

# **The 11Mbps Wireless LAN Access Point**

**WAP-2000 User's Guide**

## **FCC Information**

This equipment has been tested and found to comply with the limits for a Class A digital devices pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communication.

Operation of this equipment in residential area is likely to cause harmful interference in which case the user will be required to correct the interference at this own expense.

The user should not modify or change this equipment without written approval from company name. Modification could void authority to use this equipment.

For the safety reason, people should not work in a situation which RF Exposure limits be exceeded. To prevent the situation happening, people who work with the antenna should be aware of the following rules:

1. Install the antenna in a location where a distance of 20 cm from the antenna may be maintained.
2. While installing the antenna in the location, please do not turn on the power of wireless card.
3. While the device is working, please do not contact the antenna.

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## **CE Mark Warning**

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

## **About This Manual**

The purpose of this manual is for the setup of the 11Mbps Wireless LAN Access Point. This manual, revised as version 1.0 in 2000, includes procedures assisting you in avoiding unforeseen problems.

## **Revision**

User's guide for PLANET Wire Free Family –

For model: WAP-2000

Rev: 1.0 (July, 2000)

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# Contents

<b>Chapter 1 Introduction</b> .....	<b>1</b>
<i>1-1 Features and Benefits</i> .....	<i>1</i>
<i>1-3 System Configurations</i> .....	<i>3</i>
<b>Chapter 2 Hardware Installation</b> .....	<b>4</b>
<i>2-1 Product Kit</i> .....	<i>4</i>
<i>2-2 System Requirements</i> .....	<i>4</i>
<i>2-3 Mechanical Description</i> .....	<i>5</i>
<i>Power Socket</i> .....	<i>5</i>
<i>Ethernet Ports</i> .....	<i>5</i>
<i>RS-232 Port (Console Port)</i> .....	<i>6</i>
<i>2-4 Hardware Installation</i> .....	<i>6</i>
<b>Chapter 3 Configuring the Access Point</b> .....	<b>7</b>
<i>3-1 Using the Access Point Manager</i> .....	<i>7</i>
<i>3-2 Using the Console Mode</i> .....	<i>15</i>
<b>Chapter 4 Troubleshooting</b> .....	<b>24</b>
<b>Appendix A Network Configuration</b> .....	<b>26</b>
<b>Appendix B Specifications</b> .....	<b>29</b>
<b>Appendix C Glossary</b> .....	<b>30</b>

# Chapter 1 Introduction

The WAP-2000, 11Mbps Wireless LAN Access Point is a high-speed wireless unit that performs as a transparent Media Access Control (MAC) bridge between wired Local Area Networks, and one or more wireless networks. It brings Ethernet-like performance to the wireless realm. Placed anywhere along an Ethernet LAN, the WAP-2000 allows wireless stations in their coverage area to transparently access the corporate network. Fully compliant with the IEEE802.11(b) standard, the 11Mbps Wireless LAN Access Point also provides powerful features such as the Windows-based configuration utility, WEP security, SNMP and more. The 11Mbps Wireless LAN Access Point enables you to build a variety of network configurations.

## *1-1 Features and Benefits*

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- **Protocol-independent networking functionality**
- **Access for mobile users into the legacy wired Ethernet LAN.**
- **Seamless connectivity to wired Ethernet and PC network LAN's augments existing networks quickly and easily.**
- **Supports up to 11Mbps data rate: T-1 line alternative/replacement that dramatically cuts costs.**
- **Wireless connection without the hassles and cost of cabling.**
- **Greater flexibility to locate or move networked PC's**

## **1-2 Applications**

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The 11Mbps Wireless LAN products offer a fast, reliable, cost-effective solution for wireless client access to the network in applications like these:

- 1. Remote access to corporate network information**  
E-mail, file transfer and terminal emulation.
- 2. Difficult-to-wire environments**  
Historical or old buildings, asbestos installations, and open area where wiring is difficult to deploy.
- 3. Frequently changing environments**  
Retailers, manufacturers and those who frequently rearrange the workplace and change location.
- 4. Temporary LANs for special projects or peak time**  
C1- Trade shows, exhibitions and construction sites where a temporary network will be practical. C2- Retailers, airline and shipping companies need additional workstations during peak period. C3- Auditors requiring workgroups at customer sites.
- 5. Access to database for mobile workers**  
Doctors, nurses, retailers, accessing their database while being mobile in the hospital, retail store or office campus.
- 6. SOHO (Small Office and Home Office) users**  
SOHO users need easy and quick installation of a small computer network.
- 7. High security connection**  
The secure wireless network can be installed quickly and provide flexibility. (Please refer to page 18 for encryption configuration.)

## **1-3 System Configurations**

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The 11Mbps Wireless Access Point can be configured in a variety of network system configurations.

### **Wireless Infrastructure**

In a wireless infrastructure, the 11Mbps Access Point acts as a bridge. The Access Point connects the wireless clients together. The Access Point acts as a center point for all wireless communications. This would increase efficiency of the communications since the wireless adapters do not need to be within direct range of each other.

### **Wireless Infrastructure with Stations Attaching to a Wired LAN**

The 11Mbps Wireless LAN Access Point will provide access to a your local LAN. An integrated wireless and wired LAN is called an Infrastructure configuration. A group of wireless LAN PC users and an Access Point construct a Basic Service Set (BSS). Each wireless PC in this BSS can talk to any computer on your network via the Access Point.

# Chapter 2 Hardware Installation

This chapter describes initial setup of the Access Point.

## 2-1 Product Kit

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Before installation, make sure that you the following items:

- ◆ The 11Mbps Wireless LAN Access Point .....x 1
- ◆ Quick Start Guide .....x 1
- ◆ Power Adapter .....x 1
- ◆ Manual .....x 1

If any of the above items are not included or damaged, please contact your local dealer for support.

## 2-2 System Requirements

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Installation of the 11Mbps Wireless LAN Access Point requires:

1. An AC power outlet (100~240V, 50~60Hz) which supplies the power for the Access Point.
2. A 10/100 Base-T (UTP) Ethernet cable drop.

**Note:** (*Only if you want to re-configure the WAP-2000 Access Point instead of using factory default configuration ..*) A PC with an available RS-232C port runs the configuration program.



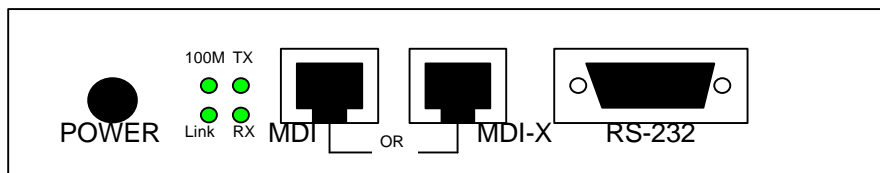
## 2-3 Mechanical Description

Top panel of the Access Point:

The following table provides an overview of each LED activity:

LED Definition	Activity	Description
PWR	Continuous Green	Power enabled
AP	Continuous Green	The Access Point is ready in service.
WLAN	Flashing Green	Off: No wireless activity Flashing: Wireless RX/TX activity
LAN	Flashing Green	Off: No Ethernet traffic activity Flashing: Wired LAN traffic activity
LINK	Continuous Green	Off: no station connected to the Access Point On: with one or more stations associated to the Access Point

Back panel of the Access Point:



### **Power Socket**

The power adapter plugs into the socket labeled "POWER".

### **Ethernet Ports**

The 11Mbps Wireless LAN Access Point supports two types of Ethernet ports: RJ-45 MDI daisy-chain port (labeled "MDI") and RJ-45 MDI-X station port (labeled "MDI-X"). To connect the Access Point to a hub, use the MDI port; to connect the Access Point to a computer/station, use the MDI-X port. Both connection ports are used with a straight-through UTP cable. Please note that, these two RJ-45 ports cannot be used *at the same time*. The four LEDs (100M/Link/Tx/Rx) next to the Ethernet ports indicate the Ethernet physical link status. The 'Link' LED is a good indicator for to see if you have proper Ethernet connection.

## ***RS-232 Port (Console Port)***

The RS-232 port is used for configuring the Access Point. Use a null-modem RS-232 cable when you desire to configure the Access Point under console mode. See the section “Access Point Console” on page 7 for detailed information.

## ***2-4 Hardware Installation***

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Take the following steps to set up your Access Point.

### ■ **Site Selection**

Before installation, determine the Access Point location. Proper placement of the Access Point is critical to ensure optimum radio range and performance. You may use the Site Survey and Access Points Browser utility (The utilities included with the wireless PC Card) to choose a proper placement for your Access Point. Typically, the best location to place your Access Point at your site is the center of your wireless coverage area. Try to place your mobile stations within the line of sight. Obstructions may impede performance of the Access Point.

### ■ **Connect the Ethernet Cable**

The 11Mbps Wireless LAN Access Point supports 10/100M Ethernet connection. Attach your UTP Ethernet cable to the RJ-45 connector on the Access Point. Then connect the other end of the RJ-45 cable to a hub or a station. Please be aware that, use the MDI port to connect the Access Point to a hub. Otherwise, please use the MDI-X port to connect the Access Point to a computer/station.

### ■ **Connect the Power Cable**

Connect the power adapter to the power socket on the Access Point, and plug the other end of the power into an electrical outlet. The Access Point will be powered on and all five indicators on the top panel will flash in sequence to test the functionality of the indicators.

