

11-Mbps
Wireless Outdoor Bridge
User's Guide

Version A1
July 2003



TRADEMARKS

All names mentioned in this document are trademarks or registered trademarks of their respective owners.

The manufacturer provides this document “as is,” without warranty of any kind, neither expressed nor implied, including, but not limited to, warranty of fitness for the particular purpose for which it is intended. The manufacturer may make improvements and/or changes in this manual or in the product(s) and/or the program(s) described in this manual at any time. This document may include technical inaccuracies and/or typographical errors.

FCC WARNING

This equipment has been tested and found to comply with the limits for a Class B Digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection .

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna

- Increase the separation between the equipment and receiver

- Connect the equipment into 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

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

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation

FCC RF Radiation Exposure Statement

This equipment is an outdoor fixed antenna use radiator. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 0.1986 meters during normal operation..

Packing List

Your 11-Mbps Wireless Outdoor Bridge package should contain the following items:

- One 11-Mbps Wireless Outdoor Bridge
- One DC injector with RJ-45 LAN and ODU (outdoor unit) jacks
- One power adapter for the DC injector
- One mounting kit
- One 25-meter Category 5 waterproof cable with RJ-45 plug and ODU connector
- WLAN Management System software and wireless outdoor bridge user's guide in electronic form (one CD-ROM or three floppy disks)

Your 11-Mbps Wireless Outdoor Bridge Solution package should contain the following items:

- One 11-Mbps Wireless Outdoor Bridge Solution assembly made up of one 11-Mbps Wireless Outdoor Bridge and one 8-dBi (or 18-dBi) directional antenna
- One DC injector with RJ-45 LAN and ODU (outdoor unit) jacks
- One power adapter for the DC injector
- One mounting kit
- One 25-meter Category 5 waterproof cable with RJ-45 plug and ODU connector
- One 30-cm N(M)-N(M) RG400 cable
- WLAN Management System software and wireless outdoor bridge user's guide in electronic form (one CD-ROM or three floppy disks)

Contents

INTRODUCTION.....	1
RELATED PRODUCTS.....	2
WLAN MANAGEMENT SYSTEM	3
AUTOMATIC DISCOVERY OF COMPATIBLE DEVICES	3
WLAN MANAGEMENT SYSTEM HARDWARE AND SOFTWARE REQUIREMENTS	5
TERMINOLOGY USED IN THIS GUIDE	6
HOW TO USE THIS GUIDE.....	7
PLANNING THE NETWORK	8
HARDWARE DESCRIPTION	9
HARDWARE CONFIGURATION	10
11-MBPS WIRELESS PRODUCT PLACEMENT GUIDELINES.....	12
ANTENNA ALIGNMENT.....	12
INSTALLING THE WLAN MANAGEMENT SYSTEM.....	13
USING THE WLAN MANAGEMENT SYSTEM	16
AUTO-DISCOVERY	16
KICK START FUNCTION	17
CONFIGURATION	18
IP	19
Filter.....	20
Wireless	21
Bridge Mode.....	22
Encryption	24
SNMP Access Control	25
Trap Server.....	26
Trap View.....	28
Advanced	28
MONITOR	30
Identity Information.....	30
Statistics	31
RESTART	31
FACTORY RESET	32
UPGRADE FIRMWARE.....	32
ANTENNA ALIGNMENT UTILITY.....	33
Features.....	33

