cables and equipment other than specified by manufacturer.

The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.

The manufacturer and its authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from failing to comply with these guidelines.

Regulatory Information

Informations pour l'utilisateur

Ce document fournit des informations sur les réglementations concernant les produits suivants :

- Les produits client sans fil tels que PC Card.
- Les produits sans fil de la Base Station tels que AP-200, AP-700, AP-1000, AP-4000, AP-4000 11a Upgrade Kit, AP-4000 11g Cardbus Kit, AP-600 11abg Upgrade Kit, AP-2500, AP-4000, ORiNOCO AP-600, AP-600 11g Upgrade Kit.

Les produits client et de la Base Station sont des produits pour réseaux sans fil conçus selon les normes IEEE 802.11 définies et approuvées par l'Institute of Electrical and Electronics Engineers (IEEE). Les produits conçus selon les normes IEEE 802.11b qui utilisent la technologie radio Direct Sequence Spread Spectrum (DSSS), c'est-à-dire à spectre étendu à séquence directe. Les produits conçus selon les normes IEEE 802.11a et IEEE 802.11g utilisent la technologie radio Orthogonal Frequency Division Multiplexing (OFDM), c'est-à-dire division multiplex de fréquence orthogonale. Ces produits sont conçus pour fonctionner avec n'importe quel autre produit sans fil qui est conforme à la norme correspondante.

Certification Wireless Fidelity (Wi-Fi) définie par la Wi-Fi Alliance.

⚠ INSTRUCTIONS IMPORTANTES CONCERNANT LA SECURITE

Quand vous utilisez ce dispositif, suivez toujours les précautions de sécurité élémentaires afin de réduire tout risque d'incendie, de secousse électrique et d'accident, y compris les précautions suivantes :

- a. N'utilisez pas ce produit à proximité de l'eau, par exemple près d'une baignoire, d'un lavabo, d'un évier ou d'une cuve à linge, dans un sous-sol humide ou près d'une piscine.
- b. Evitez d'utiliser ce produit en cas d'orage magnétique. Les éclairs sont susceptibles de provoquer des secousses électriques.
- c. N'utilisez pas ce produit pour signaler une fuite de gaz à proximité de la fuite elle-même.

Autres conditions d'installation des produits de la Base Station

Quand vous installez une Base Station (station de base), l'emplacement du dispositif doit également satisfaire les conditions d'installation suivantes :

- a. Branchez l'unité sur une prise murale CA (100-240 V CA) à l'aide du cordon ou de l'adaptateur d'alimentation standard fourni avec l'unité.
- b. L'emplacement choisi doit permettre de débrancher aisément le cordon ou l'adaptateur d'alimentation du dispositif de la prise murale CA.
- c. Ne couvrez pas le dispositif et ne bloquez pas le passage de l'air vers les autres objets. Tenez le dispositif éloigné de toute source de chaleur et d'humidité et à l'abri des vibrations et de la poussière.
- d. L'installation doit toujours être conforme aux réglementations locales.
- e. Débranchez toujours les câbles avant d'ouvrir l'équipement ou de toucher un câble non isolé, une prise ou un composant interne.
- f. Les connexions à une Base Station (station de base) peuvent être faites à l'aide de câblages bifilaires torsadés non blindés (Unshielded Twisted Pair ou UTP) ou de câblages bifilaires torsadés blindés (Shielded Twisted Pair ou STP). Si vous utilisez le dispositif en combinaison avec la solution Power over Ethernet, utilisez uniquement des câblages bifilaires torsadés blindés (Shielded Twisted Pair ou STP).

CONSERVEZ CES INSTRUCTIONS

Regulatory Information

Réseaux sans fil et votre santé

Les produits pour un réseau sans fil, comme d'autres dispositifs radio, émettent de l'énergie électromagnétique de fréquence radio. Le niveau d'énergie émis par les dispositifs pour réseau sans fil est toutefois beaucoup moins élevé que l'énergie électro-magnétique émise par des dispositifs comme par exemple les téléphones portables. Puisque les produits pour réseau sans fil fonctionnent selon les directives contenues dans les normes et recommandations de sécurité en matière de fréquence radio, nous considérons que l'utilisation de ces produits est sans danger pour les consommateurs. Ces normes et recommandations sont le reflet du consensus obtenu par la communauté scientifique et résultent des délibérations de groupes et de comités de scientifiques qui revoient et interprètent en permanence la masse d'écrits sur le sujet.

Informations sur les réglementations

Ce dispositif doit absolument être installé et utilisé conformément aux instructions décrites dans la documentation utilisateur fournie avec le produit.

Pour les certifications radio propres à chaque pays, veuillez consulter la section [Certifications radio](#) de ce dépliant.

Dans certaines situations ou environnements, l'utilisation des dispositifs sans fil peut être limitée par le propriétaire du bâtiment ou par les représentants responsables de la société. Ces situations comprennent par exemple :

- l'utilisation de l'équipement sans fil à bord d'avions ou
- dans tout autre environnement où le risque d'interférence avec d'autres dispositifs ou services est perçu ou identifié comme nuisible.

Si vous avez des doutes concernant l'utilisation d'équipements sans fil dans l'environnement spécifique d'une société (par ex. les aéroports), veuillez demander l'autorisation d'utiliser le dispositif avant de l'allumer.

Le fabricant n'est pas responsable des interférences radio ou télévision causées par une modification non autorisée du dispositif compris dans ce kit ou par le remplacement ou le branchement de câbles et équipements de connexion autres que ceux spécifiés par le fabricant.

La correction des interférences causées par de telles modifications, substitutions ou branchements non autorisés incombera à l'utilisateur.

Le fabricant et ses revendeurs ou distributeurs autorisés ne sont pas responsables des dégâts ou violations des réglementations gouvernementales qui peuvent découler de la non-observation de ces directives.

Regulatory Information

Informazioni per l'utente

Questo documento contiene informazioni legali relative ai seguenti prodotti:

- Prodotti client wireless come la PC Card.
- Prodotti per Base Station wireless come il AP-200, AP-700, AP-1000, AP-4000, AP-4000 11a Upgrade Kit, AP-4000 11g Cardbus Kit, AP-2500, AP-4000, ORiNOCO AP-600, AP-600 11g Upgrade Kit, AP-600 11abg Upgrade Kit.

I prodotti cliente e delle Base Station sono prodotti senza fili della rete basati su IEEE 802.11 standard come definiti ed approvati dall'Institute of Electrical and Electronics Engineers. I prodotti hanno progettato conciliare la tecnologia radiofonica Direct Sequence Spread Spectrum (DSSS) di uso standard dello IEEE 802.11b. I prodotti hanno progettato conciliare la tecnologia radiofonica Orthogonal Frequency Division Multiplexing (OFDM) (divisione multiplex di frequenza ortogonale) di uso standard dello IEEE 802.11a e IEEE 802.11g. Questi prodotti sono destinati per funzionare con qualunque altro prodotto senza fili che aderisce allo standard corrispondente.

Certificazione Wireless Fidelity (Wi-Fi), definita dalla Wi-Fi Alliance.

⚠️ NORME DI SICUREZZA IMPORTANTI

Quando si usa questo dispositivo è necessario rispettare sempre delle precauzioni di sicurezza fondamentali per ridurre il rischio di incendio, scosse elettriche o lesioni personali operando nel modo seguente:

- a. Non usare questo prodotto in prossimità di acqua, ad esempio vicino a una vasca da bagno, un lavandino, un lavello, una vasca per lavare, una piscina o in una cantina umida.
- b. Evitare di usare questo prodotto durante un temporale. Si potrebbe presentare un rischio remoto di scossa elettrica causata da un fulmine.
- c. Non usare questo prodotto per segnalare una perdita di gas nelle vicinanze della perdita stessa.

Requisiti supplementari per l'installazione dei prodotti Base Station

Le Base Station (stazioni base) vanno installate in un luogo che soddisfi anche i seguenti requisiti:

- a. Collegare l'unità a una presa murale AC (100-240 V AC) utilizzando il cavo di alimentazione/trasformatore standard in dotazione.
- b. La posizione di installazione deve consentire un facile scollegamento del cavo di alimentazione/trasformatore del dispositivo dalla presa murale AC.
- c. Non coprire il dispositivo e non ostruire il flusso d'aria verso il dispositivo con altri oggetti. Il luogo di installazione del dispositivo non deve essere vicino a fonti di calore o di umidità e non deve essere soggetto a vibrazioni o polvere.
- d. L'installazione deve rispettare pienamente le normative locali.
- e. Scollegare sempre i cavi prima di aprire l'apparecchiatura o di toccare un cavo, un connettore o un componente interno non isolato.
- f. I collegamenti al Base Station (stazioni base) possono essere effettuati con un cablaggio a coppia intrecciata non schermato (UTP) o schermato (STP). Se il dispositivo è utilizzato in combinazione con Power over Ethernet, usare solo un cablaggio a coppia intrecciata schermato (STP).

CONSERVARE QUESTE ISTRUZIONI

Regulatory Information

Wireless LAN e la salute

I prodotti LAN wireless, così come altri dispositivi radio, emettono energia elettromagnetica in radiofrequenza. L'energia emessa è tuttavia molto inferiore all'energia elettromagnetica emessa da altri dispositivi wireless come, ad esempio, i telefoni cellulari. Poiché i prodotti LAN wireless funzionano entro i limiti previsti dalle norme e dalle raccomandazioni sulla sicurezza delle emissioni in radiofrequenza, riteniamo che l'uso dei nostri prodotti LAN wireless non comporti rischi per la salute degli utenti. Queste norme e raccomandazioni riflettono il consenso della comunità scientifica e derivano da deliberazioni di gruppi e comitati di scienziati che si occupano continuamente dell'analisi e dell'interpretazione della vasta letteratura di ricerca.

Informazioni legali

Questo dispositivo deve essere installato e utilizzato nel pieno rispetto delle istruzioni fornite dal costruttore, riportate nella documentazione in dotazione al prodotto.

Per quanto riguarda le omologazioni dei prodotti radio per ciascun singolo paese, consultare la sezione [Omologazioni radio](#) di questo documento.

In alcune situazioni o in determinati ambienti, l'uso di dispositivi wireless potrebbe essere limitato dal proprietario dell'edificio o dai responsabili dell'azienda. Queste situazioni possono ad esempio includere i casi seguenti:

- Uso dell'apparecchiatura wireless a bordo di aerei, oppure
- In qualsiasi altro ambiente in cui il rischio di interferenza con altri dispositivi o servizi sia percepito o identificato come dannoso.

In caso di dubbi sulle norme relative all'uso di dispositivi radio in un ambiente specifico (es. aeroporti), si consiglia di richiedere l'autorizzazione all'uso del dispositivo prima di accendere l'apparecchiatura.

Il produttore non potrà essere ritenuto responsabile per interferenze radio o TV causate da modifiche non autorizzate apportate ai dispositivi inclusi in questo kit oppure dalla sostituzione o dal collegamento di cavi o dispositivi diversi da quelli prescritti dal produttore.

L'eliminazione delle interferenze causate da tali modifiche, sostituzioni o collegamenti non autorizzati sarà di responsabilità dell'utente.

Il produttore e i suoi rivenditori o distributori non potranno essere ritenuti responsabili per danni o violazioni di norme di legge causati dalla mancata osservanza di queste linee guida.

Regulatory Information

Informationen für den Benutzer

Dieses Dokument enthält wichtige Informationen über folgende Produkte:

- Funk-Client-Produkte wie die PC Card.
- Funk-Base Stations-Produkte wie der AP-200, AP-700, AP-1000, AP-4000, AP-4000 11a Upgrade Kit, AP-4000 11g Cardbus Kit, AP-2500, AP-4000, ORiNOCO AP-600, AP-600 11g Upgrade Kit, AP-600 11abg Upgrade Kit.

Funk-Client- und Funk-Base Stations-Produkte sind die drahtlosen Netzprodukte, die auf IEEE 802.11 Standards basieren, wie definiert und durch das Institute of Electrical and Electronics Engineers genehmigt. Produkte konzipierten das Übereinstimmen der Funktechnologie des IEEE 802.11b Standardgebrauch Direct Sequence Spread Spectrum (DSSS). Produkte konzipierten das Übereinstimmen der Radiotechnologie des IEEE 802.11a und IEEE 802.11g Standardgebrauch Orthogonal Frequency Division Multiplexing (OFDM) (orthogonalen Frequenzvielfachs). Diese Produkte sind konzipiert, um mit jedem anderen drahtlosen Produkt zu funktionieren, das mit dem entsprechenden Standard übereinstimmt.

WiFi-Zertifikat (Wireless Fidelity) der Wi-Fi Alliance.

⚠ WICHTIGE SICHERHEITSHINWEISE

Bei der Verwendung dieses Geräts sind die folgenden grundlegenden Sicherheitsvorkehrungen einzuhalten, um Gefahren wie Feuer, Stromschläge oder Personenschäden zu vermeiden:

- a. Setzen Sie dieses Gerät niemals in feuchten Umgebungen wie z. B. in der Nähe von Badewannen, Wasch- oder Spülbecken, in feuchten Kellerräumen oder in der Nähe von Swimmingpools ein.
- b. Vermeiden Sie die Verwendung des Produkts bei Gewittern. Es besteht das – wenn auch geringe – Risiko von Stromschlägen durch Blitzeinschlag.
- c. Bei Lecks in Gasleitungen: Setzen Sie das Produkt niemals in der Nähe des Lecks ein.