**NOTE:** ONLY use the power adapter supplied with the Access Point. Otherwise, the product may be damaged.

# Chapter 3 Configuring the Access Point

The 11Mbps Wireless LAN Access Point is shipped with default parameters, which will be suitable for the typical **infrastructure wireless LAN**. Just simply install the Access Point, power it on, and it is now ready to work. Nevertheless, you can still adjust configuration settings depending on how you would like to manage your wireless network. The 11Mbps Wireless Access Point allows for configuration either via the configuration utility, known as Access Point Manager, console port connection, or anywhere through a TCP/IP (Telnet) connection.

## *3-1 Using the Access Point Manager*

---

Installed on your Windows 95/98/NT/2000 desktop computer, the Windows-based utility “Access Point Manager” provides a user-friendly interface. The utility will enable you to configure all of your Access Points on the network more easily than ever before. The following gives instructions guiding you through the installations of the Access Point Manager utility.

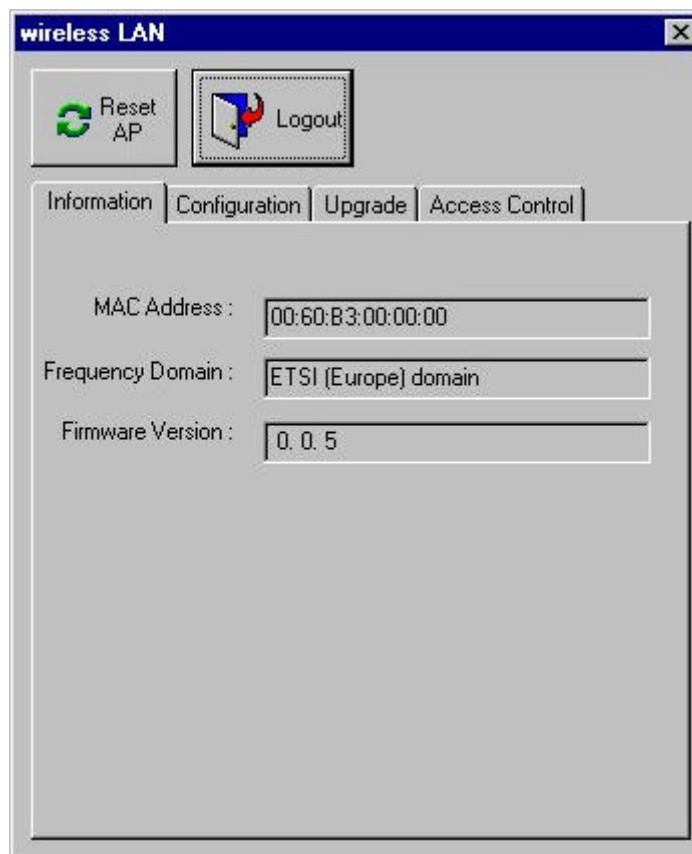
1. Insert the Software and Documentation CD into the CD-ROM drive, or the floppy disk that came with your product kit into the floppy drive on your computer.
2. From the Start menu on the Windows desktop, choose **Run**.
3. In the Run dialog box, type the path where the utility is located, then click **OK**. For floppy installation: **A:\setup**.
4. Follow the on-screen instructions to install the Access Point Manager.
5. Upon completion, execute the Access Point Manager, and it will begin to browse all the Access Points available on the network.



6. Double click an Access Point icon to access its property dialog box. Enter the password in the entry field. The default password is “default”.



7. After entering the correct password, a configuration window appears. You will see the basic information of the Access Point, such as MAC Address, Frequency Domain and Firmware Version.



**Information tab:**

**MAC Address:** It is a hardware identification number that distinguishes the unit from others. You will see the number on the label located on the bottom of the access point.

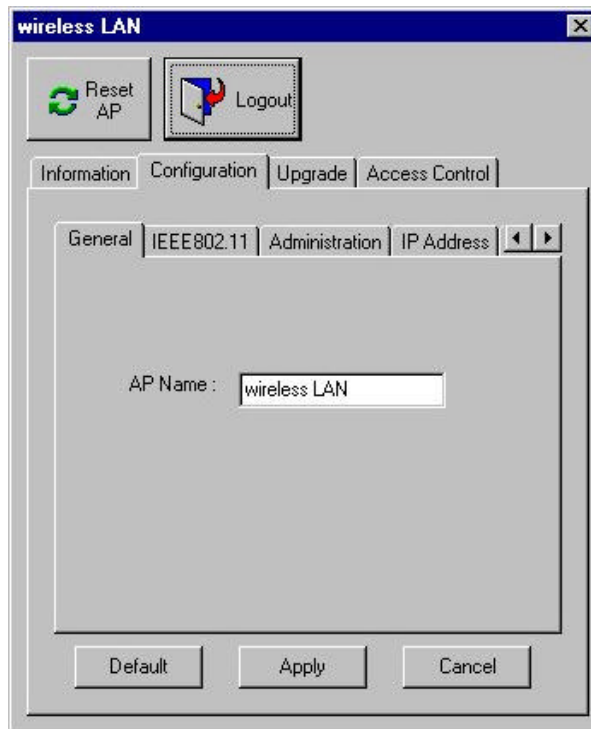
**Frequency Domain:** The regulated operating frequency per country.

**Firmware Version:** Displays the firmware version that is equipped with your hardware.

**Configuration Tab:**

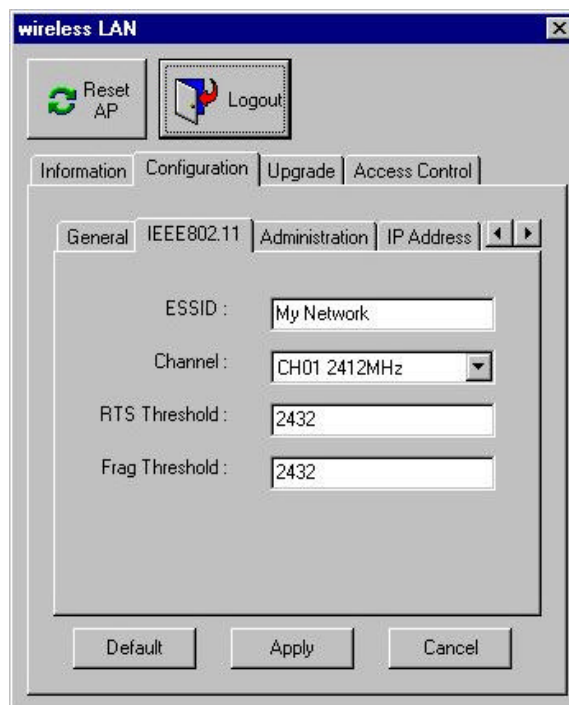
The configuration tab contains the 4 following items for you to make changes for the Access Point.

General sub tab:



**AP name:** In this entry field, you may enter any name. This will enable you to manage your Access Points with more ease.

IEEE802.11 sub tab:



**ESSID:** The ESSID is a unique ID given to the Access Point. Wireless clients associating to the Access Point must have the same ESSID. The ESSID can have up to 32 characters.

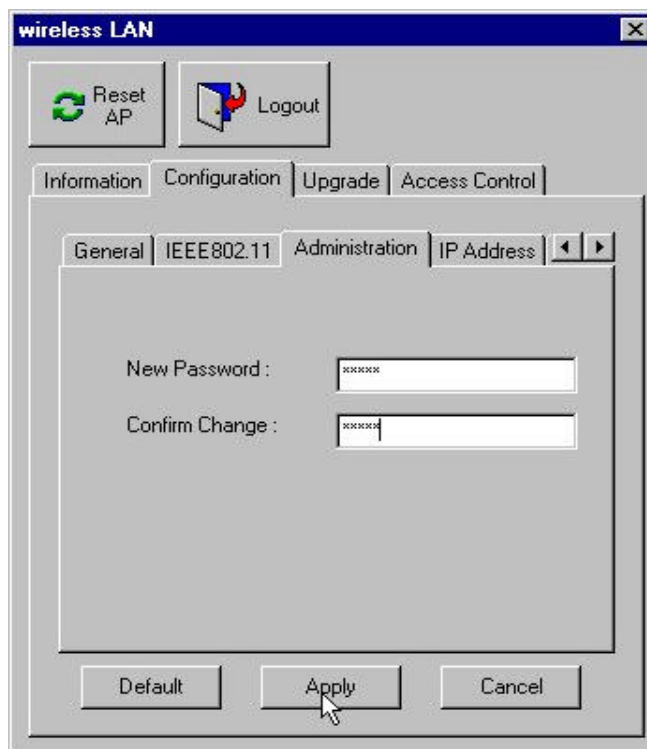
**Channel:** You may select any of the available channels as an operational channel for your Access Point.

**RTS Threshold:** RTS Threshold is a mechanism implemented to prevent the “Hidden Node” problem. “Hidden Node” is a situation in which two stations are within range of the same Access Point, but are not within range of each other. Therefore, they are hidden nodes for each other. When a hidden station starts data transmission with the Access Point, it might not notice that another station is already using the wireless medium. When these two stations send data at the same time, they might collide when arriving simultaneously at the Access Point. The collision will most certainly result in a loss of messages for both stations. Thus, the RTS Threshold mechanism will provide the solution to prevent data collisions. When the RTS is activated, the station and its Access Point will use a Request to Send/Clear to Send protocol (RTS/CTS). The station will send an RTS to the Access Point, informing that it is going to transmit the data. Upon receipt, the Access Point will respond with a CTS message to all station within its range to notify all other stations to defer transmission. It will also confirm to the requesting station that the Access Point has reserved the channel for transmission.