ADVANCED MANAGEMENT 41

 BATCH MODE OPERATION 41

 MANAGE WLAN MANAGEMENT SYSTEM HOST TABLE 41

Exporting a Configuration Profile to a File 43

Importing a Configuration Profile from a File 43

FAQS 46

TROUBLESHOOTING 48

TECHNICAL SUPPORT 49

LIMITED WARRANTY 50

REGULATORY DOMAINS AND CHANNELS 53

INDEX 54

Figures

FIGURE 1.	TYPICAL APPLICATION SCENARIO.....	8
FIGURE 2.	CONNECTION TO LAN OR LAN/WLAN.....	8
FIGURE 3.	WIRELESS OUTDOOE BRIDGE AND DC INJECTOR	9
FIGURE 4.	WIRELESS OUTDOOR BRIDGE SOLUTION INSTALLATION	10
FIGURE 5.	WIRELESS OUTDOOR BRIDGE INSTALLATION	11
FIGURE 6.	WELCOME SCREEN	13
FIGURE 7.	IMPORTANT ISSUES WINDOW	14
FIGURE 8.	CHOOSE DESTINATION LOCATION WINDOW.....	14
FIGURE 9.	SELECT PROGRAM FOLDER WINDOW	15
FIGURE 10.	SETUP COMPLETE WINDOW	15
FIGURE 11.	MAIN AND HOSTS VIEW WINDOWS	17
FIGURE 12.	WLAN KICK START WINDOW	18
FIGURE 13.	CONFIGURATION WINDOW — IP PANEL	19
FIGURE 14.	CONFIGURATION WINDOW — FILTER PANEL.....	20
FIGURE 15.	CONFIGURATION WINDOW — WIRELESS PANEL	21
FIGURE 16.	BRIDGE MODE – POINT TO POINT.....	22
FIGURE 17.	BRIDGE MODE – POINT TO MULTIPOINT.....	23
FIGURE 18.	CONFIGURATION WINDOW — ENCRYPTION PANEL	24
FIGURE 19.	CONFIGURATION WINDOW — SNMP ACCESS CONTROL PANEL	25
FIGURE 20.	NEW/EDIT ADDRESS DIALOG BOX	25
FIGURE 21.	CONFIGURATION WINDOW — TRAP SERVER PANEL	27
FIGURE 22.	CONFIGURATION WINDOW — CLEAR ALL ADDRESS FUNCTION	27
FIGURE 23.	TRAP VIEW WINDOW	28
FIGURE 24.	CONFIGURATION WINDOW — ADVANCED PANEL	29
FIGURE 25.	WARNING BEFORE BRIDGE RESET	29
FIGURE 26.	MONITOR WINDOW — IDENTITY PANEL.....	30
FIGURE 27.	MONITOR WINDOW — STATISTICS PANEL	31
FIGURE 28.	WARNING BEFORE BRIDGE RESTART	31
FIGURE 29.	WARNING BEFORE FACTORY DEFAULTS ARE LOADED	32
FIGURE 30.	UPGRADE FIRMWARE DIALOG BOX	32
FIGURE 31.	ANTENNA ALIGNMENT FOR BRIDGES.....	34
FIGURE 32.	ANTENNA ALIGNMENT TOOL	35
FIGURE 33.	THROUGHPUT PRESENTED AS A 3D GRAPHIC	36
FIGURE 34.	3D VIEW OF DATA RATE DISTRIBUTION.....	36
FIGURE 35.	SAVING THE TEST RESULTS TO A FILE	37
FIGURE 36.	3D VIEW OF PAST AND LATEST TEST RESULTS.....	37
FIGURE 37.	ZOOMING IN FOR A MAGNIFIED VIEW	38
FIGURE 38.	ZOOMING OUT FOR A WIDER VIEW	39
FIGURE 39.	ENHANCED 3D EFFECT.....	39
FIGURE 40.	ROTATION AND ELEVATION EFFECTS	40
FIGURE 41.	EXPORTING THE CHART TO A FILE	40
FIGURE 42.	BATCH MODE OPERATION LIST	41

FIGURE 43. NEW/EDIT ADDRESS DIALOG BOX 43

FIGURE 44. EXPORTING A CONFIGURATION PROFILE TO A FILE..... 43

FIGURE 45. IMPORTING A CONFIGURATION PROFILE FROM A FILE (1)..... 44

FIGURE 46. IMPORTING A CONFIGURATION PROFILE FROM A FILE (2)..... 44

FIGURE 47. ENCRYPTION DIALOG WHEN IMPORTING A CONFIGURATION PROFILE ... 45

FIGURE 48. IMPORTING A CONFIGURATION PROFILE FROM A FILE (3)..... 45

Introduction

Congratulations on choosing an outstanding wireless product. This guide gives comprehensive instructions on installing and using the 11-Mbps Wireless Outdoor Bridge, and also explains how to install and use the WLAN Management System software.

Related Products

11-Mbps Wireless Outdoor Bridge is part of a family of wireless networking products that can provide an integrated solution for your wireless networking needs.

- For indoor applications: Access points, wireless workgroup bridges, wireless Ethernet clients, and wireless adapters with various bus interfaces (PCMCIA, USB, and PCI).
- For outdoor applications: The 11-Mbps Wireless Outdoor Bridge connects two independent Ethernet LANs via a radio link, making expensive outdoor cabling unnecessary. High-gain directional antennas provide the greatest possible transmission range.
- Management tools: 11-Mbps wireless products support the industry-standard Simple Network Management Protocol (SNMP) and the SNMP-based WLAN Management System, a powerful set of utilities for managing not only devices but whole networks and inter-networks.

WLAN Management System

WLAN Management System is a powerful network management system that is fully compatible with the industry-standard Simple Network Management Protocol (SNMP). It features:

- Automatic discovery of all compatible devices that are configured within the same subnet.
- Individual and batch-mode remote management of compatible devices, including Multi-Monitor, Batch-Upgrade, Batch-Reset, and Batch-Load Default functions. Batch-mode operation is ideal when deploying multiple compatible products.
- A friendly end-user interface with a consistent look and feel.

Automatic Discovery of Compatible Devices

A powerful auto-discovery algorithm is built into WLAN Management System. With a simple click on the Auto Discovery icon, all compatible devices within the subnet will be discovered. This discovery feature is based on the following techniques:

- **DHCP client and IP recovery:** The Outdoor Bridge has a built-in DHCP client, and will request an IP address from a DHCP server so that SNMP management can be carried out. Should there be a failure of the DHCP server, the Outdoor Bridge will auto-assign itself an IP address (see next) and then automatically negotiate for a new IP address when the server recovers.
- **Auto-IP:** When the Outdoor Bridge cannot get an IP address from a DHCP server, it will auto-assign itself an IP address of 169.254.x.x and a subnet mask of 255.255.0.0. A Windows-based system configured as a DHCP client will use the same algorithm to assign itself an IP address in the same subnet. *When the DHCP server comes back on line, users may need to renew their stations' IP settings as described below;* otherwise, Windows may continue to use the previous IP address instead of executing the auto-IP procedure.