Weitere Installationsvoraussetzungen für Base Stationsprodukte

Bei der Installation von Base Station (Basisstationen) muss die Platzierung des Geräts außerdem folgende Installationsvoraussetzungen erfüllen:

- a. Schließen Sie das Gerät an einer Wechselstrom-Wandsteckdose (100-240 V) an. Verwenden Sie dazu das im Lieferumfang enthaltene Standardnetz kabel bzw. den Standardadapter.
- b. Bringen Sie das Gerät so an, dass das Netzkabel bzw. der Adapter jederzeit wieder leicht von der Wechselstrom-Wandsteckdose abgezogen werden kann.
- c. Decken Sie das Gerät nicht ab, und blockieren Sie nicht die Luftzufuhr. Setzen Sie das Gerät weder übermäßiger Hitze noch Feuchtigkeit, Vibrationen oder Staub aus.
- d. Beachten Sie bei der Installation stets die örtlichen Bestimmungen.
- e. Ziehen Sie immer alle Kabel vom Gerät ab, bevor Sie das Gehäuse des Geräts öffnen oder nicht isolierte Kabel, Buchsen oder interne Komponenten berühren.
- f. Die Verbindungen zum Base Station (Basisstationen) können entweder über ein un abgeschirmtes Twisted-Pair (UTP)-Kabel oder ein abgeschirmtes Twisted-Pair (Shielded Twisted Pair, STP)-Kabel hergestellt werden. Wenn Sie das Gerät zusammen mit unserer Power-over-Ethernet-Lösung einsetzen, müssen Sie immer ein abgeschirmtes Twisted-Pair (STP)-Kabel verwenden.

BEWAHREN SIE DIESE ANWEISUNGEN AN EINEM SICHEREN ORT AUF

Regulatory Information

Funk-LAN und gesundheitliche Sicherheit

Funk-LAN-Produkte geben wie alle Hochfrequenzgeräte elektromagnetische Hochfrequenzenergie ab. Bei Funk-LAN-Geräten ist jedoch eine deutlich geringere Emission elektromagnetischer Energie zu verzeichnen als bei anderen Funkgeräten, wie z. B. Mobiltelefonen. Da die Funk-LAN-Produkte den Richtlinien der HF-Sicherheitsstandards und -empfehlungen entsprechen, besteht beim Gebrauch von Funk-LAN-Produkten keine Gefährdung für den Kunden. Diese Standards und Empfehlungen basieren auf wissenschaftlichen Erkenntnissen und sind das Ergebnis von Beratungen verschiedener Wissenschaftsgremien und -komitees, die sich laufend mit der umfangreichen Forschungsliteratur beschäftigen und diese auswerten.

Rechtliche Hinweise

Die Installation und der Gebrauch dieses Geräts müssen streng nach den Anweisungen des Herstellers erfolgen, die in der Benutzerdokumentation zu diesem Produkt zu finden sind.

Die länderspezifischen Funkzulassungen finden Sie im Abschnitt [Funktenehmigungen](#) dieses Dokumentes.

In bestimmten Situationen oder Umgebungen ist der Gebrauch von Funkgeräten möglicherweise durch den Gebäudeeigentümer oder verantwortliche Personen des Unternehmens untersagt. Nicht gestattet ist zum Beispiel:

- der Betrieb von Funkgeräten an Bord eines Flugzeuges oder
- der Betrieb von Funkgeräten in jeder anderen Umgebung, in der das Risiko, dass der Betrieb oder der Empfang anderer Geräte gestört wird, besteht oder als möglich angesehen wird.

Falls Sie die Vorschriften für die Verwendung von Funkgeräten in einem bestimmten Unternehmen oder in einer bestimmten Umgebung (z. B. Flughäfen) nicht genau kennen, bitten Sie um Erlaubnis, bevor Sie das Gerät einschalten.

Der Hersteller übernimmt keine Haftung für Funk- oder Fernsehstörungen, die durch unzulässige Änderungen an den in diesem Paket enthaltenen Geräten auftreten oder durch den Austausch und Anschluss von anderen als den vom Hersteller genannten Anschlusskabeln und Geräten verursacht werden.

Die Verantwortung für die Behebung der durch ein solches Ändern, Austauschen oder Anschließen hervorgerufenen Störungen trägt der Benutzer.

Der Hersteller, seine autorisierten Händler oder Vertriebspartner haften nicht für Schäden oder Verletzungen staatlicher Vorschriften, die sich aus der Nichteinhaltung dieser Richtlinien ergeben.

Regulatory Information

Información para el usuario

Este documento incluye información sobre normativas acerca de los siguientes productos:

- Productos cliente inalámbricos como la PC Card.
- Productos de Base Station inalámbricos como el AP-200, AP-700, AP-1000, AP-4000, AP-4000 11a Upgrade Kit, AP-4000 11g Cardbus Kit, AP-2500, AP-4000, ORiNOCO AP-600, AP-600 11g Upgrade Kit, AP-600 11abg Upgrade Kit.

Los productos del cliente sin hilos y de la estación baja son productos sin hilos de la red basados en IEEE 802.11 estándares para LANs sin hilos según lo definidos y aprobados por el Institute of Electrical and Electronics Engineers. Los productos diseñaron acordar la tecnología de radio espectro ensanchado en secuencia directa (DSSS) del uso estándar de IEEE 802.11b. Los productos diseñaron acordar la tecnología de radio Orthogonal Frequency Division Multiplexing (OFDM) (multiplexación de división de frecuencia ortogonale) del uso estándar de IEEE 802.11a y IEEE 802.11g. Estos productos se diseñan para funcionar con cualquier otro producto sin hilos que se conforme con el estándar correspondiente.

La certificación Wi-Fi (Wireless Fidelity – Fidelidad inalámbrica) definida por la Wi-Fi Alliance.

INSTRUCCIONES DE SEGURIDAD IMPORTANTES

Deben cumplirse las siguientes precauciones de seguridad en el manejo de este dispositivo cuyo objetivo es reducir el riesgo de incendio, descarga eléctrica y daños personales:

- a. No utilice este producto cerca del agua, por ejemplo, cerca de una bañera, lavadero, fregadero o lavadora, en un sótano húmedo o cerca de una piscina.
- b. Evite su utilización durante una tormenta con aparato eléctrico. Existe el riesgo de una descarga eléctrica debida a los rayos.
- c. No utilice este producto para informar sobre un escape de gas cerca del mismo.

Requisitos de instalación adicionales para los productos de Base Station

En las instalaciones de Base Station (estaciones base), la colocación del dispositivo debe cumplir además los siguientes requisitos de instalación:

- a. Conecte la unidad a una toma de corriente de pared de Corriente Alterna (CA) (100-240 V CA) solo mediante el cable de alimentación estándar y/o el adaptador que se suministra con la unidad.
- b. La unidad debe colocarse de modo que se pueda desconectar el cable de alimentación o adaptador fácilmente de la toma de corriente de pared de CA.
- c. No tape la unidad ni bloquee la entrada de ventilación con ningún objeto. Mantenga la unidad apartada de fuentes de calor y humedad excesivos y en un lugar sin vibraciones ni polvo.
- d. La instalación debe cumplir en todas las ocasiones con las normas locales.
- e. Desconecte todos los cables antes de abrir la tapa o tocar cables sin aislante, enchufes o cualquier componente interno.
- f. La conexión con el Base Station (estaciones base) puede realizarse mediante un cable de par trenzado no apantallado (UTP) o un cable de par trenzado apantallado (STP). Si utiliza el dispositivo en combinación con la solución Power over Ethernet, utilice siempre un cable de par trenzado apantallado (STP).

GUARDE ESTAS INSTRUCCIONES

Regulatory Information

LAN inalámbrica y su salud

Los productos de LAN inalámbrica, al igual que otros dispositivos de radiotecnología, emiten energía electromagnética de radiofrecuencia. Sin embargo, el nivel de energía que emiten es mucho menor que la energía electromagnética emitida por otros dispositivos inalámbricos, como por ejemplo los teléfonos móviles. Debido a que los productos de LAN inalámbrica operan de conformidad con las pautas fijadas en las normas y recomendaciones de seguridad de radiofrecuencia, creemos que nuestros productos de LAN inalámbrica son seguros para los consumidores. Estas normas y recomendaciones reflejan el consenso de la comunidad científica y son el resultado de deliberaciones de grupos y comités de científicos que continuamente revisan e interpretan la extensa documentación de investigación.

Información sobre normativas

Este dispositivo debe instalarse y utilizarse siguiendo exactamente las instrucciones del fabricante incluidas en la documentación del usuario que se entrega con el producto.

El apartado [Permisos de utilización](#) de este folleto, incluye las normas específicas de cada país.

Puede que, en algunas situaciones o entornos, el propietario del edificio o los responsables de la organización restrinjan el uso de dispositivos inalámbricos. Estas situaciones pueden incluir:

- El uso del equipo inalámbrico en aviones o
- En cualquier otro entorno donde se supone o se ha determinado que el riesgo de interferencias con otros dispositivos o servicios es peligroso.

Si no está seguro de la norma que rige el uso de dispositivos inalámbricos en una organización o en un entorno específico, por ejemplo, en los aeropuertos, se recomienda que solicite autorización para utilizar el dispositivo antes de poner en marcha el equipo.

El fabricante no es responsable de ninguna interferencia de radio o televisión causada por la modificación no autorizada de los dispositivos incluidos en este kit, o la sustitución o conexión de cables y equipo no especificada por el propio fabricante.

El usuario será responsable de corregir la interferencia causada por cualquier modificación, sustitución o conexión sin autorización.

El fabricante y sus distribuidores o proveedores no son responsables de los daños o infracciones de las leyes gubernamentales que puedan producirse por el incumplimiento de estas directrices.

Regulatory Information

ユーザー情報

このマニュアルでは、次の製品に関する規制情報について説明します。

- ・ PC Card などの無線クライアント製品
- ・ AP-200, AP-700, AP-1000, AP-4000, AP-4000 11a Upgrade Kit, AP-4000 11g Cardbus Kit, AP-2500, AP-4000, ORiNOCO AP-600, AP-600 11g Upgrade Kit, AP-600 11abg Upgrade Kit, などの無線 Base Station 製品。

無線クライアントおよび Base Station 製品は、電気電子技術者協会 (IEEE) により定義・承認された無線 LAN 向け IEEE 802.11 標準に基づく無線ネットワーク製品です。IEEE 802.11a/802.11g 標準に準拠して設計された製品は、直交周波数分割多重 (OFDM) 無線技術を使用しています。IEEE 802.11b に準拠して設計された製品は、ディレクトシーケンススペクトラム拡散 (DSSS) 無線技術を使用しています。これらの製品は、各々の標準に準拠している他のすべての無線タイプの製品と相互運用性があります。

Wi-Fi Alliance によって定義された Wi-Fi (Wireless Fidelity) 認証。

⚠ 重要な安全上の指示事項

この装置を使用するときは、火災、電気ショックおよび人身への傷害の危険を軽減するために、必ず以下の安全上の基本的事項に従ってください。

- a. この製品は、浴槽、洗面台、流し台、洗濯機などのそばや、湿気のある地下室、スイミングプールなど、水を使う場所の近くでは使用しないでください。
- b. 雷雨の間は、この製品の使用を避けてください。可能性は低いですが、落雷による電気ショックの危険があります。
- c. この製品を、ガス漏れの近くで、ガス漏れの通報のために使用しないでください。

Base Station 製品に関する追加設置要件

ベースの端末装置を設置する場合は、次の設置要件も満たす必要があります。

- a. 本製品を、付属してる電源コードまたは電源アダプターで、壁の電源コンセント (100-240 V AC) に接続してください。
- b. AC 壁コンセントから電源ケーブル / アダプタをはずしやすいような位置に装置を設置します。
- c. 装置を物で覆ったり、装置の空気の流れを妨げる物を置いたりしないでください。高温多湿の場所を避けて、振動や埃のない場所に設置してください。
- d. 設置に際しては、常に各地域の規制に従ってください。
- e. 装置の覆いを開けるときや、絶縁されていないケーブル、ジャック、または内部コンポーネントに触れるときは、その前に必ずケーブルを外してください。
- f. Base Station 装置に接続するときは、非シールド型ツイステッドペア (UTP) ケーブルまたはシールド型ツイステッドペア (STP) ケーブルのいずれかを使用できます。装置を、パワーオーバーイーサネットと組み合わせて使用する場合は、シールド型ツイステッドペア (STP) ケーブルのみが使用できます。

これらの指示書を保管してください

Regulatory Information

無線 LAN と人体への影響

無線 LAN 製品は、他の無線装置と同様に、無線周波数電磁エネルギーを放出します。ただし、無線 LAN 装置が放出するエネルギーのレベルは、携帯電話などの無線装置が放出する電磁エネルギーより、はるかに低く抑えられています。無線 LAN 製品は、無線周波数に関する各種安全基準や推奨基準のガイドラインを反映するもので、広範な研究資料を検討している研究者によるパネルや委員会の審議の結果策定されています。

規制に関する情報

この装置は、製品に添付のユーザーマニュアルに記載されたメーカーの指示に従って取り付け、使用する必要があります。国ごとの無線の承認については、この冊子の**無線の承認**のセクションを参照してください。ただし、建物の所有者または組織の代表者によって無線装置の使用が規制される場合もあります。たとえば、次のような場合です。

- ・ 飛行機内での無線装置の使用
 - ・ 他の装置やサービスに対する干渉の危険性が認められるか、または有害であると考えられる環境での使用
- 空港などの特定の組織または環境で無線の使用が許可されているかどうか不明な場合は、使用前に無線装置の使用の可否を確認してください。
- このキットに含まれる装置を許可なく変更した場合、またはメーカーの指定以外の接続ケーブルおよび機器を使用した場合、ラジオまたはテレビに干渉が発生しても、メーカーは一切責任を負いません。
- 上記のような許可のない変更や、代替製品の使用または取り付けによって発生した干渉については、ユーザーの責任において修正を行うものとします。
- メーカーおよびその正規の代理店または販売店は、これらのガイドラインに従わないことによって生じる損害または法規違反については、一切責任を負いません。

Regulatory Information

United States FCC Information

Federal Communications Commission (FCC)

Declaration of Conformity

Products marked with the FCC logo and comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Operation of this device is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may cause undesired operation.