**Fragmentation Threshold:** Fragmentation mechanism is used for improving the efficiency when there is high traffic within the wireless network. If you transmit large files in a wireless network, you can enable the Fragmentation Threshold and specify the packet size.

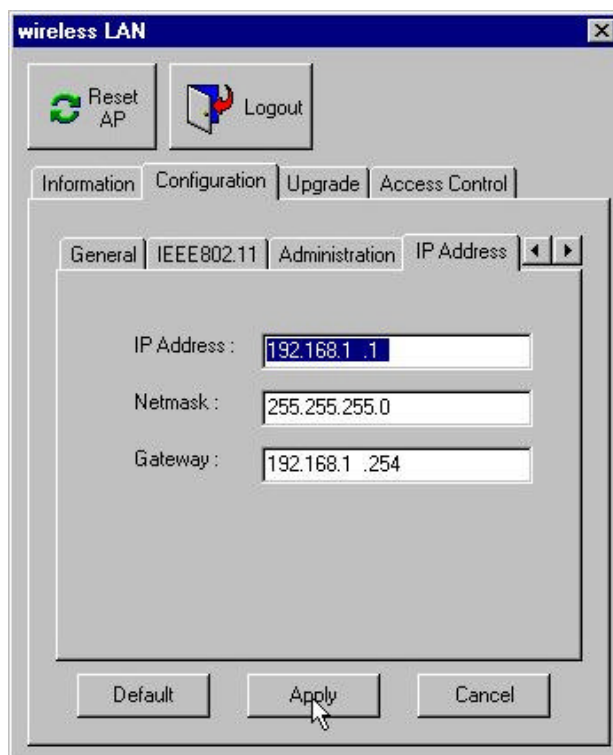
The mechanism will split the packet into the packet size you set.

Administration sub tab:



You may change the default password by entering the new password.

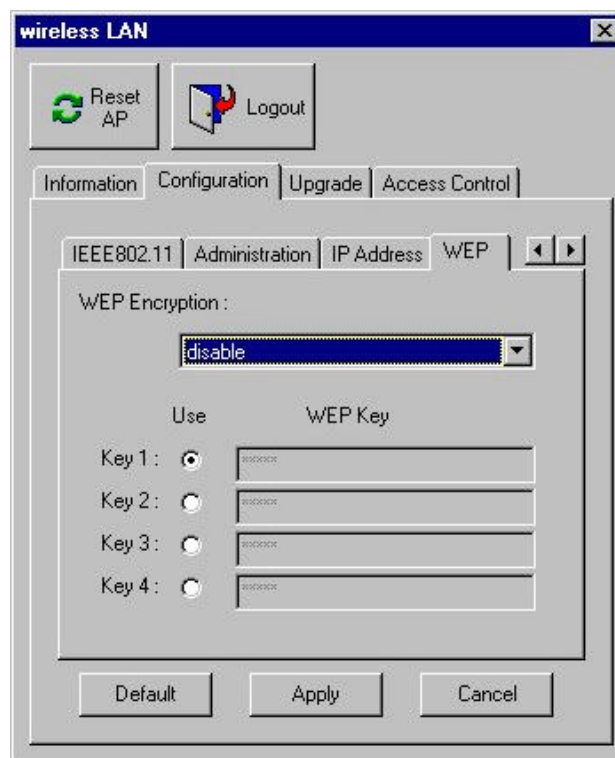
IP Address sub tab:



To enable remote access to the Access Point using Telnet, you must assign an IP address to the Access Point. You may also assign other related Internet addressing options, such as subnet mask or gateway address. Consult your network administrator to obtain an available

IP address. (Default IP address: 192.168.1.1)

WEP sub tab:



The 11Mbps Wireless LAN Access Point allows you to create up to 4 data encryption keys to secure your data from being eavesdropping by unauthorized wireless user. To activate and set the WEP keys, do the following:

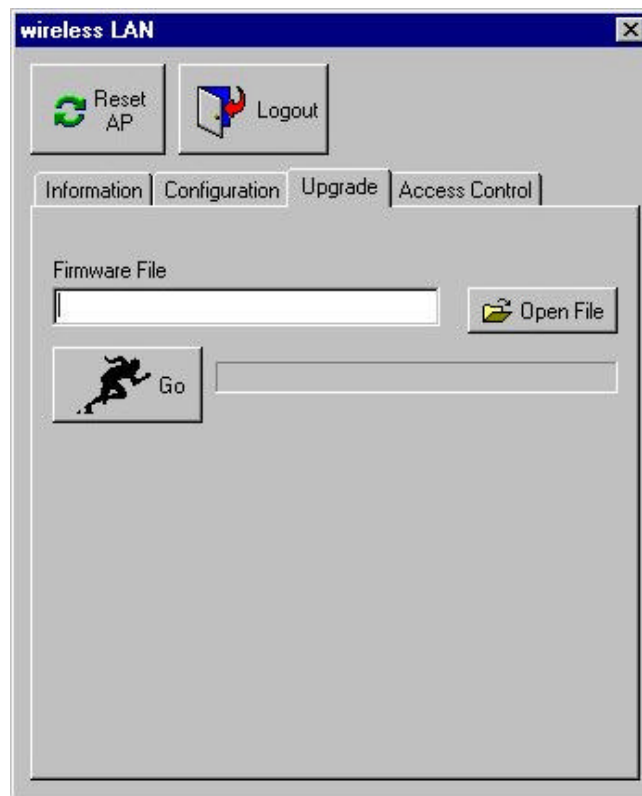
- From the WEP encryption item, pull down the menu and it will list three options:
  - Disable** – Allows wireless adapters communicate with Access Points without any data encryption.
  - WEP40** – Requires wireless stations to use data encryption when communicating with the Access Point.
  - Optional WEP40** – Allows wireless clients to communicate with the Access Point with or without data encryption.
- When WEP40 or Optional WEP40 is selected, type five alphanumeric characters in the range of “a-z”, “A-Z” and “0-9” (e.g. MyKey) in the WEP Key 1 entry field. Alternatively, you may enter 10 digit hexadecimal values in the range of “A-F” and “0-9”, preceded by the characters “0x” values (e.g. 0x11AA22BB33). You can also enter WEP keys in the Key 2, Key 3 and Key 4 if you wish. WEP will only use 1 Key. You will have to select one WEP key as an active key before enabling use of encryption.

**NOTE:** The WEP key must be set up exactly the same on the Access Points as they are on the wireless client stations. If you use Key 1 on the Access Point and the value is (e.g. MyCar), the same must be assigned to Key 1 for all client stations.



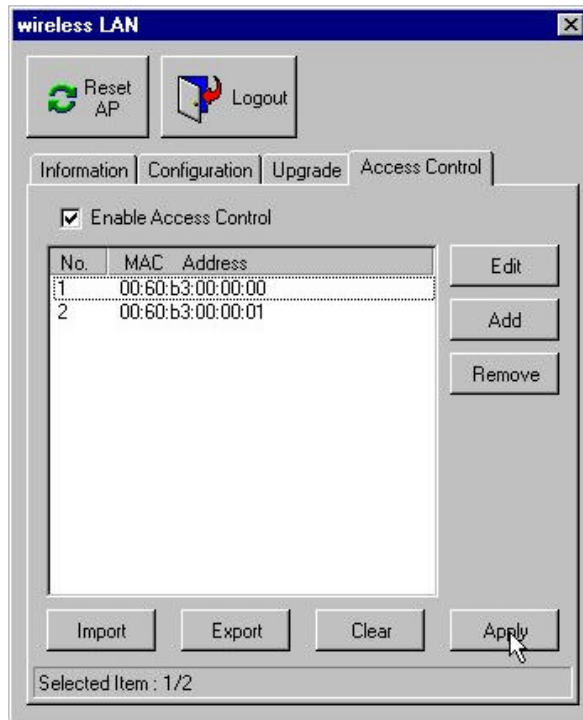
**NOTE:** WEP will work with TCP/IP only. Netbeui and IPX/SPX will be supported in upcoming firmware.

Upgrade sub tab:



This item is used for uploading the newest firmware of the Access Point. You may either enter the file name in the entry field or browse the file by clicking the Open File button. For information about the release of the newest firmware, contact your local reseller.

Access Control sub tab:



With the Access Control Table enabled, you can authorize wireless units to access the Access Point by identifying the MAC address of the wireless devices that are allowed access to transmit data. To create or edit the Access Control Table, do the following:

Go to the Access Control tab and select "Enable Access Control". Note that when you enable the Access Control Table without any MAC address in the table, no access is allowed to communicate with the Access Point.

Use the following buttons to manage the Access Control Table:

**Add** – to enter MAC addresses of authorized wireless devices one at a time.

**Edit** – to change the entries in the table if you enter the incorrect MAC address.

**Remove** – to remove MAC addresses one at a time.

**Clear** – to remove all MAC addresses in the table.

**Import** – to import an existing Access Control Table.

**Export** – to save the current Access Control Table to a location on your computer.

\* You can save the file as a text document.

## 3-2 Using the Console Mode

---

The Access Point can be configured via the command prompt console with either:

**RS-232 (serial) Connection:** The RS-232 port configuration is provided for advanced users to manage the Access Point. You may use any terminal emulation program with a RS-232 (serial) connection (e.g., Telix, ProCOMM, Windows 95/98/NT/2000's Hyperterminal) to configure the Access Point.