Products that contain a radio transmitter are marked with FCC ID number and may also carry the FCC logo.

Warnings

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

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

In some situations or environments, the use of wireless devices may be restricted by the proprietor of the building or responsible representatives of the organization. These situations may for example include the use of wireless equipment on board of airplanes, or in any other environment where the risk of interference to other devices or services is perceived or identified as harmful.

If you are uncertain of the policy that applies on the use of wireless equipment in a specific organization or environment (e.g. airports), you are encouraged to ask for authorization to use this device prior to turning on the equipment.

Caution: Exposure to Radio Frequency Radiation

To comply with the FCC radio frequency exposure requirements, the following antenna installation and device operating configurations must be satisfied:

- a. For client devices using an integral antenna, the separation distance between the antenna(s) and any person's body (including hands, wrists, feet and ankles) must be at least 2.5 cm (1 inch).
- b. For base stations and configurations using an approved external antenna, the separation distance between the antenna and any person's body (including hands, wrists, feet and ankles) must be at least 20 cm (8 inch).

The transmitter shall not be collocated with other transmitters or antennas.

Modifications

The FCC requires the user to be notified that any changes or modifications to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment. The correction of interference caused by unauthorized modification, substitution or attachment will be the responsibility of the user. The manufacturer and its authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from failing to comply with these guidelines.

Regulatory Information

Canada IC Information

Industry Canada (IC)

This device complies with the limits for a class B digital device and conforms to Industry Canada standard ICES-003. Products that contain a radio transmitter comply with Industry Canada standard RSS 210 and are labelled with IC approval number.

Wireless LAN products designed according the IEEE 802.11b or IEEE 802.11g standard additionally comply with Industry Canada standard RSS 139.

Cet appareil numérique de classe B est conforme à la norme ICES-003 de Industry Canada. La radio sans fil de ce dispositif est conforme à la certification RSS 210 de Industry Canada et est étiquetée avec un numéro d'approbation IC.

Les produits pour réseaux sans fil qui utilisent la norme IEEE 802.11b ou IEEE 802.11g sont en plus conformes à la certification RSS 139 de Industry Canada.

Product Safety

ETL or UL listed products conform to ANSI/UL STD.1950 certified to CAN/CSA STD C22.2 NO.950.

Les produits répertoriés ETL ou UL sont conformes à ANSI/UL STD.1950 certifiés selon la norme CAN/CSA STD C22.2 NO.950.

Regulatory Information

Europe Information

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- Products labeled with the CE mark comply with EMC Directive 89/336/EEC and the Low Voltage Directive CE
 - 73/23/EEC implying conformity to the following European Norms.
 - Tous les produits portant la marque CE sont conformes à la directive EMC 89/336/EEC et à la directive
 - 73/23/EEC sur les basses tensions qui impliquent la conformité aux normes de la Commission de la Communauté Européenne.
 - Tutti i prodotti con il marchio CE sono conformi alle direttive EMC 89/336/EEC e direttive Bassa tensione 73/23/EEC che rispetto le norme dalla Commissione della Comunità Europea.
 - Produkte mit der CE Kennzeichnung erfüllen die EMV Richtlinie 89/336/EEC sowie die Niederspannungsrichtlinie 73/23/EEC, implizieren die Erfüllung der Normen der EU-Kommission.
 - Todos los productos con la marca CE cumplen con la directiva de compatibilidad electromagnética EMC 89/336/EEC y la directiva de baja tensión 73/23/EEC y implica conformidad con las normas de la Comisión de la Unión Europea.
 - EN 60950 (IEC60950) - Product Safety
 - EN 55022 (CISPR 22) - Electromagnetic Interference
 - EN 55024 (IEC61000-4-2,3,4,5,6,8,11) - Electromagnetic Immunity
 - EN 61000-3-2 (IEC610000-3-2) - Power Line Harmonics
 - EN 61000-3-3 (IEC610000-3-3) - Power Line Flicker
-
- Products labeled with the CE 0XXX (!) contain a radio transmitter that complies with the R&TTE Directive 1999/5/EC implying conformity to the following European Norms. CE 0336 Ⓞ
 - Les produits portant la marque CE 0XXX (!) contiennent un émetteur radio conforme à la directive R&TTE 1999/5/EC qui impliquent la conformité aux normes de la Commission de la Communauté Européenne.
 - I prodotti che recano l'avvertenza CE 0XXX (!) contengono un trasmettitore radio conforme alla Direttiva R&TTE 1999/5/EC emessa dalla Commissione della Comunità Europea.
 - Funkprodukte mit der CE 0XXX (!) Kennzeichnung enthalten einen Funktransmitter, der die von der Kommission der EU verabschiedete Richtlinie R&TTE 1999/5/EC erfüllt.
 - Los productos con la marca CE 0XXX (!) contienen un transmisor de radio que cumple con la Directiva R&TTE 1999/5/EC emitida por la Comisión Europea.
 - EN 60950 (IEC60950) - Product Safety
 - ETSI EN 300328 - Radio LAN equipment operating in the 2.4 Ghz band
 - ETSI EN 301893 - Radio LAN equipment operating in the 5 Ghz band
 - ETSI EN 300826 or ETSI EN 301489-17 - General EMC requirements for radio equipment
 - To determine the type of transmitter, check the product identification label on your Wireless LAN product.
 - Pour identifier le type d'émetteur, reportez-vous à l'étiquette d'identification de votre produit.
 - Per determinare il tipo di trasmettitore, controllare la targhetta di identificazione del prodotto.
 - Um welchen Transmittertyp es sich handelt, können Sie auf dem Typenschild auf dem Produkt ablesen.
 - Para determinar el tipo de transmisor, compruebe la etiqueta de identificación del producto.

Regulatory Information

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- Proxim 802.11a Base Station products sold in Europe use a technique called Dynamic Frequency Selection (DFS) to automatically select an operating channel. The European Telecommunications Standard Institute (ETSI) requires that 802.11a devices use DFS to prevent interference with radar systems and other devices that already occupy the 5 GHz band.
 - Les produits de la Proxim 802.11a Base Station vendues en Europe utilisent une technique dénommée Sélection de fréquence dynamique (Dynamic Frequency Selection, DFS) pour qu'un canal de fonctionnement soit automatiquement choisi. Le l'institut européen des standards de télécommunications (European Telecommunications Standard Institute, ETSI) exige que les périphériques 802.11a utilisent DFS pour empêcher toute interférence avec les systèmes radar et d'autres périphériques qui occupent déjà la bande des 5 GHz.
 - Le unità Proxim 802.11a Base Station vendute in Europa impiegano una tecnologia denominata Selezione di frequenza dinamica (Dynamic Frequency Selection, DFS) per la selezione automatica del canale operativo. L'Istituto europeo di standardizzazione delle telecomunicazioni (European Telecommunications Standard Institute, ETSI) sancisce che tutti i dispositivi 802.11a devono usare la DFS per prevenire eventuali interferenze con sistemi radar ed altri dispositivi che già occupano la banda de 5 GHz.
 - Die in Europa vertriebenen Proxim 802.11a Base Station-Geräte verwenden die so genannte dynamische Frequenzwahl (Dynamic Frequency Selection, DFS), um automatisch einen gültigen Betriebskanal auszuwählen. Das European Telecommunications Standard Institute (European Telecommunications Standard Institute, ETSI) schreibt vor, dass 802.11a-Geräte DFS verwenden, um Störungen in Radarsystemen und anderen Geräten, die das 5-GHz-Band verwenden, zu vermeiden.
 - Las unidades Proxim 802.11a Base Station vendidas en Europa usan una técnica llamada Selección dinámica de frecuencias (Dynamic Frequency Selection, DFS) para seleccionar automáticamente un canal de operación. El Instituto Europeo de Normas de Telecomunicaciones (European Telecommunications Standard Institute, ETSI) requiere que los dispositivos 802.11a usen DFS para evitar las interferencias con sistemas de radar y otros dispositivos que ya ocupan la banda de 5 GHz.

Some European countries using this product may be subject to specific restrictions as listed in the [Radio Approvals](#) section.

Dans certains pays, l'utilisation du produit peut être subordonnée à des conditions spécifiques comme indiquées dans la section [Certifications radio](#).

In alcuni paesi l'uso del prodotto può essere soggetto a limitazioni specifiche, come indicato nelle sezioni [Omologazioni radio](#).

In einigen Ländern kann der Betrieb dieses Produktes bestimmten Beschränkungen unterliegen, wie sie in dem Abschnitt [Funkgenehmigungen](#).

En algunos países la utilización de este producto puede estar sujeta a restricciones concretas, tal y como se describe en el apartado [Permisos de utilización](#).

Regulatory Information

Japan Information

日本の通達

Association of Radio Industries and Businesses (ARIB)

電波産業会 (ARIB) STD-T71) 通達

このセクションは、5.15 ~ 5.25 GHz 帯域で運用されている IEEE 802.11a 準拠の送信機のみには当てはまりません。使用の際に適用される制限については、本冊子の「Radio Approvals」セクションをご覧ください。

電波産業会 (ARIB) STD-T66) 通達

このセクションは、2.4 GHz 帯域で運用されている IEEE 802.11b 準拠の送信機のみには当てはまりません。この製品は、「第二世代低電力データ通信システム」に分類され、「電子通信企業に関する法律」および「電磁波に関する法律」に規定されている「端末装置の技術基準」に適合しています。承認番号については、「Radio Approvals」セクションをご覧ください。



この製品は、ディレクトシーケンススペクトラム拡散 (DSSS) を採用しており、無線周波数帯は 2.400 ~ 2.483 MHz です。この周波数帯域は、次のような産業・科学・医療機器でも使用されています。

- ・ 電子レンジ
- ・ 次のいずれかを含む移動体識別用システム (RF-ID)
 - ・ 免許を要する構内無線局
 - ・ 免許を要しない工場製造ライン用特定小電力無線局

この装置を使用する前に、

- 1 無線 LAN 装置を使用する場所の近くに、移動体識別用システム (RF-ID) がないことを確認してください。40 メートル以内に近づくと、干渉が起きる場合があります。
- 2 移動体識別用システム (RF-ID) への RF 干渉が発生した場合は、無線信号の発信を停止するか、装置が使用する周波数チャンネルを変更してください。免許を要する移動体識別用システム (RF-ID) の付近で RF 干渉が発生した場合は、ただちに無線信号の発信を停止してください。
- 3 無線装置から移動体識別用システム (RF-ID) への干渉が発生するなどの問題が生じた場合は、正規の代理店またはメーカーまでご連絡ください。お問い合わせ先については、Web サイト <http://www.proxim.com> を参照してください。

Regulatory Information

South Korea Information

제품이름 (Product Name)	모델명 (Model Name)	제조사 (Trade Name/Manufacturer)	증명번호 (Certification No.)	증명일 (Date of Certification)	제조국가 (Made in)
PC Card	PC24E-H-FC	Agere Systems	R-LARN-01-028	2001.10.15	Taiwan
	PC24E-11-FC/R	Agere Systems	R-LARN-02-0027	2002.01.26	Taiwan
AP-500	AP-500	Agere Systems	E-E900-01-4590	2001.10.13	Taiwan
AP-600a	Alpha-1	Proxim Corporation	E-E900-03-2111 (B)	2003.05.15	Taiwan
AP-600b	Alpha-1	Proxim Corporation	E-E900-03-2111 (B)	2003.05.15	Taiwan
AP-600g	Alpha-1	Proxim Corporation	E-E900-03-2111 (B)	2003.05.15	Taiwan
AP-600abg	Alpha-1	Proxim Corporation	E-E900-03-2111 (B)	2003.05.15	Taiwan
AP-1000	AP-II E	Agere Systems	E-E900-01-4591	2001.10.13	Taiwan
AP-4000	AP-2000	Proxim Corporation	E-F900-01-5918 (B)	2003.04.07	Taiwan
AP-2500	AP-2000	Proxim Corporation	E-F900-03-1500 (B)	2003.04.07	Taiwan
AS-2000	AS-2000	Agere Systems	E-F900-02-0043 (B)	2002.01.03	Taiwan
AP-700	AP-AG-AT-01	Proxim Corporation / USI	pending	2004.XX.XX	Taiwan
AP-4000	AP-AG-AT-02	Proxim Corporation / USI	pending	2004.XX.XX	Taiwan

For Class (A) products:

Class (A) 제품용

이 제품은 업무용으로 전자파적합등록을 한 제품이오니 판매자 또는 사용자는 이점을 주의하시기 바라며, 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하기 바랍니다.

For Class (B) products:

Class (B) 제품용

이 제품은 가정용으로 전자파적합등록을 한 제품으로서 주거지역에서와 다른 지역에서도 사용할 수 있습니다

Regulatory Information

Radio Approvals

To determine whether you are allowed to use your device in the countries listed below, please check the “contains transmitter” number that is printed on the identification label of your device.

Certifications radio

Pour déterminer si vous êtes autorisé à utiliser votre dispositif dans les pays indiquées ci-dessous, veuillez contrôler le “numéro de l’émetteur” imprimé sur l’étiquette d’identification de votre dispositif.

Omologazioni radio

Per determinare se sia consentito o meno utilizzare l’apparecchiatura nei paesi sotto elencati, controllare il numero “contiene trasmettitore” impresso sulla targhetta di identificazione del dispositivo.

Funkgenehmigungen

Um festzustellen, ob Sie zum Gebrauch des Geräts in den nachfolgend aufgeführten Ländern berechtigt sind, überprüfen Sie die Transmitternummer auf dem Geräteetikett.

Permisos de utilización

Para determinar si puede utilizar el dispositivo en los países que se enumeran a continuación, compruebe el número “contiene transmisor” impreso en la etiqueta de identificación del dispositivo.

無線の承認

以下の各国において装置の使用が許可されているかどうかを判断するには、製品の識別ラベルに印刷されている「無線送信機を含む製品」番号を確認してください。

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Argentina	PC24E-H-FC	CNC: 16-2327	
	PC24E-11-FC/R	CNC: 16-2574	
Australia	PC24E-H-FC		
	PC24E-11-FC/R		
Australia	G11FNF-PC		
Australia	PC50E-8-FC/A		• For indoor use only.
	A13QBF-PC		• For indoor use only.
Australia	Alpha-1: B11FNF		
Australia	Alpha-1: G11FNF		
Australia	Alpha-1: C38WCW		• For indoor use only.
Australia	AP-700: AP-AG-AT-01		• For indoor use only.
Australia	AP-4000: AP-AG-AT-02		• For indoor use only.

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Australia	Alpha-1: A13QBF		• For indoor use only.
Austria Österreich	PC24E-H-FC	CE 0122 !	
	PC24E-H-ET-L	R0167 SRD3a	
	PC24E-H-ET		
	PC24E-11-FC/R	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-ET/R		• Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
Austria Österreich	G11FNF-PC	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	G13ENE-PC	CE 0336 !	• Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
Austria Österreich	Alpha-1: B13ENE	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne).
Austria Österreich	Alpha-1: G11FNF	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	Alpha-1: G13ENE		• Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne).

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Belgium Belgie Belgique	PC24E-H-FC	CE 0122 !	<ul style="list-style-type: none"> • For outdoor usage you may only use channels 10 and 11 (2457 and 2462 MHz). • <i>Private</i> usage outside buildings across less than 300 m public grounds requires no special registration. <i>Private</i> usage outside buildings across more than 300 m public grounds require special registration at IBPT/BIPT. • <i>Public</i> usage outside buildings requires an IBPT/BIPT licence. For registration and license please contact IBPT/BIPT. • Voor buitengebruik mag alleen kanaal 10 en 11 (2457 en 2462 MHz) worden geactiveerd. • Bij prive gebruik buiten gebouwen over minder dan 300m publiek terrein is geen vergunning nodig. Voor prive gebruik buiten gebouwen over meer dan 300m publiek terrein moet een vergunning bij IBPT/BIPT aangevraagd worden. • Bij publieke toepassingen buiten gebouwen moet een vergunning bij IBPT/BIPT aangevraagd worden. • Pour un usage extérieur vous ne devez utiliser que les canaux 10 et 11 (2457 et 2462 MHz). • L'utilisation extérieure à titre <i>privé</i> dont la portée est inférieure à 300 m de parcs publiques ne nécessite pas d'enregistrement. L'utilisation extérieure à titre <i>privé</i> dont la portée est supérieure à 300 m de parcs publiques nécessite l'enregistrement auprès de IBPT/BIPT. • L'utilisation extérieure à titre <i>publique</i> nécessite une licence par IBPT/BIPT. Pour l'enregistrement et la licence, veuillez contacter IBPT/BIPT. • Für den Einsatz im Freien sind nur die Kanäle 10 und 11 (2457 und 2462 MHz) zulässig. • Für die private Nutzung außerhalb von Gebäuden auf öffentlichem Gelände und über Entfernungen weniger als 300 m ist keine besondere Registrierung erforderlich. • Für die private Nutzung außerhalb von Gebäuden auf öffentlichem Gelände und über Entfernungen von mehr als 300 m ist eine besondere Registrierung beim IBPT/BIPT erforderlich. • Für öffentliche Einsatz ist eine besondere Registrierung beim IBPT/BIPT erforderlich.
	PC24E-H-ET-L	RTT/RL/X 113	
	PC24E-H-ET	CE 0122 !	
	PC24E-11-FC/R	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-ET/R	CE 0336 !	<ul style="list-style-type: none"> • Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.

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Belgium	Alpha-1: C38WCW	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne).
Belgium	AP-700: AP-AG-AT-01	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne).
Belgium	AP-4000: AP-AG-AT-02	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne).
Belgium Belgie Belgique	G11FNF-PC	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne).
	G13ENE-PC	CE 0336 !	
Belgium Belgie Belgique	PC50E-4-ET/A	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne).
	PC50E-8-ET/A	CE 0336 !	
	A19PCE-PC	CE 0560 !	
Belgium Belgie Belgique	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne).
Belgium Belgie Belgique	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne).
	Alpha-1: G13ENE	CE 0336 !	

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Belgium Belgie Belgique	Alpha-1: A04LAE	CE 0336 !	
	Alpha-1:A08NAE	CE 0336 !	
Brazil	PC24E-H-FC modelo: PC24E-11-FC/R Fabricante: Agere Systems Netherlands B.V.	(01) 07898903006 02 0	<ul style="list-style-type: none"> This equipment operates in secondary mode: It is not allowed to protect the equipment against harmful interference from primary mode stations or stations of the same type. It is not allowed to cause interference to systems that operate in primary mode.
Brazil	G11FNF-PC	pending	<ul style="list-style-type: none"> This equipment operates in secondary mode: It is not allowed to protect the equipment against harmful interference from primary mode stations or stations of the same type. It is not allowed to cause interference to systems that operate in primary mode.
Brazil	Alpha-1, modelo: B11FNF Fabricante: Proxim Corporation p/a Europe B.V.	(01) 07898903006 01 3	<ul style="list-style-type: none"> This equipment operates in secondary mode: It is not allowed to protect the equipment against harmful interference from primary mode stations or stations of the same type. It is not allowed to cause interference to systems that operate in primary mode.
Brazil	Alpha-1: G11FNF	pending	<ul style="list-style-type: none"> This equipment operates in secondary mode: It is not allowed to protect the equipment against harmful interference from primary mode stations or stations of the same type. It is not allowed to cause interference to systems that operate in primary mode.
Canada	PC24E-H-FC PC24-11-FC/R PC24E-11-FC/R	IC: 230391152A IC: 4005A-PC2411R IIC: 4005104679A	<ul style="list-style-type: none"> System with outdoor antenna requires license from Industry Canada. Les systèmes dotés d'une antenne extérieure nécessitent la délivrance d'une licence de la part de Industry Canada.
Canada	G11FNF-PC	IC: 1856A-G11FNFPC	<ul style="list-style-type: none"> System with outdoor antenna requires license from Industry Canada. Les systèmes dotés d'une antenne extérieure nécessitent la délivrance d'une licence de la part de Industry Canada.
Canada	C38WCW	IC: 1856A-C38WCW	<ul style="list-style-type: none"> For indoor use only. Pour usage intérieur uniquement.
Canada	AP-700: AP-AG-AT-01	IC: 4110A-APAGAT01	<ul style="list-style-type: none"> For indoor use only. Pour usage intérieur uniquement.
Canada	AP-4000: AP-AG-AT-02	IC: 4110A-APAGAT02	
Canada	PC50E-8-FC/A A13QBF-PC	IC: 4005A-PCE508A IC: 1856A-A13QBFPC	<ul style="list-style-type: none"> For indoor use only. Pour usage intérieur uniquement.

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Canada	Alpha-1: B11FNF	IC: 1856B-B11FNF	<ul style="list-style-type: none"> • Only with integral, approved Range Extender Antenna. • Pour usage avec une antenne intégrale ou amplificatrice approuvée.
Canada	Alpha-1: G11FNF	IC: 1856A-G11FNF	<ul style="list-style-type: none"> • Only with integral, approved Range Extender Antenna. • Pour usage avec une antenne intégrale ou amplificatrice approuvée.
Canada	Alpha-1: A13QBF	IC: 1856A-A13QBF	<ul style="list-style-type: none"> • For indoor use only. • Pour usage intérieur uniquement.
China	PC24E-H-FC	CMII: 2001AJ0385	
	PC24E-H-ET	CMII: 2000AJ0152	
	PC24E-11-FC/R	CMII ID: 2002DJ1380	
	PC24E-11-ET/R	CMII ID: 2002DJ1225	
China	G13ENE-PC	CMII ID: 2003DJ0807	• The use of external antennas is not allowed
China	A04VBA-PC	CMII ID: 2003AJ0806	
China	Alpha-1: B13ENE	CMII ID: 2003DJ0344 MPCI3A-20/R Agere Systems	• The use of external antennas is not allowed
China	Alpha-1: G13ENE	CMII ID: 2003DJ0604	• The use of external antennas is not allowed
China	Alpha-1: A04VBA	CMII ID: 2003AP0741	
China	Alpha-1: C38WCW	CMII ID: 2003DJ1055	• The use of external antennas is not allowed
China	AP-700: AP-AG-AT-01	CMII ID: pending	• The use of external antennas is not allowed
China	AP-4000: AP-AG-AT-02	CMII ID: pending	
Chile	PC24E-H-FC		
	PC24E-11-FC/R		
Chile	G11FNF-PC	SUBTEL 34166	
	G13ENE-PC	SUBTEL 34166	
Colombia	PC24E-H-FC		
	PC24E-11-FC/R	400399	
Colombia	G11FNF-PC		
Colombia	Alpha-1: B11FNF		
Colombia	Alpha-1: G11FNF		

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Czech Republic	PC24E-H-ET-L PC24E-H-ET	45314454	
Denmark Danmark	PC24E-H-FC PC24E-H-ET-L PC24E-H-ET	CE 0122 ! R0167 SRD3a CE 0122 !	
	PC24E-11-FC/R PC24E-11-ET/R	CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Kun til indendørs brug sammen med en integreret eller godkendt afstandsforlængerantenne.
Denmark Danmark	G11FNF-PC G13ENE-PC	CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Kun til indendørs brug sammen med en integreret eller godkendt afstandsforlængerantenne.
Denmark Danmark	PC50E-4-ET/A A19PCE-PC	CE 0336 ! CE 0560 !	<ul style="list-style-type: none"> • For indoor use only. • Nemlig til indendørs brug.
Denmark Danmark	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Kun til indendørs brug sammen med en integreret eller godkendt afstandsforlængerantenne.
Denmark Danmark	Alpha-1: G11FNF Alpha-1: G13ENE	CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Use only with approved external antennas.
Denmark	Alpha-1: C38WCW	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna • Kun til indendørs brug sammen med en integreret eller godkendt afstandsforlængerantenne.
Denmark	AP-700: AP-AG-AT-01	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna
Denmark	AP-4000: AP-AG-AT-02	CE 0560 !	<ul style="list-style-type: none"> • Kun til indendørs brug sammen med en integreret eller godkendt afstandsforlængerantenne.
Denmark Danmark	Alpha-1: A04LAE	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Nemlig til indendørs brug.
Estonia	PC24E-H-ET-L PC24E-H-ET	M9599048	

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Finland Suomi	PC24E-H-FC	CE 0122 !	
	PC24E-H-ET-L	R0167 SRD3a	
	PC24E-H-ET		
	PC24E-11-FC/R PC24E-11-ET/R	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Ainoa sisä- avulla integraali eli hyväksytty Ala Avartaa Tuntosarvi.
Finland Suomi	G11FNF-PC	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Ainoa sisä- avulla integraali eli hyväksytty Ala Avartaa Tuntosarvi.
	G13ENE-PC	CE 0336 !	<ul style="list-style-type: none"> • Ainoa sisä- avulla integraali eli hyväksytty Ala Avartaa Tuntosarvi.
Finland Suomi	PC50E-4-ET/A	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Ajaksi sisä- apu ainoa
	PC50E-8-ET/A	CE 0336 !	
	A19PCE-PC	CE 0560 !	
Finland Suomi	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Ainoa sisä- avulla integraali eli hyväksytty Ala Avartaa Tuntosarvi.
Finland Suomi	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Ainoa sisä- avulla integraali eli hyväksytty Ala Avartaa Tuntosarvi.
	Alpha-1: G13ENE	CE 0336 !	<ul style="list-style-type: none"> • Ainoa sisä- avulla integraali eli hyväksytty Ala Avartaa Tuntosarvi.
Finland Suomi	Alpha-1: C38WCW	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Ainoa sisä- avulla integraali eli hyväksytty Ala Avartaa Tuntosarvi.
Finland Suomi	AP-700: AP-AT-AG-01	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Ainoa sisä- avulla integraali eli hyväksytty Ala Avartaa Tuntosarvi.
Finland Suomi	AP-4000: AP-AT-AG-02	CE 0560 !	<ul style="list-style-type: none"> • Ainoa sisä- avulla integraali eli hyväksytty Ala Avartaa Tuntosarvi.
Finland Suomi	Alpha-1: A04LAE	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Ajaksi sisä- apu ainoa.
	Alpha-1:A08NAE	CE 0336 !	