**Telnet (TCP/IP) Connection:** Assign an IP address to your Access Point through the RS-232 connection or Access Point Manager and then telnet to the Access Point anywhere to get access to the Access Point console. Thus, you will be able to make the configuration via the TCP/IP connection.

The following are the instructions to configure the Access Point through RS-232 connection under Windows. Configuration through **Telnet** is the same as the RS-232 configuration.

**Note:** Use a null modem

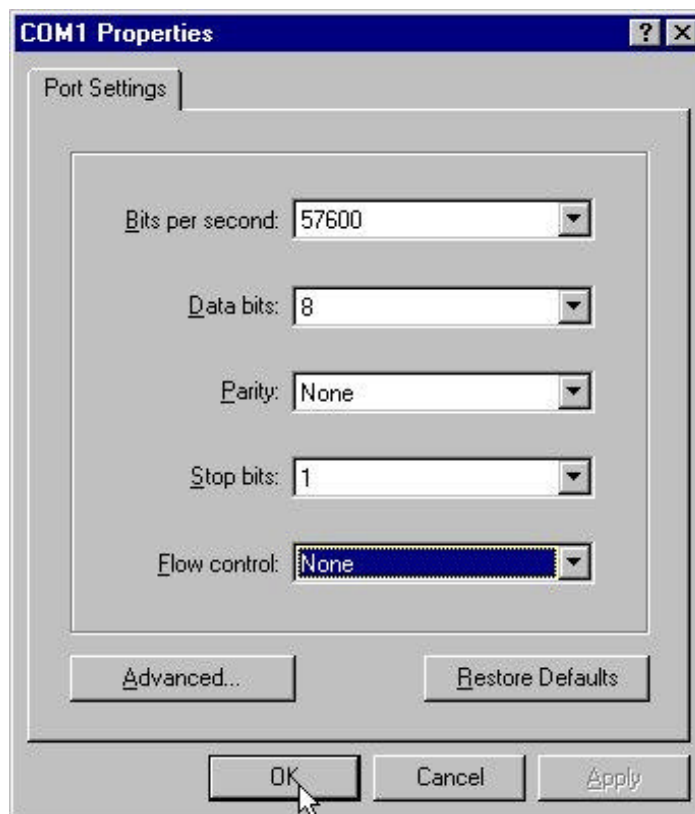
1. Attach the 9-pin or 25-pin connector of the RS-232 cable to the COM port on your computer.
2. Connect the other end of the RS-232 cable to the RS-232 port on your Access Point.
3. From the **Start** menu, select **Program Files** and open the Terminal program.
4. Assign a name for the connection.



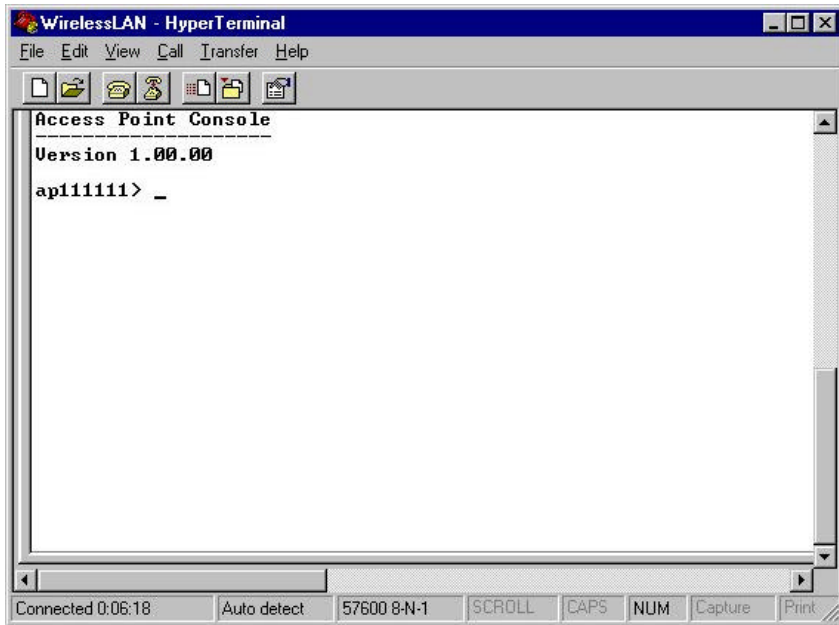
5. Select the Com port and click **OK**.



5. Set the port settings to **57600 bps, 8 data bits, no parity, no flow control**. Click **OK**.



6. The Access Point console screen appears when the connection has been established.



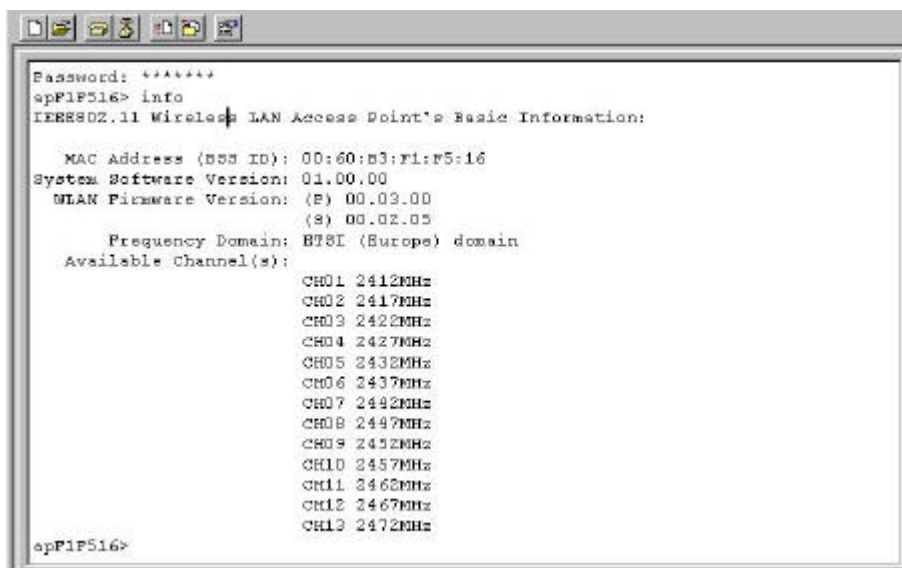
### 3-2-1 Basic Commands

The following are the commands provided for configuring the Access Point. In loader mode, i.e., no valid firmware in the Access Point, only the commands with an asterisk (\*) are provided.

**NOTE:** [xxx] stands for optional arguments.

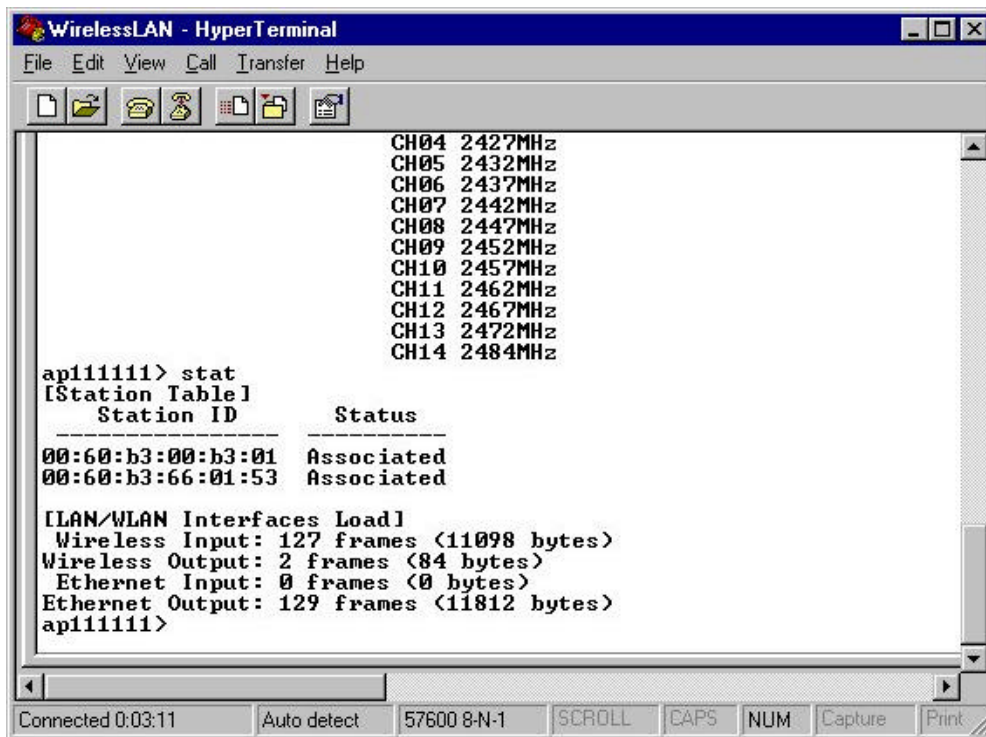
*info\**

Display some basic information of the Access Point, for example, firmware version, frequency domain, etc.



*stat*

Display the statistical values of the operation of the access point, for example, association status, LAN/WLAN interface load, etc.