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France	PC24E-H-FC	CE 0122 !	<ul style="list-style-type: none"> Restricted frequency band: On French territory PC24E-H-FC devices may only use channels 10 and 11 (2457 and 2462 MHz). Bande de fréquence limitée : Sur le territoire français les dispositifs PC24E-H-FC ne sont autorisés à utiliser que les canaux 10 et 11 (2457 MHz et 2462 MHz).
	PC24E-H-FR-L	99 0394 PP 0 (Dossier 97289 RD)	<ul style="list-style-type: none"> PC24E-H-FR(-L) & PC24E-H-ET(-L) devices may only use channels 10, 11,12 and 13 (2457, 2462, 2467and 2472 MHz).
	PC24E-H-FR	99 0393 PP 0 (Dossier 97290 RD)	<ul style="list-style-type: none"> It is not allowed to operate the device at any other channel as supported by the device. License required for every indoor installation (please contact ART for procedure to follow). Use outdoors is not allowed. Les dispositifs PC24E-H-FR(-L) & PC24E-H-ET(-L) ne sont autorisés à utiliser que les canaux 10, 11,12 et 13 (2457, 2462, 2467et 2472 MHz). Il est interdit d'utiliser le dispositif sur les autres canaux pris en charge par le dispositif. La licence est requise pour toute installation intérieure (veuillez contacter ART pour les procédures à suivre). Les installations extérieures sont interdites.
France	PC24E-11-FC/R	CE 0336 !	<ul style="list-style-type: none"> Only indoor with integral or approved Range Extender Antenna. Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
	PC24E-11-ET/R	CE 0336 !	
	PC24E-11-FR/R	CE 0336 !	
France	G11FNF-PC	CE 0336 !	<ul style="list-style-type: none"> Only indoor with integral or approved Range Extender Antenna. Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
	G13ENE-PC	CE 0336 !	
France	Alpha-1: C38WCW	CE 0560 !	<ul style="list-style-type: none"> Only indoor with integral or approved Range Extender Antenna. Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
France	AP-700: AP-AG-AT-01	CE 0560 !	<ul style="list-style-type: none"> Only indoor with integral or approved Range Extender Antenna.
France	AP-4000: AP-AG-AT-02	CE 0560 !	<ul style="list-style-type: none"> Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
France	PC50E-4-ET/A	CE 0336 !	<ul style="list-style-type: none"> For indoor use only. Pour usage intérieur uniquement.
	PC50E-4-ET/B	CE 0336 !	
	PC50E-4-ET/C	CE 0336 !	
	A19PCE-PC	CE 0560 !	

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France	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Restricted frequency band: On French territory B13ENE devices may only use channels 10, 11, 12, and 13 (2457, 2462, 2467 and 2472 MHz). • For WLAN hotspots, ART (Autorité de Regulation des Télécommunications) has special regulations allowing the use of other channels as well; check with ART for authorizations and local rulings. • Only indoor with integral or approved Range Extender Antenna. • Bande de fréquence limitée : Sur le territoire français les dispositifs B13ENE / G13ENE ne sont autorisés à utiliser que les canaux 10, 11, 12 et 13 (2457, 2462, 2467 et 2472 MHz). • Pour les réseaux locaux sans fil (WLAN), l'Autorité de Regulation des Télécommunications (ART) permet l'utilisation d'autres bandes de fréquence; vérifiez auprès de l'ART pour les autorisations et règlements locaux. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
France	Alpha-1: G11FNF Alpha-1: G13ENE		<ul style="list-style-type: none"> • Restricted frequency band: On French territory B13ENE devices may only use channels 10, 11, 12, and 13 (2457, 2462, 2467 and 2472 MHz). • For WLAN hotspots, ART (Autorité de Regulation des Télécommunications) has special regulations allowing the use of other channels as well; check with ART for authorizations and local rulings. • Only indoor with integral or approved Range Extender Antenna. • Bande de fréquence limitée : Sur le territoire français les dispositifs B13ENE / G13ENE ne sont autorisés à utiliser que les canaux 10, 11, 12 et 13 (2457, 2462, 2467 et 2472 MHz). • Pour les réseaux locaux sans fil (WLAN), l'Autorité de Regulation des Télécommunications (ART) permet l'utilisation d'autres bandes de fréquence; vérifiez auprès de l'ART pour les autorisations et règlements locaux. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
France	Alpha-1: A04LAE	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Pour usage intérieur uniquement.
Germany Deutschland	PC24E-H-FC PC24E-H-ET-L PC24E-H-ET	CE 0122 ! CETECOM: D810070L CETECOM: D810069L	<ul style="list-style-type: none"> • License required for outdoor installations. Check with reseller for procedure to follow. • Für Installationen im Freien ist eine Lizenz erforderlich. Nähere Informationen zur Vorgehensweise erhalten Sie bei Ihrem Händler.
	PC24E-11-FC/R PC24E-11-ET/R	CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)

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Germany Deutschland	G11FNF-PC	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
	G13ENE-PC	CE 0336 !	
Germany Deutschland	Alpha-1: C38CWC	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
	AP-700: AP-AG-AT-01	CE 0560 !	
	AP-4000: AP-AG-AT-02	CE 0560 !	
Germany Deutschland	PC50E-4-ET/A	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Nur für Innengebrauch.
	PC50E-8-ET/A	CE 0336 !	
	A19PCE-PC	CE 0560 !	
Germany Deutschland	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
Germany Deutschland	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
	Alpha-1: G13ENE	CE 0336 !	
Germany Deutschland	Alpha-1: A04LAE	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Für nur Innengebrauch.
	Alpha-1: A08NAE	CE 0336 !	
Greece	PC24E-H-FC	CE 0122 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-FC/R	CE 0336 !	
	PC24E-11-ET/R	CE 0336 !	
Greece	G11FNF-PC	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	G13ENE-PC	CE 0336 !	
Greece	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
Greece	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	Alpha-1: G13ENE	CE 0336 !	

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Hong Kong	PC24E-H-FC	LP400096	
	PC24E-H-ET	LP400095	
	PC24E-11-FC/R		
Hong Kong	Alpha-1: B13ENE	HKTA-1039	
Hong Kong	Alpha-1: A09SBS	HKTA-1039	
Hong Kong	G13ENE-PC	HKTA-1039	
Hong Kong	A19PCE-PC	HKTA-1039	
Hong Kong	Alpha-1: G13ENE	HKTA-1039	
Hong Kong	Alpha-1: C38WCW	HKTA-1039	
Hong Kong	AP-700: AP-AT-AG-01	HKTA-1039	
Hong Kong	AP-4000: AP-AT-AG-02	HKTA-1039	
Hungary	PC24E-H-FC	LA-004-1-2000/00	
	PC24E-H-ET-L	LA-005-0-2000/00	
	PC24E-H-ET	LA-004-0-2000/00	
Iceland Ísland	PC24E-H-FC	CE 0122 !	
	PC24E-H-ET-L	R0167 SRD3a	
	PC24E-H-ET		
	PC24E-11-FC/R	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
Iceland Ísland	PC24E-11-ET/R	CE 0336 !	
	G11FNF-PC	CE 0336!	• Only indoor with integral or approved Range Extender Antenna.
Iceland Ísland	G13ENE-PC	CE 0336!	
	Alpha-1: C38WCW	CE 0560!	• Only indoor with integral or approved Range Extender Antenna.
Iceland Ísland	AP-700: AP-AG-AT-01	CE 0560!	• Only indoor with integral or approved Range Extender Antenna.
Iceland Ísland	AP-4000: AP-AG-AT-02	CE 0560!	

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Iceland Island	PC50E-4-ET/A	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Fyrir inni- nota eini
	PC50E-8-ET/A	CE 0336!	
	A19PCE-PC	CE 0560 !	
Iceland Island	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
Iceland Island	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	Alpha-1: G13ENE	CE 0336 !	
Iceland Island	Alpha-1: A04LAE	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Fyrir inni- nota eini
	Alpha-1: A08NAE	CE 0336 !	
India	PC24E-H-FC PC24E-11-FC/R		India Telegraph Act 1885 requires "End User License". To obtain a license contact: The Jt. Wireless Advisor The Wireless Planning & Co-ordination Wing Ministry of Communications, Sanchar Bhavan New Delhi
Ireland	PC24E-H-FC	CE 0122 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	PC24E-H-ET-L	TRA 24/5/84/6	
	PC24E-H-ET	CE 0122 !	
	PC24E-11-FC/R PC24E-11-ET/R	CE 0336 ! CE 0336 !	
Ireland	G11FNF-PC	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	G13ENE-PC	CE 0336 !	
Ireland	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
Ireland	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	Alpha-1: G13ENE	CE 0336 !	
Israel	PC24E-11-IL/R	MoC 597-2002	<ul style="list-style-type: none"> • Restricted frequency band: only channels 4 through 8 (2418.0-2457.0 MHz) may be used in Israel. • Restricted frequency band: only channels 4 through 8 (2418.0-2457.0 MHz) may be used in Israel. • Only indoor with integral or approved Range Extender Antenna.

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Israel	G05INI-PC	MoC pending	<ul style="list-style-type: none"> • Restricted frequency band: only channels 4 through 8 (2418.0-2457.0 MHz) may be used in Israel. • Restricted frequency band: only channels 4 through 8 (2418.0-2457.0 MHz) may be used in Israel. • Only indoor with integral or approved Range Extender Antenna.
Israel	Alpha-1: B05INI	MoC pending	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
Israel	Alpha-1: G05INI	MoC pending	<ul style="list-style-type: none"> • Restricted frequency band: only channels 4 through 8 (2418.0-2457.0 MHz) may be used in Israel. • Restricted frequency band: only channels 4 through 8 (2418.0-2457.0 MHz) may be used in Israel. • Only indoor with integral or approved Range Extender Antenna.
Italy Italia	PC24E-H-FC	CE 0122 !	<ul style="list-style-type: none"> • License required for indoor use. Use with outdoor installations not allowed.
	PC24E-H-ET-L	CEPT-RLAN I DGPGF/4/2/144-03/340 367/96	<ul style="list-style-type: none"> • Licenza necessaria per uso in interno. Non è consentito l'uso in installazioni esterne
	PC24E-H-ET	CEPT-RLAN I DGPGF/4/2/144-03/340 327/774	
	PC24E-11-FC/R	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-ET/R	CE 0336 !	<ul style="list-style-type: none"> • Solo per interni con Antenna Range Extender integrale o approvata.
Italy Italia	G11FNF-PC	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	G13ENE-PC	CE 0336 !	<ul style="list-style-type: none"> • Solo per interni con Antenna Range Extender integrale o approvata.
Italy Italia	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Solo per interni con Antenna Range Extender integrale o approvata.
Italy Italia	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	Alpha-1: G13ENE	CE 0336 !	<ul style="list-style-type: none"> • Solo per interni con Antenna Range Extender integrale o approvata.

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Japan 日本	PC24E-H-FC	TELEC: NYCA0010	JATE: D99-1057JP
	PC24E-H-JP	TELEC: NYCA0008 TELEC: GZCA0007	
	PC24E-H-ET-L	TELEC: NYCA00024	
	PC24E-11-FC/R	TELEC: 01NYDA1121	JATE: D01-1128JP
	PC24E-11-JP/R	TELEC: 01NYDA1122	
Japan 日本	G13GNJ-PC	TELEC: 03YNDA0185 TELEC: 03GZDA0150	
Japan 日本	PC50E-4-JP/A	TELEC: 01WYBA1051	• For indoor use only. • 屋内使用のみ
	A04LEJ-PC	TELEC: 03WYBA0048	
Japan 日本	Alpha-1: B14GNJ	TELEC: 03NYDA0130 TELEC: 03GZDA0079	• Only indoor with integral or approved Range Extender Antenna. • 内蔵、あるいは認可された範囲拡張アンテナを使った、屋内の使用に（限定）されています。
Japan 日本	Alpha-1: G13GNJ	TELEC: 03YNDA0190 TELEC: 03GZDA0154	• Only indoor with integral or approved Range Extender Antenna. • 内蔵、あるいは認可された範囲拡張アンテナを使った、屋内の使用に（限定）されています。
Japan 日本	Alpha-1: A04LEJ	TELEC: 03WYBA0025	• For indoor use only. • 屋内使用のみ
Japan 日本	Alpha-1: C38WCW	TELEC: 003NY03042 0000 TELEC: 003GZ03027 0000 TELEC: 003WY03015 0000	• Only indoor with integral or approved Range Extender Antenna. • 内蔵、あるいは認可された範囲拡張アンテナを使った、屋内の使用に（限定）されています。
Japan 日本	AP-700: AP-AG-AT-01	TELEC: pending TELEC: pending TELEC: pending	• Only indoor with integral or approved Range Extender Antenna. • 内蔵、あるいは認可された範囲拡張アンテナを使った、屋内の使用に（限定）されています。
Japan 日本	AP-4000: AP-AG-AT-02	TELEC: pending TELEC: pending TELEC: pending	•
Korea	PC24E-H-FC	MIC: R-LARN-01-028 Certification date: 2002.10.15	Product name: PC Card Manufacturer: Agere Systems Made in: Taiwan
	PC24E-11-FC/R	MIC: R-LARN-02-0027 Certification date: 2002.01.26	
Korea	G11FNF-PC	MIC: R-LARN-03-0238 Certification date: 2003.05.29	Product name: PC Card Manufacturer: Proxim Corporation Made in: Taiwan

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Korea	A04VBA-PC	MIC: R-LARN-03-0248 Certification date: 2003.06-04	Product name: PC Card Manufacturer: Proxim Corporation Made in: Taiwan
Korea	Alpha-1: B13ENE	MIC: R-LARN-03-0209 Certification date: 2003.05.13	Product name: PC Card Manufacturer: Proxim Corporation Made in: Taiwan
Korea	Alpha-1: G11FNF	MIC: R-LARN-03-0230 Certification date: 2003.05.23	Product name: PC Card Manufacturer: Proxim Corporation Made in: Taiwan
Korea	Alpha-1: C38WCW	MIC: R-LARN-03-0366 Certification date: 2003.08.29	Product name: PC Card Manufacturer: Proxim Corporation Made in: Taiwan
Korea	AP-700: AP-AG-AT-01	MIC: pending Certification date: 2004.XX.XX	Product name: Access Point Manufacturer: Proxim Corporation Made in: Taiwan
Korea	AP-4000: AP-AG-AT-02	MIC: pending Certification date: 2004.XX.XX	
Korea	Alpha-1: A04VBA	MIC: R-LARN-03-208 Certification date: 2003.05.13	Product name: PC Card Manufacturer: Proxim Corporation Made in: Taiwan
Liechtenstein	PC24E-H-FC	CE 0122 ! R&TTE Directive 1999/5/EC	
	PC24E-11-FC/R	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-ET/R		• Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
Liechtenstein	G11FNF-PC	CE 0336!	• Only indoor with integral or approved Range Extender Antenna.
	G13ENE-PC	CE 0336!	• Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
Liechtenstein	PC50E-4-ET/A	CE 0336 !	• For indoor use only.
	A19PCE-PC	CE 0560 !	• Nur für Innengebrauch.
Liechtenstein	Alpha-1: C38WCW	CE 0560!	• Only indoor with integral or approved Range Extender Antenna.
			• Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)

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Liechtenstein	AP-700: AP-AG-AT-01	CE 0560!	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
Liechtenstein	AP-4000: AP-AG-AT-02	CE 0560!	<ul style="list-style-type: none"> • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
Liechtenstein	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
Liechtenstein	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	Alpha-1: G13ENE	CE 0336 !	<ul style="list-style-type: none"> • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne)
Liechtenstein	Alpha-1: A04LAE	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Für nur Innengebrauch.
Lithuania	PC24E-H-FC	14E911 Nr. 0225	
	PC24E-H-ET-L	14E911 Nr. 0225	
	PC24E-H-ET		
Luxemburg Luxembourg	PC24E-H-FC	CE 0122 !	
	PC24E-H-ET-L	L 2490/10585-01J	
	PC24E-H-ET	L 2490/10584-01J	
	PC24E-11-FC/R	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-ET/R	CE 0336 !	<ul style="list-style-type: none"> • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
Luxemburg Luxembourg	G11FNF-PC	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
Luxemburg Luxembourg	Alpha-1: C38WCW	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
Luxemburg Luxembourg	AP-700: AP-AG-AT-01	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna.
Luxemburg Luxembourg	AP-4000: AP-AG-AT-02	CE 0560 !	<ul style="list-style-type: none"> • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.

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Luxemburg Luxembourg	PC50E-4-ET/A	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Pour usage intérieur uniquement.
	PC50E-8-ET/A	CE 0336 !	
	A19PCE-PC	CE 0560 !	
Luxemburg Luxembourg	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
Luxemburg Luxembourg	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée.
	Alpha-1: G13ENE	CE 0336 !	
Luxemburg Luxembourg	Alpha-1: A04LAE	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Pour usage intérieur uniquement.
	Alpha-1: A08NAE	CE 0336 !	
Mexico México	PC-24E-H-FC	COFETEL: RCPLUWA99-660	<ul style="list-style-type: none"> • On Mexican territory wireless devices may only use channel 11 (2450.0-2483.5 MHz), however for indoors use there are no restrictions on for using all channels, because use of this equipment in Mexico is on secondary basis. • En el territorio mexicano, los dispositivos inalámbricos sólo pueden usar el canal 11 (2450,0-2483,5 MHz), pero no hay restriccion para el uso de estos equipos dentro de areas cerradas porque operan con frecuencia de uso secundario. Para uso en areas abiertas, la banda de frecuencia esta restringida.
	PC24E-11-FC/R	COFETEL: RCPLUPC01-498-A2	
Mexico México	G11FNF-PC	COFETEL: RCPPRG103-249	<ul style="list-style-type: none"> • On Mexican territory wireless devices may only use channel 11 (2450.0-2483.5 MHz), however for indoors use there are no restrictions on for using all channels, because use of this equipment in Mexico is on secondary basis. • En el territorio mexicano, los dispositivos inalámbricos sólo pueden usar el canal 11 (2450,0-2483,5 MHz), pero no hay restriccion para el uso de estos equipos dentro de areas cerradas porque operan con frecuencia de uso secundario. Para uso en areas abiertas, la banda de frecuencia esta restringida.
Mexico México	PC50E-8-FC/A	COFETEL: RTIPRPC02-369	<ul style="list-style-type: none"> • For indoor use only. • Para el uso interior sólo.
	A13QBF-PC	COFETEL: RTIPRA103-310	

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Mexico México	Alpha-1: B11FNF	COFETEL: PCPPRAL03-095	<ul style="list-style-type: none"> On Mexican territory wireless devices may only use channel 11 (2450.0-2483.5 MHz), however for indoors use there are no restrictions on for using all channels, because use of this equipment in Mexico is on secondary basis. En el territorio mexicano, los dispositivos inalámbricos sólo pueden usar el canal 11 (2450,0-2483,5 MHz), pero no hay restriccion para el uso de estos equipos dentro de areas cerradas porque operan con frecuencia de uso secundario. Para uso en areas abiertas, la banda de frecuencia esta restringida.
Mexico México	Alpha-1: G11FNF	COFETEL: PCPPRG103-250	<ul style="list-style-type: none"> On Mexican territory wireless devices may only use channel 11 (2450.0-2483.5 MHz), however for indoors use there are no restrictions on for using all channels, because use of this equipment in Mexico is on secondary basis. En el territorio mexicano, los dispositivos inalámbricos sólo pueden usar el canal 11 (2450,0-2483,5 MHz), pero no hay restriccion para el uso de estos equipos dentro de areas cerradas porque operan con frecuencia de uso secundario. Para uso en areas abiertas, la banda de frecuencia esta restringida.
Mexico México	Alpha-1: C38WCW	COFETEL: PRTIPRC303-088-A1	<ul style="list-style-type: none"> On Mexican territory wireless devices may only use channel 11 (2450.0-2483.5 MHz), however for indoors use there are no restrictions on for using all channels, because use of this equipment in Mexico is on secondary basis. En el territorio mexicano, los dispositivos inalámbricos sólo pueden usar el canal 11 (2450,0-2483,5 MHz), pero no hay restriccion para el uso de estos equipos dentro de areas cerradas porque operan con frecuencia de uso secundario. Para uso en areas abiertas, la banda de frecuencia esta restringida.
Mexico México	AP-700: AP-AG-AT-01	COFETEL: RCPPRAP03-537	<ul style="list-style-type: none"> On Mexican territory wireless devices may only use channel 11 (2450.0-2483.5 MHz), however for indoors use there are no restrictions on for using all channels, because use of this equipment in Mexico is on secondary basis. En el territorio mexicano, los dispositivos inalámbricos sólo pueden usar el canal 11 (2450,0-2483,5 MHz), pero no hay restriccion para el uso de estos equipos dentro de areas cerradas porque operan con frecuencia de uso secundario. Para uso en areas abiertas, la banda de frecuencia esta restringida.
Mexico México	AP-4000: AP-AG-AT-02	COFETEL: RCPPRAP03-537	
Mexico México	Alpha-1: A13QBF	COFETEL: PTIPRAL03-094	<ul style="list-style-type: none"> For indoor use only. Para el uso interior sólo.

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Netherlands Nederland	PC24E-H-FC	CE 0122 ! No 67	• License required for outdoor installations. Check with reseller for procedure to follow.
	PC24E-H-ET-L	R0167 SDR3a; NL99061474 HDTP/RDR/485997	• Vergunning vereist voor buiteninstallatie. Raadpleeg de doorverkoper voor te volgen procedures.
	PC24E-H-ET	CE 0122 !	
	PC24E-11-FC/R	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-ET/R	CE 0336 !	• Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne.
Netherlands Nederland	G11FNF-PC	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	G13ENE-PC	CE 0336 !	• Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne.
Netherlands Nederland	PC50E-4-ET/A	CE 0336 !	• For indoor use only.
	PC50E-4-ET/B	CE 0336 !	• Alleen voor gebruik binnen.
	PC50E-4-ET/C	CE 0336 !	
	PC50E-8-ET/A	CE 0336 !	
	A19PCE-PC	CE 0560 !	
Netherlands Nederland	Alpha-1: B13ENE	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna. • Alleen voor gebruik binnenshuis met ingebouwde of goedgekeurde reikwijdteversterkerantenne.
Netherlands Nederland	Alpha-1: G11FNF	CE 0336 !	• Only with approved Range Extender Antenna.
	Alpha-1: G13ENE	CE 0336 !	• Alleen gebruiken met goedgekeurde externe antenne.
Netherlands Nederland	Alpha-1: C38WCW	CE 0560 !	• Only indoor with integral or approved Range Extender Antenna. • Alleen binnen te gebruiken met goedgekeurde Externe Antenne.
Netherlands Nederland	AP-700: AP-AG-AT-01	CE 0560 !	• Only indoor with integral or approved Range Extender Antenna.
Netherlands Nederland	AP-4000: AP-AG-AT-02	CE 0560 !	• Alleen binnen te gebruiken met goedgekeurde Externe Antenne.
Netherlands Nederland	Alpha-1: A04LAE	CE 0336 !	• For indoor use only.
	Alpha-1: A08NAE	CE 0336 !	• Alleen voor gebruik binnen.