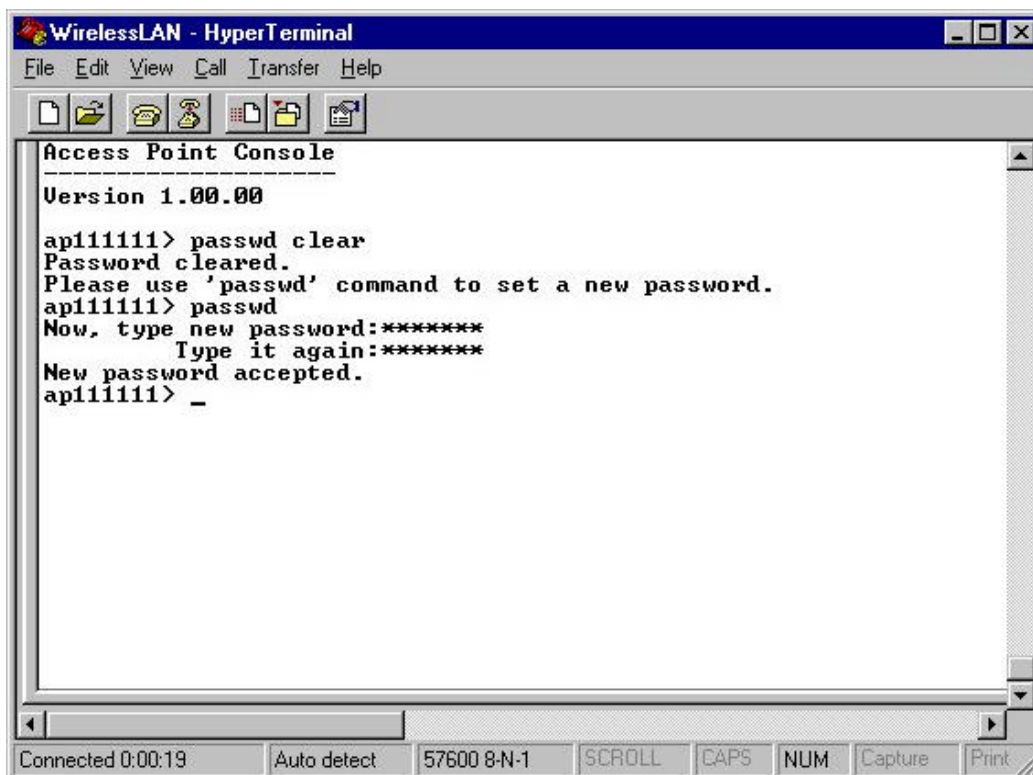
```
CH04 2427MHz
CH05 2432MHz
CH06 2437MHz
CH07 2442MHz
CH08 2447MHz
CH09 2452MHz
CH10 2457MHz
CH11 2462MHz
CH12 2467MHz
CH13 2472MHz
CH14 2484MHz

ap111111> stat
[Station Table]
  Station ID      Status
-----
00:60:b3:00:b3:01  Associated
00:60:b3:66:01:53  Associated

[[LAN/WLAN Interfaces Load]
Wireless Input: 127 frames (11098 bytes)
Wireless Output: 2 frames (84 bytes)
Ethernet Input: 0 frames (0 bytes)
Ethernet Output: 129 frames (11812 bytes)
ap111111>
```

*passwd [clear]*

Change the password of the Access Point. The *clear* option is used to delete the existing password if you miss it (This option is only available in RS-232 console).

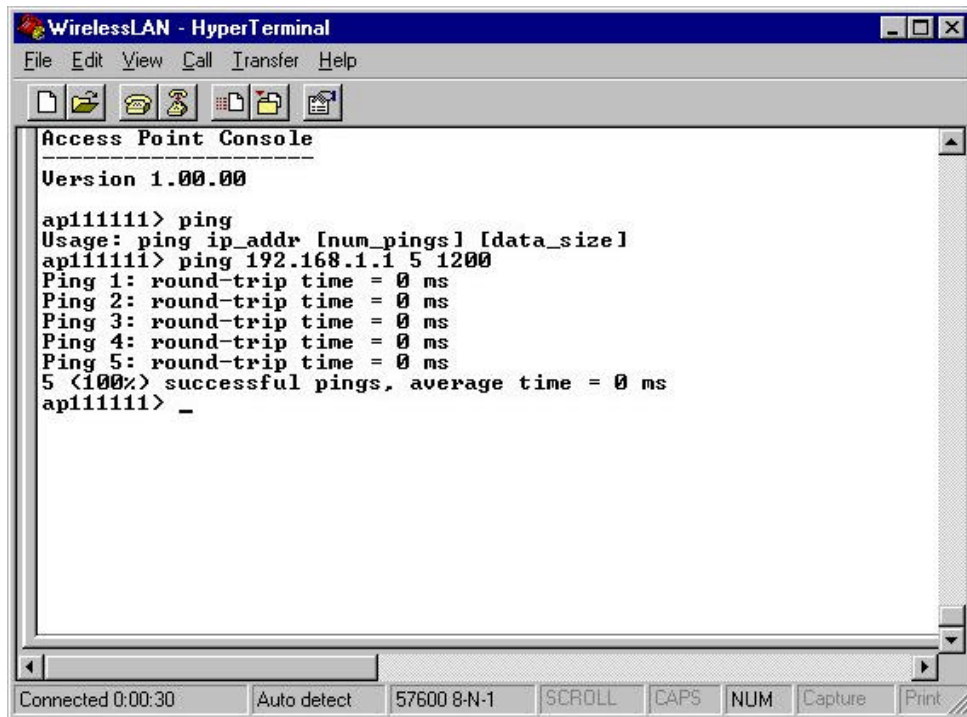


```
Access Point Console
Version 1.00.00

ap111111> passwd clear
Password cleared.
Please use 'passwd' command to set a new password.
ap111111> passwd
Now, type new password:*****
Type it again:*****
New password accepted.
ap111111> _
```

*ping ip\_addr [num\_pings] [data\_size]*

Ping (ICMP echo) to an *ip\_addr* host with optional *num\_pings* times with optional data size in a length of *data\_size*.

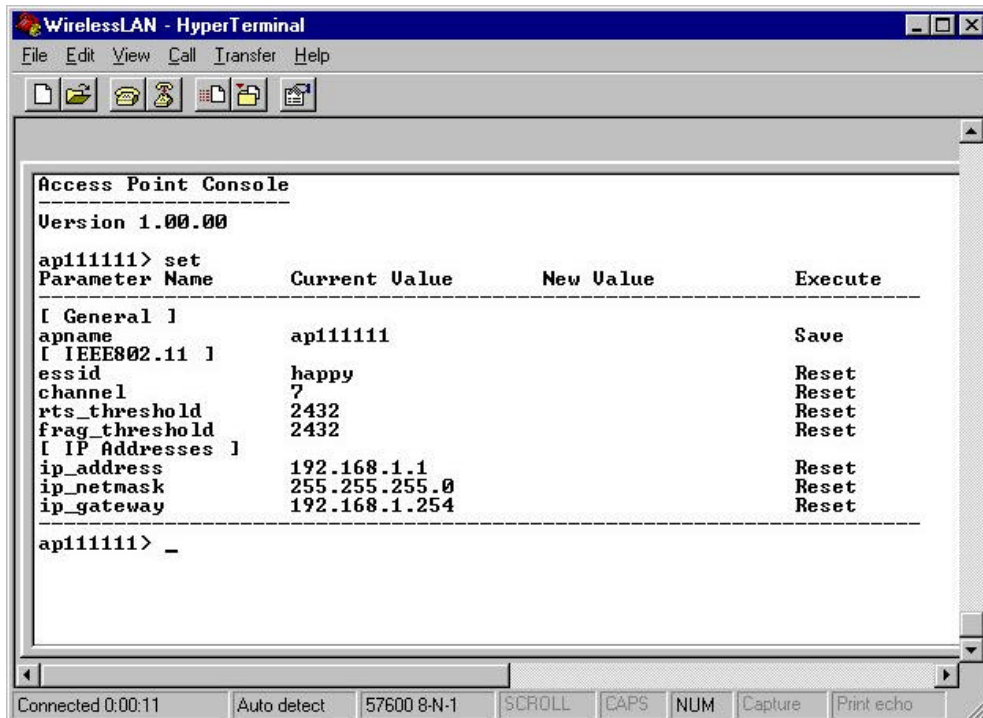


```
WirelessLAN - HyperTerminal
File Edit View Call Transfer Help
Access Point Console
Version 1.00.00
ap111111> ping
Usage: ping ip_addr [num_pings] [data_size]
ap111111> ping 192.168.1.1 5 1200
Ping 1: round-trip time = 0 ms
Ping 2: round-trip time = 0 ms
Ping 3: round-trip time = 0 ms
Ping 4: round-trip time = 0 ms
Ping 5: round-trip time = 0 ms
5 (100%) successful pings, average time = 0 ms
ap111111> _
Connected 0:00:30 Auto detect 57600 8-N-1 SCROLL CAPS NUM Capture Print
```

*set*

List the configuration information.