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New Zealand	PC24E-H-FC	RFS	
	PC24E-11-FC/R	ENG 3/2/RFS29	
	PC24E-H-ET-L	RFS	
	PC24E-H-ET		
	PC24E-11-ET/R	ENG 3/2/RFS29	
Norway Norsk	PC24E-H-FC	CE 0122 !	
	PC24E-H-ET-L	R0167 SRD3a	
	PC24E-H-ET		
	PC24E-11-FC/R	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-ET/R		• Bare innendørs med integral eller godkjent antenne med utvidet rekkevidde.
Norway Norsk	G11FNF-PC	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	G13ENE-PC	CE 0336 !	• Bare innendørs med integral eller godkjent antenne med utvidet rekkevidde.
Norway Norsk	Alpha-1: C38WCW	CE 0560 !	• Only indoor with integral or approved Range Extender Antenna. • Bare innendørs med integral eller godkjent antenne med utvidet rekkevidde.
Norway Norsk	AP-700: AP-AG-AT-01	CE 0560 !	• Only indoor with integral or approved Range Extender Antenna.
Norway Norsk	AP-4000: AP-AG-AT-02	CE 0560 !	• Bare innendørs med integral eller godkjent antenne med utvidet rekkevidde.
Norway Norsk	PC50E-4-ET/A	CE 0336 !	• For indoor use only.
	A19PCE-PC	CE 0560 !	• Bruk bare innenfor
Norway Norsk	Alpha-1: B13ENE	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna. • Bare innendørs med integral eller godkjent antenne med utvidet rekkevidde.
Norway Norsk	Alpha-1: G11FNF	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	Alpha-1: G13ENE	CE 0336 !	• Bare innendørs med integral eller godkjent antenne med utvidet rekkevidde.
Norway Norsk	Alpha-1: A04LAE	CE 0336 !	• For indoor use only. • Bruk bare innenfor.
Peru	PC24E-H-FC	AVBS1816	

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Poland	PC24E-H-FC	688/2000	
	PC24E-H-FC/R	072/2002	
	PC24E-H-ET-L		
	PC24E-H-ET		
	PC24E-H-ET/R	072/2002	
Portugal	PC24E-H-FC	CE 0122 !	
	PC24E-11-FC/R	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-ET/R		• Somente indoor com a antena integral ou aprovada do extender da escala.
Portugal	G11FNF-PC	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	G13ENE-PC	CE 0336 !	• Somente indoor com a antena integral ou aprovada do extender da escala.
Portugal	Alpha-1: C38WCW	CE 0560 !	• Only indoor with integral or approved Range Extender Antenna. • Somente indoor com a antena integral ou aprovada do extender da escala.
Portugal	AP-700: AP-AG-AT-01	CE 0560 !	• Only indoor with integral or approved Range Extender Antenna.
Portugal	AP-4000: AP-AG-AT-02	CE 0560 !	• Somente indoor com a antena integral ou aprovada do extender da escala.
Portugal	PC50E-4-ET/A	CE 0336 !	• For indoor use only.
	A19PCE-PC	CE 0560 !	• Para dentro de casa usar apenas
Portugal	Alpha-1: B13ENE	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna. • Somente indoor com a antena integral ou aprovada do extender da escala.
Portugal	Alpha-1: G11FNF	CE 0336 !	•
	Alpha-1: G13ENE	CE 0336 !	
Portugal	Alpha-1: A04LAE	CE 0336 !	• For indoor use only. • Para dentro de casa usar apenas
Russia	G11FNF-PC	GOST ME96	•
	G13ENE-PC	GOST ME96	

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Saudi Arabia	PC24E-H-FC	Reference 10/36 of 18-3-2002	
	PC24E-11-FC/R	Reference 10/36 of 18-3-2002	
	PC24E-H-ET	Reference 10/36 of 18-3-2002	
	PC24E-H-ET-L	Reference 10/36 of 18-3-2002	
	PC24E-11ET/R	Reference 10/36 of 18-3-2002	
Saudi Arabia	G11FNF-PC	Reference 1355 HT/T	
	G13ENE-PC	Reference 1355 HT/T	
Singapore	PC24E-H-FC	IDA: PMREQ-0267-2000	• This equipment is allowed for use in a confined area of a building as well as in localized on-site operation.
	PC24E-11-FC/R	IDA: PMREQ-0029-2002	
	PC24E-H-ET	IDA: PMREQ-WLAN-B-0934-99	
	PC24E-11-ET/R	IDA: PMREQ-0030-2002	
Singapore	G13ENE-PC	IDA: PMREQ-0693-2003	• This equipment is allowed for use in a confined area of a building as well as in localized on-site operation.
Singapore	PC50E-4-FC/A	IDA: PMREQ-0634-2002	• This equipment is allowed for use in a confined area of a building as well as in localized on-site operation.
	A09SBS-PC	IDA: PMREQ-0122-2003	
Singapore	Alpha-1: B13ENE	IDA: PMREQ-0121-2003	• This equipment is allowed for use in a confined area of a building as well as in localized on-site operation.
Singapore	Alpha-1: G13ENE	IDA: PMREQ-0688-2003	• This equipment is allowed for use in a confined area of a building as well as in localized on-site operation.
Singapore	Alpha-1: C38WCW	IDA: pending	• This equipment is allowed for use in a confined area of a building as well as in localized on-site operation.
Singapore	AP-700: AP-AG-AT-01	IDA: pending	• This equipment is allowed for use in a confined area of a building as well as in localized on-site operation.
Singapore	AP-4000: AP-AG-AT-02	IDA: pending	
Singapore	Alpha-1: A09SBS		• This equipment is allowed for use in a confined area of a building as well as in localized on-site operation.

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South Africa	PC24E-H-FC PC24E-H-ET-L PC24E-H-ET		
South Africa	G11FNF-PC G13ENE-PC	ICASA: TA-2003/93 ICASA: TA-2003/93	
Spain España	PC24E-H-FC PC24E-H-ET-L PC24E-H-ET PC24E-11-FC/R PC24E-11-ET/R	CE 0122 ! 01 00 0196 01 00 0195 CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Sólo en interiores, con antena integrada o antena de extensión de alcance aprobada
Spain España	G11FNF-PC G13ENE-PC	CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Sólo en interiores, con antena integrada o antena de extensión de alcance aprobada.
Spain España	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Sólo en interiores, con antena integrada o antena de extensión de alcance aprobada
Spain España	Alpha-1: G11FNF Alpha-1: G13ENE	CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Sólo en interiores, con antena integrada o antena de extensión de alcance aprobada
Spain España	AP-700: AP-AG-AT-01	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Sólo en interiores, con antena integrada o antena de extensión de alcance aprobada
Spain España	AP-4000: AP-AG-AT-02	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Sólo en interiores, con antena integrada o antena de extensión de alcance aprobada
Sweden Sverige	PC24E-H-FC PC24E-H-ET-L PC24E-H-ET PC24E-11-FC/R PC24E-11-ET/R	CE 0122 ! Ue990137 CE 0122 ! CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Endast inomhus med integrerad antenn eller godkänd antenn med längre räckvidd.

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Sweden Sverige	G11FNF-PC	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Endast inomhus med integrerad antenn eller godkänd antenn med längre räckvidd.
	G13ENE-PC	CE 0336 !	
Sweden Sverige	Alpha-1: C38WCW	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Endast inomhus med integrerad antenn eller godkänd antenn med längre räckvidd.
Sweden Sverige	AP-700: AP-AG-AT-01	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Endast inomhus med integrerad antenn eller godkänd antenn med längre räckvidd.
Sweden Sverige	AP-4000: AP-AG-AT-02	CE 0560 !	
Sweden Sverige	PC50E-4-ET/A	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • För indoor använda bara.
	PC50E-4-ET/B	CE 0336 !	
	PC50E-4-ET/C	CE 0336 !	
Sweden Sverige	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Endast inomhus med integrerad antenn eller godkänd antenn med längre räckvidd.
Sweden Sverige	Alpha-1: G11FNF	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Endast inomhus med integrerad antenn eller godkänd antenn med längre räckvidd.
	Alpha-1: G13ENE	CE 0336 !	
Sweden Sverige	Alpha-1: A04LAE	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • För indoor använda bara.
Switzerland Suisse Schweiz Svizzera	PC24E-H-FC	CE 0122 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne). • Solo per interni con Antenna Range Extender integrale o approvata.
	PC24E-H-ET-L	BAKOM 99.0538.L.P	
	PC24E-H-ET	CE 0122 !	
	PC24E-11-FC/R	CE 0336 !	
	PC24E-11-ET/R	CE-0336 !	

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Switzerland Suisse Schweiz Svizzera	G11FNF-PC G13ENE-PC	CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne). • Solo per interni con Antenna Range Extender integrale o approvata.
Switzerland Suisse Schweiz Svizzera	PC50E-4-ET/A A19PCE-PC	CE 0336 ! CE 0560 !	<ul style="list-style-type: none"> • For indoor use only. • Pour usage intérieur uniquement. • Nur für Innengebrauch. • Per uso interno solo.
Switzerland Suisse Schweiz Svizzera	Alpha-1: B13ENE	CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne). • Solo per interni con Antenna Range Extender integrale o approvata.
Switzerland Suisse Schweiz Svizzera	Alpha-1: G11FNF Alpha-1: G13ENE	CE 0336 ! CE 0336 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne). • Solo per interni con Antenna Range Extender integrale o approvata.
Switzerland Suisse Schweiz Svizzera	Alpha-1: C38WCW	CE 0560 !	<ul style="list-style-type: none"> • Only indoor with integral or approved Range Extender Antenna. • Pour usage intérieur uniquement, avec une antenne intégrale ou amplificatrice approuvée. • Nur zum Einsatz innerhalb von Gebäuden (mit der integrierten Antenne oder einer zugelassenen Reichweitenverstärkerantenne). • Solo per interni con Antenna Range Extender integrale o approvata.

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Switzerland Suisse Schweiz Svizzera	AP-700: AP-AG-AT-01	CE 0560 !	<ul style="list-style-type: none"> • For indoor use only. • Pour usage intérieur uniquement. • Nur für Innengebrauch. • Per uso interno solo.
Switzerland Suisse Schweiz Svizzera	AP-4000: AP-AG-AT-02	CE 0560 !	
Switzerland Suisse Schweiz Svizzera	Alpha-1: A04LAE	CE 0336 !	<ul style="list-style-type: none"> • For indoor use only. • Pour usage intérieur uniquement. • Nur für Innengebrauch. • Per uso interno solo.
Thailand	PC24E-H-ET	0704/4184	
Thailand	Alpha-1: G13ENE	4937	
Thailand	G11FNF-PC	5361	
Thailand	G13ENE-PC	5361	
Taiwan	PC24E-H-FC	DGT: 89LP0064 (98-7-24)	
	PC24E-11-FC/R	DGT: 91LP0025 (91-2-5)	BSMI 3912A213
Taiwan	G11FNF-PC	DGT: 92LP0349	
Taiwan	A09TBT-PC	DGT: 92LP0444	
Taiwan	Alpha-1: B11FNF	DGT: 92LP0275	
Taiwan	Alpha-1: G13FNF	DGT: 92LP0350	
Taiwan	Alpha-1: C38WCW	DGT: 92LP0607	
Taiwan	AP-700: AP-AT-AG-01	DGT: pending	
Taiwan	AP-4000: AP-AT-AG-02	DGT: pending	
Taiwan	Alpha-1: A09TBT	DGT: 92LP0276	

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United Kingdom	PC24E-H-FC	CE 0122 !	
	PC24E-H-ET-L	R0167 SRD3a	
	PC24E-H-ET	CE 0122 !	
	PC24E-11-FC/R	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	PC24E-11-ET/R	CE 0336 !	
United Kingdom	G11FNF-PC	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	G13ENE-PC	CE 0336 !	
United Kingdom	Alpha-1: C38WCW	CE 0560 !	• Only indoor with integral or approved Range Extender Antenna.
United Kingdom	AP-700: AP-AT-AG-01	CE 0560 !	• Only indoor with integral or approved Range Extender Antenna.
United Kingdom	AP-4000: AP-AT-AG-02	CE 0560 !	
United Kingdom	PC50E-4-ET/A	CE 0336 !	• For indoor use only.
	PC50E-8-ET/A	CE 0336 !	
	A19PCE-PC	CE 0560 !	
United Kingdom	Alpha-1: B13ENE	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
United Kingdom	Alpha-1: A04LAE	CE 0336 !	• For indoor use only.
	Alpha-1: A08NAE	CE 0336 !	
United Kingdom	Alpha-1: G11FNF	CE 0336 !	• Only indoor with integral or approved Range Extender Antenna.
	Alpha-1: G13ENE	CE 0336 !	
USA	PC24E-H-FC	FCC ID: IMRWLPCE24H	
	PC24E-11-FC/R	FCC ID: IMRWLPCE2411R	• Only indoor with integral or approved Range Extender Antenna.
	PC24-11-FC/R	FCC ID: IMRWLPC2411R	
USA	G11FNF-PC	FCC ID: HZB-G11FNFPC	• Only indoor with integral or approved Range Extender Antenna.
USA	PC50E-8-FC/A	FCC ID: IMRWLPCE508A	• For indoor use only.
	A13QBF-PC	FCC ID: HZB-A13QBFPC	

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USA	Alpha-1: B11FNF	FCC ID: HZB-B11FNF	
USA	Alpha-1: G11FNF	FCC ID: HZB-G11FNF	
USA	Alpha-1: A13QBF	FCC ID: HZB-A13QBF	• For indoor use only.
USA	Alpha-1: C38WCW	FCC ID: HZB-C38WCW	• For indoor use only.
USA	AP-700: AP-AG-AT-01	FCC ID: IXMAPAGAT01	• For indoor use only. • For indoor use only.
USA	AP-4000: AP-AG-AT-02	FCC ID: IXMAPAGAT01	
Venezuela	PC24E-11-FC/R	CONATEL: 01388301	

For Radio Type Numbers with the format **PCxxE-y-zz**:

xx =24 identifies a IEEE 802.11b compliant WLAN radio product for the 2.4 GHz frequency band.

50 identifies a IEEE 802.11a compliant WLAN radio product for the 5 GHz frequency band.

E = optional identifier to indicate that the transmitter has an integral antenna.

y =H or **11** identifies a transmitter that supports high speed data transfer of 11, 5.5, 2 and 1 Mbps.

4 or **8** identifies the number of channels.

zz =FC or **FC/R** identifies a 11 channel FCC compliant 'worldcard' restricted to operate in the 2.412 - 2.462 GHz frequency band.

FC/A identifies a IEEE 802.11a radio transmitter compliant with the FCC rules.

ET or **ET/R** identifies a 13 channel radio transmitter compliant with the European Union regulations.

ET/A or **ET/B** or **ET/C** identifies a IEEE 802.11a radio transmitter, compliant with the European Union regulations.

FR or **FR/R** identifies a radio transmitter compliant with the French regulations.

JP or **JP/R** identifies a 14 channel radio transmitter compliant with the Japanese regulations.

JP/A identifies a IEEE 802.11a radio transmitter compliant with the Japanese regulations.

For Radio Type Numbers with the format **qrrss**:

q =B identifies a IEEE 802.11b compliant WLAN radio product for the 2.4 GHz frequency band.

C identifies a product that conforms to IEEE 802.11a/b/g

G identifies a IEEE 802.11g compliant WLAN radio product for the 2.4 GHz frequency band.

A identifies a IEEE 802.11a compliant WLAN radio product for the 5 GHz frequency band.

rr = 04, 05, 08, 09, 11, 13, 14 or **19** identifies the number of channels.

sss = ENE /LAE / NAE / PCE = ETSI (Europe)

SBS = Singapore

FNF /QBF = FCC

TBT = Taiwan

GNJ / LEJ = Japan

VBA = Asia (China, South Korea)

INI = Israel

WCW = WORLD

Le code pour le type de radio qui a le format **PCxxE-y-zz** :

xx =24 indique un produit conforme à la norme IEEE 802.11b avec une radio à 2,4 GHz.

50 indique un produit conforme à la norme IEEE 802.11a avec une radio à 5 GHz.

E =identificateur facultatif pour indiquer que l'émetteur a une antenne intégrale.

y =H ou **11** indique un émetteur qui prend en charge les transferts à haute vitesse : 11, 5.5, 2 and 1 Mb/s.

Regulatory Information

4 ou **8** indique le nombre de canaux.

zz =FC ou **FC/R** identifie un carte universelle à 11 canaux, conforme aux normes FCC, qui opère dans la zone de 2.412 - 2.462 GHz seulement.

FC/A identifie un émetteur radio IEEE 802.11a conforme aux normes FCC.

ET ou **ET/R** identifie un émetteur radio à 13 canaux conforme aux normes de la Communauté Européene.

ET/A ou **ET/B** ou **ET/C** identifie un émetteur radio IEEE 802.11a conforme aux normes de la Communauté Européene.

FR ou **FR/R** identifie un émetteur radio conforme aux normes françaises.

JP ou **JP/R** identifie un émetteur radio à 14 canaux conforme aux normes japonaises.

JP/A identifie un émetteur radio IEEE 802.11a conforme aux normes japonaises.

Le code pour le type de radio qui a le format **qrrsss**:

q =B indique un produit conforme à la norme IEEE 802.11b avec une radio à 2,4 GHz.

C identifie un produit qui se conforme à IEEE 802.11a/b/g

G indique un produit conforme à la norme IEEE 802.11g avec une radio à 2,4 GHz.

A indique un produit conforme à la norme IEEE 802.11a avec une radio à 5 GHz.

rr = 04, 05, 08, 09, 11, 13, 14 ou **19** indique le nombre de canaux.

sss = ENE /LAE / NAE / PCE = ETSI (Europe)

FNF /QBF = FCC

GNJ / LEJ = Japan

INI = Israel

SBS = Singapore

TBT = Taiwan

VBA = Asia (China, South Korea)

WCW = WORLD

Il numero del tipo di radio che ha il formato **PCxxE-y-zz**:

xx =24 identifica un prodotto che conforma alle normative IEEE 802.11b per una radio a 2,4 GHz.

50 identifica un prodotto che conforma alle normative IEEE 802.11b per una radio a 5 GHz.

E =contrassegno facoltativo per indicare che il trasmettitore ha un'antenna integrale.

y =H o **11** identifica un trasmettitore che supporta alle normative di alta velocità: 11, 5.5, 2 and 1 Mb/s.

4 o **8** identifica il nombre de canales.

zz =FC o **FC/R** identifica un trasmettitore a 11 canali conforma alle normative FCC che funciona nella banda di 2.412 - 2.462 GHz.

FC/A identifica un trasmettitore radio IEEE 802.11a conforma alle normative FCC.

ET o **ET/R** identifica un trasmettitore a 13 canali conforma alle normative della Comunità Europea.

ET/A o **ET/B** o **ET/C** identifica un trasmettitore radio IEEE 802.11a conforma alle normative della Comunità Europea.

FR o **FR/R** identifica un trasmettitore radio che conforma alle normative in vigore in Francia.

JP o **JP/R** identifica un trasmettitore a 13 canali conforma alle normative nel Giappone.

JP/A identifica un trasmettitore radio IEEE 802.11a conforma alle normative nel Giappone.

Il numero del tipo di radio che ha il formato **qrrsss**:

q =B identifica un prodotto che conforma alle normative IEEE 802.11b per una radio a 2,4 GHz.

C identifica un prodotto che è conforme a IEEE 802.11a/b/g

G identifica un prodotto che conforma alle normative IEEE 802.11g per una radio a 2,4 GHz.

A identifica un prodotto che conforma alle normative IEEE 802.11b per una radio a 5 GHz.

rr = 04, 05, 08, 09, 11, 13, 14 o **19** identifica il nombre de canales.

sss = ENE /LAE / NAE / PCE = ETSI (Europe)

FNF /QBF = FCC

GNJ / LEJ = Japan

INI = Israel

SBS = Singapore

TBT = Taiwan

VBA = Asia (China, South Korea)

WCW = WORLD

Die Nummer des Transmittertyps die hat das Format **PCxxE-y-zz**:

xx =24 kennzeichnet ein WLAN IEEE 802.11b gefälliges Radioprodukt für das 2,4 GHz Frequenzband.

50 kennzeichnet ein WLAN IEEE 802.11a gefälliges Radioprodukt für das 5 GHz Frequenzband.

Regulatory Information

E =wahlweise freigestellte Kennung, zum anzuzeigen, daß der Übermittler eine integrale Antenne hat.
y =H oder **11** kennzeichnet einen Funksender, der hohe Datentransferraten bis zu 11, 5,5, 2 und 1 Mbps unterstützt.
4 oder **8** kennzeichnet die Zahl Funkkanälen.
zz =FC oder **FC/R** kennzeichnet eine FCC-konforme "Worldcard" mit 11 Kanälen, die auf den Betrieb in einem Frequenzband von 2,412 - 2,462 GHz beschränkt ist.
FC/A kennzeichnet einen IEEE 802.11a Radioübermittler, der mit den FCC Richtlinien gefällig ist..
ET oder **ET/R** kennzeichnet einen Funksender mit 13 Kanälen, der mit den EG-Bestimmungen konform ist.
ET/A oder **ET/B** oder **ET/C** kennzeichnet einen IEEE 802.11a Radioübermittler, der mit europäischen Regelungen gefällig ist.
FR oder **FR/R** kennzeichnet einen IEEE 802.11a Radioübermittler, der mit französische Regelungen gefällig ist.
JP oder **JP/R** kennzeichnet einen Funksender mit 14 Kanälen, der mit den japanischen Bestimmungen konform ist.
JP/A kennzeichnet einen IEEE 802.11a Radioübermittler, der mit japanische Regelungen gefällig ist.

Die Nummer des Transmittertyps die hat das Format **qrrsss**:

q =B kennzeichnet ein WLAN IEEE 802.11a gefälliges Radioprodukt für das 2,4 GHz Frequenzband.

C kennzeichnet ein Produkt, das an IEEE 802.11a/b/g sich anpaßt

G kennzeichnet ein WLAN IEEE 802.11g gefälliges Radioprodukt für das 2,4 GHz Frequenzband.

A kennzeichnet ein WLAN IEEE 802.11a gefälliges Radioprodukt für das 5 GHz Frequenzband.

rr = 04, 05, 08, 09, 11, 13, 14 oder **19** kennzeichnet die Zahl Funkkanälen.

sss = ENE /LAE / NAE / PCE = ETSI (Europe)

SBS = Singapore

FNF /QBF = FCC

TBT = Taiwan

GNJ / LEJ = Japan

VBA = Asia (China, South Korea)

INI = Israel

WCW = WORLD

El número de tipo de radio que tiene el formato **PxxE-y-zz**:

xx =24 identifica un producto de radio obediente el estandard WLAN IEEE 802.11b para la banda de frecuencia de 2,4 GHz.

50 identifica un producto de radio obediente el estandard WLAN IEEE 802.11a para la banda de frecuencia de 5 GHz.

E =identificador opcional para indicar que el transmisor tiene una antena integral.

y =H o **11** identifica un transmisor que soporta transferencia de datos a alta velocidad de 11, 5,5, 2 y 1 Mbps.

4 o **8** identifica el número de canales.

zz =FC o **FC/R** identifica una 'worldcard' de 11 canales que cumple con la FCC, limitada para operar únicamente en la banda de frecuencia 2,412 - 2,462 GHz.

FC/A identifica un radiotransmisor de IEEE 802.11a obediente con las reglas de la FCC.

ET o **ET/R** identifica un radiotransmisor de 13 canales que cumple con las regulaciones de la Unión Europea.

ET/A o **ET/B** o **ET/C** identifica un radiotransmisor de IEEE 802.11a obediente con las regulaciones de la union europea.

FR o **FR/R** identifica un radiotransmisor de IEEE 802.11a obediente con las regulaciones francesas.

JP o **JP/R** identifica un radiotransmisor de 14 canales que cumple con las regulaciones japonesas.

JP/A identifica un radiotransmisor de IEEE 802.11a obediente con las regulaciones japonesas.

El número de tipo de radio que tiene el formato **qrrsss**:

q =B identifica un producto de radio obediente el estandard WLAN IEEE 802.11a para la banda de frecuencia de 2,4 GHz.

C identifica un producto que se conforme con IEEE 802.11a/b/g

G identifica un producto de radio obediente el estandard WLAN IEEE 802.11g para la banda de frecuencia de 2,4 GHz.

A identifica un producto de radio obediente el estandard WLAN IEEE 802.11a para la banda de frecuencia de 5 GHz

rr = 04, 05, 08, 09, 11, 13, 14 o **19** identifica el número de canales.

sss = ENE /LAE / NAE / PCE = ETSI (Europe)

SBS = Singapore

FNF /QBF = FCC

TBT = Taiwan

Regulatory Information

GNJ / LEJ = Japan
INI = Israel

VBA = Asia (China, South Korea)
WCW = WORLD

無線タイプ番号の形式は、PCxxE-y-zz です。

xx =24 は、2.4 GHz 周波数帯域で使用される IEEE 802.11b 準拠の WLAN 無線製品であることを示します。

50 は、5 GHz 周波数帯域で使用される IEEE 802.11a 準拠の WLAN 無線製品であることを示します。

E = 送信機に統合アンテナが装備されていることを示すオプションの識別記号です。

y =H または **11** は、11、5.5、2 および 1 Mbps の高速データ転送をサポートする送信機であることを示します。

4 または **8** はチャンネル数を示します。

zz =FC または **FC/R** は、運用が 2.412~2.462 GHz 周波数帯域に制限されている、FCC 準拠の 11 チャンネル「Worldcard」であることを示します。

FC/A は、FCC 規則に準拠した IEEE 802.11a 無線送信機であることを示します。

ET = または **ET/R** は、欧州連合規制に準拠した 13 チャンネル無線送信機であることを示します。

ET/A または **ET/B** または **ET/C** は、欧州連合規制に準拠した IEEE 802.11a 無線送信機であることを示します。

FR または **FR/R** は、フランスの規制に準拠した無線送信機であることを示します。

JP または **JP/R** は、日本の規制に準拠した 14 チャンネル無線送信機であることを示します。

JP/A は、日本の規制に準拠した IEEE 802.11a 無線送信機であることを示します。

無線タイプ番号の形式は、**qrrss** です。

q =B は、2.4 GHz 周波数帯域で使用される IEEE 802.11b 準拠の WLAN 無線製品であることを示します。

G は、2.4 GHz 周波数帯域で使用される IEEE 802.11g 準拠の WLAN 無線製品であることを示します。

A は、5 GHz 周波数帯域で使用される IEEE 802.11a 準拠の WLAN 無線製品であることを示します。

rr =04、05、08、09、11、13、14 または **19** はチャンネル数を示します。

sss = ENE / LAE / NAE / PCE = ETSI (Europe)

SBS = Singapore

FNF / QBF = FCC

TBT = Taiwan

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