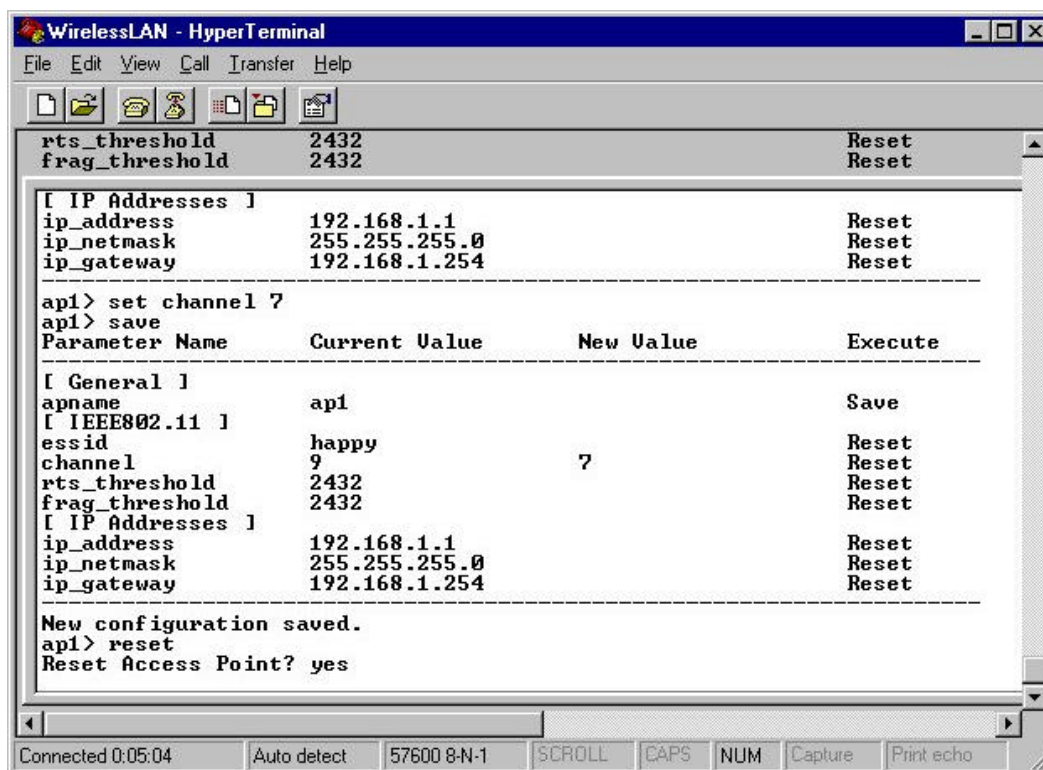
*set apname | channel | essid | rts\_threshold | frag\_threshold | ip\_address | ip\_netmask | ip\_gateway*



```
WirelessLAN - HyperTerminal
File Edit View Call Transfer Help
Access Point Console
Version 1.00.00
ap111111> set
Parameter Name      Current Value      New Value      Execute
-----
[ General ]
apname              ap111111          Save
[ IEEE802.11 ]
essid               happy             Reset
channel             7                 Reset
rts_threshold       2432              Reset
frag_threshold      2432              Reset
[ IP Addresses ]
ip_address          192.168.1.1       Reset
ip_netmask          255.255.255.0     Reset
ip_gateway          192.168.1.254     Reset
ap111111> _
Connected 0:00:11 Auto detect 57600 8-N-1 SCROLL CAPS NUM Capture Print echo
```



To change factory default settings, type “set xxx (parameter) xxxx (value). For example, set channel 7 command will set the channel to number 7; set essid “Your Network” command will set the ESSID as *Your Network*. Remember that, a 'save' command is required for changes to take effect. Always reset your AP with the “Reset” command.



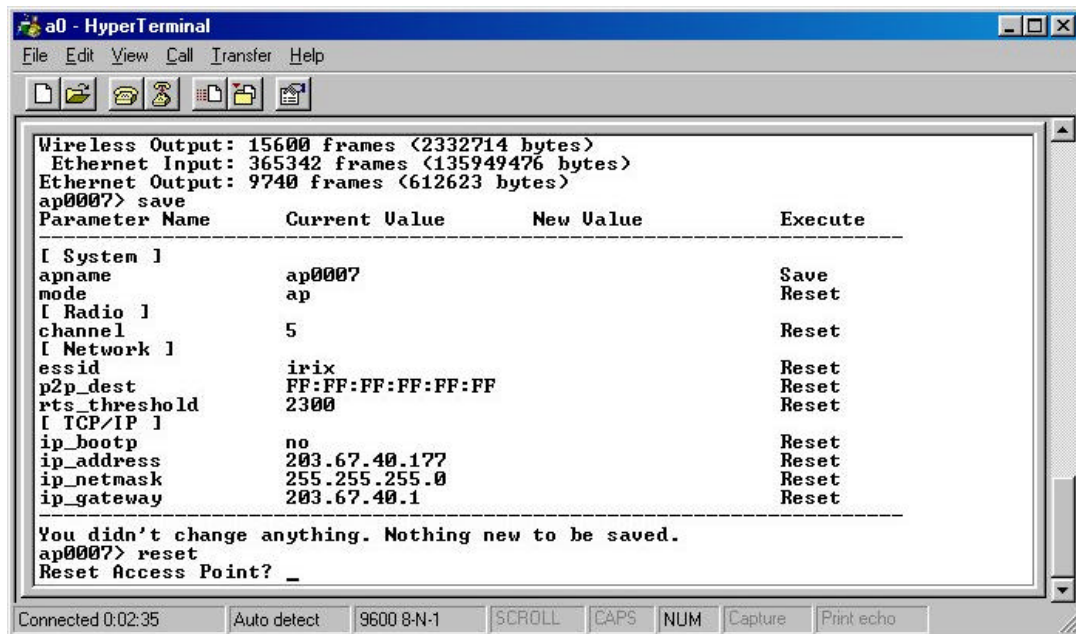
The following is a list of parameters you can make changes on the Access Point.

Parameter	Description	Default Value
apname	A textual name for the identification of the Access Point.	apXXXXXX (where XXXXXX is the last six octets of Access Point's MAC address)
channel	The radio channel number.	1
essid	The ESS ID (a.k.a., SSID) of the Access Point.	My Network
rts_threshold	The threshold (number of bytes) for enabling RTS/CTS handshake. Data with its frame size larger than this value will perform the RTS/CTS handshake. Range of value: 0~2432.	2432
frag_threshold	The threshold (number of bytes) for the fragmentation boundary. Data will be transmitted in fragments which its size does not exceed this value. Range of value: 256~2432.	2432
ip_address	The IP address of the Access Point.	192.168.1.1
ip_netmask	The subnet mask address of the Access Point.	255.255.255.0
ip_gateway	The default gateway address of the Access Point.	192.168.1.254



*save*

Save your new configuration. Remember that the “save command” is required every time you make the new configuration.



*set default*

Return the factory default settings of the Access Point except for the IP addresses. A 'save' command is required for changes to take effect.

*cls\**

Clear the console screen.

*exit\**

Exit the console.

*?\* or help\**

Print a help screen.

*rz\**

Receive a firmware file by the Zmodem protocol. The console will enter Zmodem receiving mode and then use the "file upload" function of your terminal emulation program to upload a new firmware file (ap.img) to the Access Point. Upon completion, always remember to type the 'reset' command for running the Access Point with the new firmware.

*reset\**

Issue a reset signal. The Access Point will be reset if user confirms.

## 3-2-2 Advanced Settings for Security

This section describes the commands to control the security for Access Point. To prevent unauthorized wireless stations from accessing data transmitted over the network, the 11Mbps Wireless LAN Access Point offers the following levels of security options.

- Access Control Table restricts wireless stations to access the Access Point.
- Data Encryption, known as WEP (Wired Equivalency Privacy), encrypts wireless data transmitted via wireless medium.

### *Access Control*

*auth mode / add / del / list / clear*

The 'auth' command contains sub-commands that allow you to manage the access control (MAC address filter) of the Access Point. The access control table consists of a list for you to control the accessibility of any wireless stations or repeaters. The sub-commands are listed below:

*mode open / allow*: set the access control mode. The definition of each mode is specified as follows:

- *open*: open to public (default)
- *restrict*: only allow access of the authorized stations/repeaters in the table (no access is allowed if the list stays empty)

*add mac\_addr*: add an address into the access control table

*del mac\_addr /index*: delete a MAC address, or index an address from the access control table

*list [start/end]*: display the content of the access control mode and the address list. The optional arguments, start and end, can be affixed to select the range of items to be listed.

*clear*: clear all the addresses in the access control table.

```
Access Point Console
-----
Version 1.00.00

ap888> auth
Current status of Access Control (MAC address filter)
-----
Mode: restrict
-----
Address List:
  1 : 00:00:00:00:00:00
  2 : 00:11:11:11:11:11
  3 : FF:FF:FF:FF:FF:FF
-----
Sub-Command List:
mode      add          del          list
clear
ap888> auth mode
Usage: auth mode <open|restrict>
open: open to public,
restrict: restrict to stations in list,
        (i.e., deny all access except those ones in list)

ap888>
```

## WEP Keys

*wep mode / set / list*

The 'wep' command contains sub-commands that allow you to manage the data encryption (WEP, wired equivalent privacy) function provided with the access point. The sub-commands are listed as follows:

*mode disable / wep40 / wep40opt*: set the access control mode. The following are the definition of each data encryption mode.

- *none*: no encryption (default)
- *wep40*: use 40-bit WEP data encryption
- *wep40opt*: use 40-bit WEP data encryption for 40-bit WEP-equipped clients while allowing non-WEP clients associating to the Access Point as well.

*set key1 key\_text*: set WEP Key#1 as *key\_text*. 10 hexadecimal digits (0-9 or A-F) heading by "0x" or five alphanumeric values (ASCII characters, case-sensitive) are required if 40-bit WEP is used.

Example: 0x1122334455, 0x0055AA55AA, abcde, or MyKey.

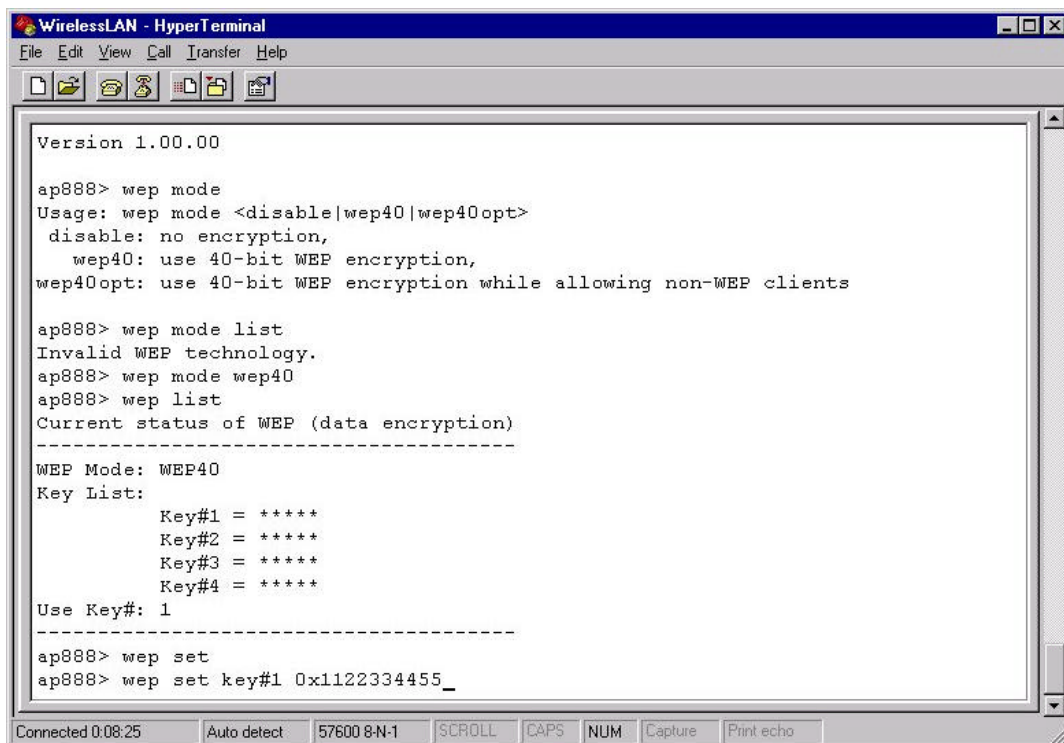
*set key2 key\_text*: set WEP Key#2 as *key\_text* with a same format as WEP Key#1.

*set key3 key\_text*: set WEP Key#3 as *key\_text* with a same format as WEP Key#1.

*set key4 key\_text*: set WEP Key#4 as *key\_text* with a same format as WEP Key#1.

*set usekey 1/2/3/4*: Select the WEP key to be used for encrypting data transmission. Only one key can be selected at a time.

*list*: Display current WEP settings.



```
Version 1.00.00
ap888> wep mode
Usage: wep mode <disable|wep40|wep40opt>
disable: no encryption,
wep40: use 40-bit WEP encryption,
wep40opt: use 40-bit WEP encryption while allowing non-WEP clients

ap888> wep mode list
Invalid WEP technology.
ap888> wep mode wep40
ap888> wep list
Current status of WEP (data encryption)
-----
WEP Mode: WEP40
Key List:
Key#1 = *****
Key#2 = *****
Key#3 = *****
Key#4 = *****
Use Key#: 1
-----
ap888> wep set
ap888> wep set key#1 0x1122334455_
```

**Note:** Your new WEP settings will take effect after resetting the access point.

## Chapter 4 Troubleshooting

If you have trouble using the 11Mbps Wireless LAN Access Point, the starting point to troubleshoot the problem with your Access Point is looking at the LED activity of the Access Point. The following is “LED Error Table” provided to assist you in diagnosing and solving operational problems.

PWR	AP	WLAN	LAN	LINK	Description/Action
Continuous Green	Continuous Green	Flash Green	Flash Green	Steady Green	Normal operation where flickering indicates interface activity. No action required.
	On	Off	Off	-	Normal operation that indicates there is no LAN activity. No action required.
Off	Off	Off	Off	Off	Power failure. Check the power cord. Check the power supply.
Continuous Green	Off	Off	Off	Off	Invalid loader firmware or the micro-controller is dead. Return the unit to the vendor for support.
	Blink Green	-	-	-	Invalid Access Point firmware. Upgrade the firmware via the utility or console mode.
	Blink Green	Blink Green	-	-	Wireless LAN initialization failure Check whether the wireless module has been properly installed.
	Blink Green	-	Blink Green	-	Ethernet initialization failure Return the device to the vendor for support.

If you are still unable to solve the problem by checking the LED activity, the error may be caused from configuration mismatch, which prevents the Access Point from establishing a wireless connection with the network. You may check the following to ensure normal operation of the Access Point.

- **WEP keys:** If data encryption is activated, always remember to set WEP keys exactly the same on the Access Point as are on the wireless stations.

- Access Control: Make sure that the MAC address of your Access Point is not included in the Access Control table of other wireless devices.

# Appendix A Network Configuration

The 11Mbps Wireless LAN products support the same network configuration options of the legacy Ethernet LANs as defined by IEEE 802 standard committee.

The 11Mbps Wireless LAN products can be configured as:

- ◆ Ad-Hoc for departmental or SOHO LANs
- ◆ Infrastructure for enterprise LANs.

## A-1 Network Topology

◆ Ad-Hoc

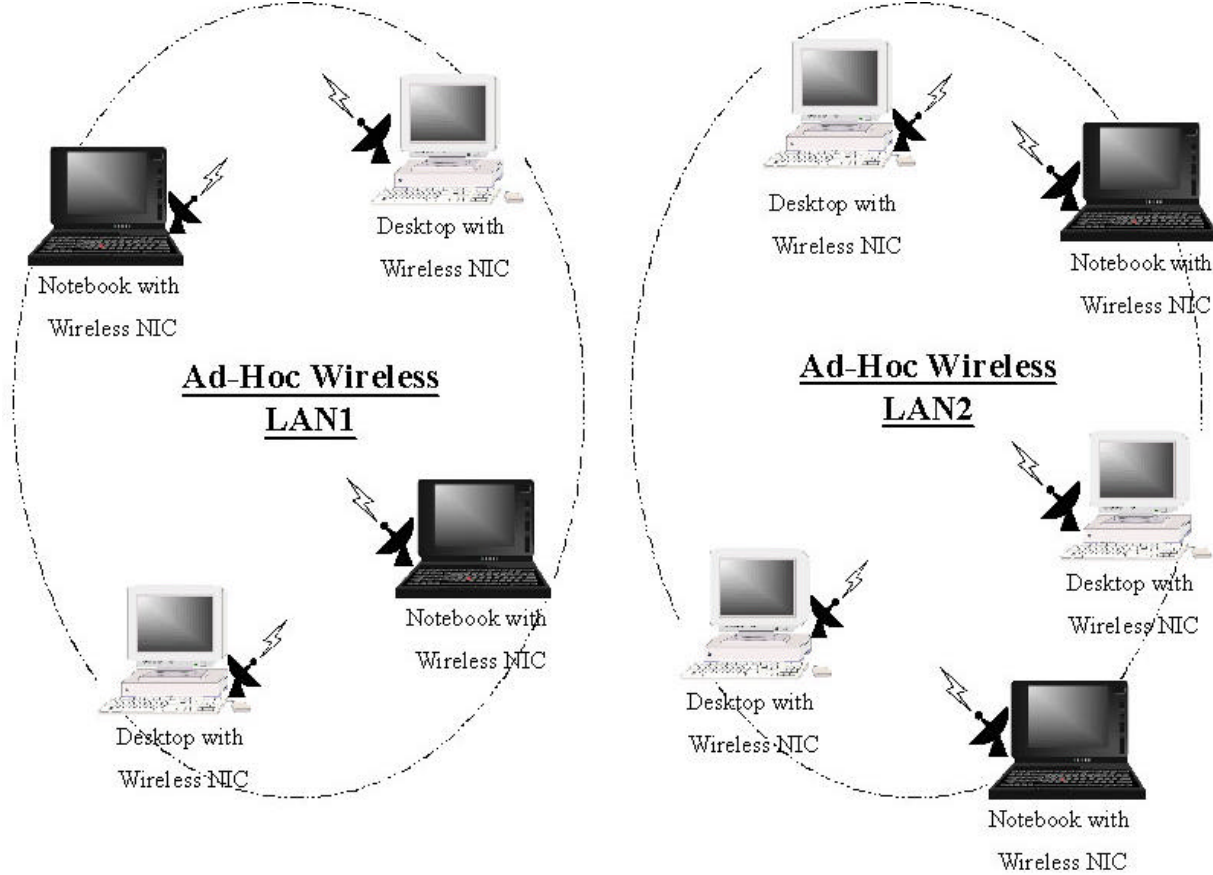


Fig A.1 An Example of Ad-Hoc Wireless LAN

An Ad-Hoc wireless LAN is a group of computers, each equipped with one wireless adapter, connected as an independent wireless LAN. Computers in a specific Ad-Hoc wireless LAN must be configured at the same radio channel.

Ad-Hoc wireless LAN is applicable at a departmental scale for a branch or SOHO operation.

◆ Infrastructure

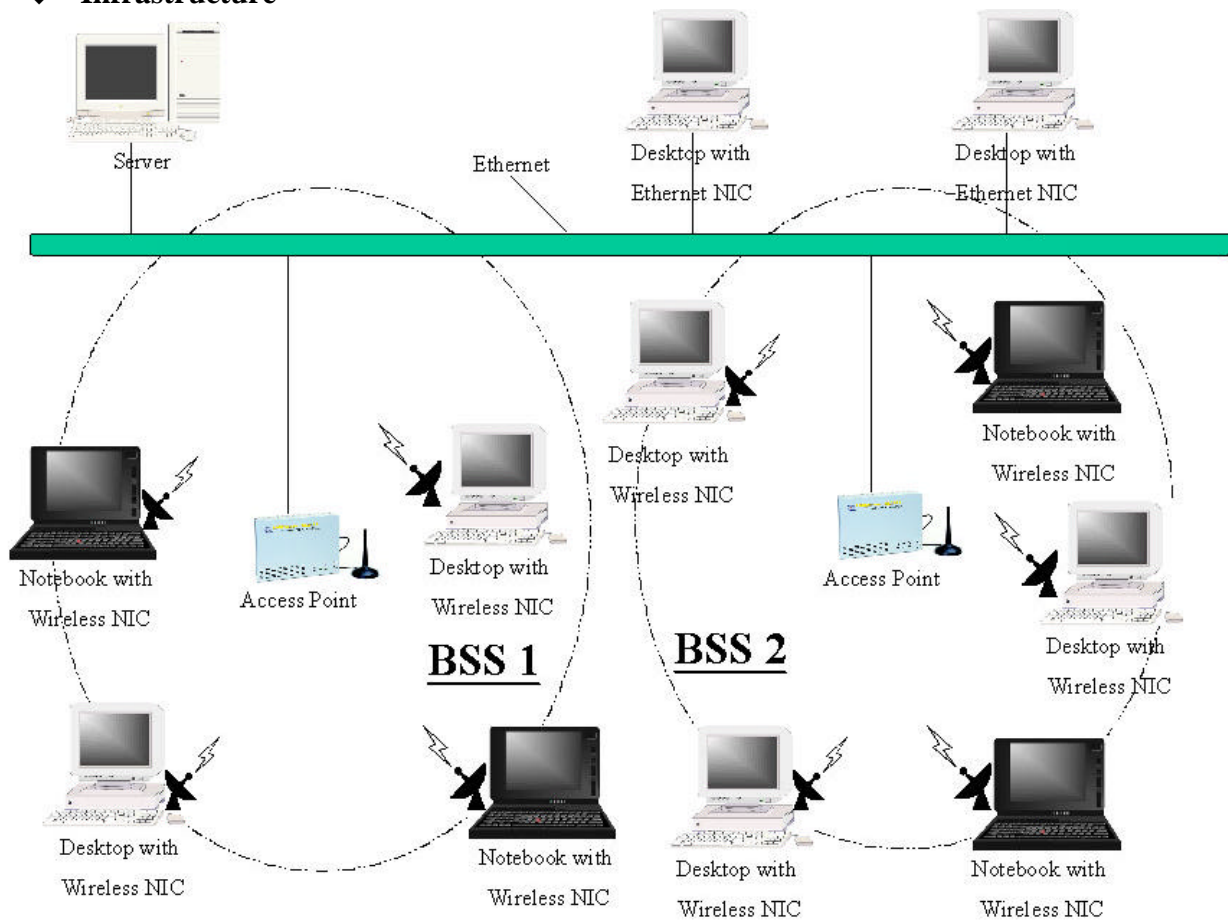
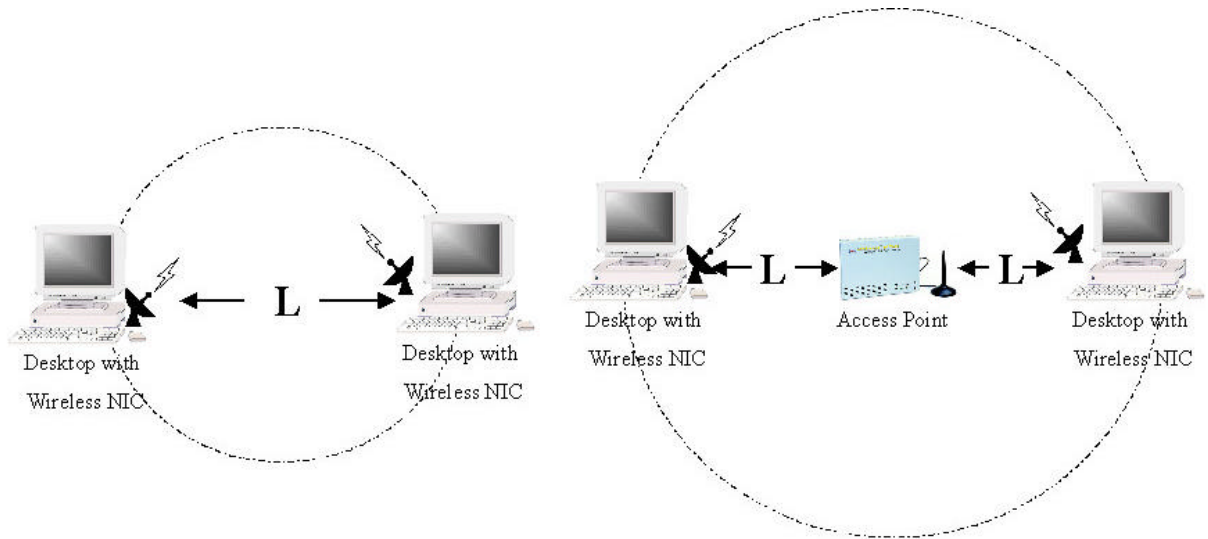


Fig A.2 An Example of Infrastructure Wireless LAN

The 11Mbps Wireless LAN devices provides access to a wired LAN for wireless workstations. An integrated wireless and wired LAN is called an Infrastructure configuration. A group of wireless LAN PC users and an Access Point construct a Basic Service Set (BSS). Each wireless-equipped PC in this BSS can talk to any computer in the wired LAN infrastructure via the Access Point.

Infrastructure configuration will extend the accessibility of a wireless station to the wired LAN. Multiple Access Points will allow roaming and it will increase the transmission range. The Access Point is also able to forward data within its BSS. The effective transmission range in an infrastructure LAN is **doubled**.



Ad-Hoc

Infrastructure

Fig A.3 The effective Transmission Range



## Appendix B Specifications

<b>Product</b>	<b>11Mbps Wireless LAN Access Point</b>
Wired Interface	10/100Base-TX (RJ-45)
Serial Port	DB9 RS-232 (configuration port)
Wireless Interface	11Mbps Wireless LAN
Modulation	DSSS (CCK, DQPSK, DBPSK)
Operation Frequency	N. America/FCC: 2412~2.462 GHz (11 channels ) Europe CE/ETSI: 2.412~2.472 GHz (13 channels) Japan: 2.412~2.484 GHz (14 channels) France: 2.457~2.472 GHz (4 channels) Spain: 2.457~2.462 GHz (2 channels)
Speed Options	11M/5.5M/2M/1M, also support Auto Rate Selections
RF Technology	Direct Sequence Spread Spectrum
Power Supply	DC 7.5V (External power supply included)
RF Output Power	13 dBm
Sensitivity	-84dBm @ 11Mbps, PER < 8* 10 <sup>-2</sup>
Antenna	Integrated dipole antenna

## Appendix C Glossary

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

**Ad-Hoc** - An Ad-Hoc wireless LAN is a group of computers each with WireFree adapters, connected as an independent wireless LAN.

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

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

**Bridge** - An internetworking function that incorporates the lowest 2 layers of the OSI network protocol model.

**BSS** - Stands for "Basic Service Set," an Access Point and all the WireFree PCs that associated with it.

**ESS** - Stands for "Extended Service Set." More than one BSS can be configured as an Extended Service Set. WireFree mobile users can roam between BSS in an ESS.

**Ethernet** - A popular local area data communications network, originally developed by Xerox Corp., which accepts transmission from computers and terminals. Ethernet operates on 10 Mbps baseband transmission over shielded coaxial cable or over shielded twisted pair telephone wire.

**Infrastructure** - An integrated wireless and wired LAN is called an Infrastructure configuration.

**PCMCIA** - Personal Computer Memory Card International Association, which develops standards for PC cards, formerly known as PCMCIA cards, are available in three "types" which are about the same length and width as credit cards, but range in thickness from 3.3 mm (Type I) to 5.0 mm (Type II) to 10.5 mm (Type III). These cards can be used for many functions, including memory storage, landline modems and wireless modems.

**Roaming** - A WireFree mobile user moves around an ESS and get the continuous connection to the Infrastructure network.

**RTS Threshold** – Transmitters contending for the medium may not hear each other. RTS/CTS mechanism can solve this “ Hidden Node Problem”. If the packet size is smaller than the preset RTS Threshold size, the RTS/CTS mechanism will NOT be enabled.

**Web Management** - Network management by using web browser connecting to the target devices.