Windows 95/98

- step 1.** Click **Start/Run**, type *winipcfg*, and click **OK**. The *IP Configuration* dialog box will open.
- step 2.** Select the network adapter you use to connect to the Outdoor Bridge. Click **Release**.
- step 3.** Click **Renew** to retrieve new information (IP address, subnet mask, and default gateway address) from the DHCP server. Click **OK** to save the changes and exit the program.

Windows NT 4.0

- step 1.** Click **Start/Programs/Command Prompt**. Type *ipconfig /release* (with a space after *ipconfig*) and press **Enter**.
- step 2.** Type *ipconfig /renew* (with a space after *ipconfig*) and press **Enter** to retrieve new information (IP address, subnet mask, and default gateway address) from the DHCP server.
- step 3.** Type *exit* and press **Enter**.

Windows 2000/XP

- step 1.** Click **Start/Programs/Accessories/Command Prompt**. Type *ipconfig /release* (with a space after *ipconfig*) and press **Enter**.
- step 2.** Type *ipconfig /renew* (with a space after *ipconfig*) and press **Enter** to retrieve new information (IP address, subnet mask, and default gateway address) from the DHCP server.
- step 3.** Type *exit* and press **Enter**.

WLAN Management System Hardware and Software Requirements

System requirements for installing and operating the WLAN Management System are:

- An x86-based microcomputer running Microsoft Windows 95, 98, Me, NT 4.0, 2000, or XP
- Microsoft Internet Explorer 4.01 or later
- A connection to an Ethernet network

Particular versions of Windows have the following additional requirements:

1. On Windows 95, Microsoft DCOM95 must be installed. You can obtain DCOM95 from the following Microsoft Web page:
<http://www.microsoft.com/com/dcom/dcom95/download.asp>
DCOM95 can also be found on the Microsoft Visual Basic 5.0 CD-ROM (Enterprise, Professional, or Standard edition), in the directory \Pro\Tools\DCOM95.
2. On Windows 98 (with the exception of Windows 98SE, which already includes this component), Microsoft DCOM98 must be installed. You can use the following link to download it:
<http://www.microsoft.com/com/dcom/dcom98/download.asp>
3. On Windows NT 4.0, Service Pack 4 or later must be installed.

Terminology Used in this Guide

BSSID, MAC ID

The BSSID (Basic Service Set ID) is a factory-set ID unique to each wireless networking product. It is identical to the MAC ID (Media Access Control ID). It allows each device to be identified on the wireless network.

ESSID

An Extended Service Set ID (often referred to as Service Set ID, or SSID) identifies the wireless LAN domain that a bridge is in. A domain is generally composed of wireless bridges in communication with each other via radio links. You can type an existing domain name or create a new one that contains up to 32 characters. The SSID is case-sensitive.

Regulatory Domain

11-Mbps wireless products use the license-free ISM (Industrial, Scientific, and Medical) band to communicate through radio waves. Different countries offer different radio frequencies to be used as the ISM band. There are four frequency bands defined by IEEE 802.11: Japan (2.471 to 2.497 GHz), USA, Extended Japan, Canada, and Europe (2.4 to 2.4835 GHz), Spain (2.445 to 2.475 GHz), and France (2.4465 to 2.4835 GHz). To use 11-Mbps wireless products in a country not listed above, check with your government's regulating body to find the correct frequency band to use. All 11-Mbps wireless products are supplied preset to the country of sale's frequency band.

WEP

WEP stands for Wired Equivalent Privacy. It is an encryption scheme that provides secure wireless data communications. WEP uses a 40-bit or 128-bit key to encrypt data. In order to decode the data transmission, all wireless clients on the network must use identical keys.

How to Use this Guide

This user’s guide gives complete instructions for installation and use of the 11-Mbps Wireless Outdoor Bridge.

Wireless Outdoor Bridge is supplied with factory set default network settings. Use the WLAN Management System tool to change the default settings before introducing a new bridge to an already-established wireless network.

The WLAN Management System is a simple-to-use, yet extremely powerful, SNMP-based utility for online central configuration and network management from a remote station on the same subnet. A trap management program is also provided to monitor/diagnose the Outdoor Bridge.

Read through the next section ‘Planning the Network’, in order to get the best possible performance from the 11-Mbps wireless network.

Step 1: Plan the wireless network	See “Planning the Network,” for details.
Step 2: Pre-configure the bridge before installing it into an existing Ethernet network	See “Hardware Configuration,” for details.
Step 3: Install the bridge into the Ethernet network	See “Installing the WLAN Management System,” for details.
Step 4: Make online configuration and manage the bridge via the WLAN Management System utility	See “Using the WLAN Management System,” for details.

Planning the Network

The Wireless Outdoor Bridge is used to connect two separate networks via radio waves. A typical application is shown below.



Figure 1. Typical application scenario

The bridge connects to your existing wired or wired/wireless local area network as shown below (Figure 2).

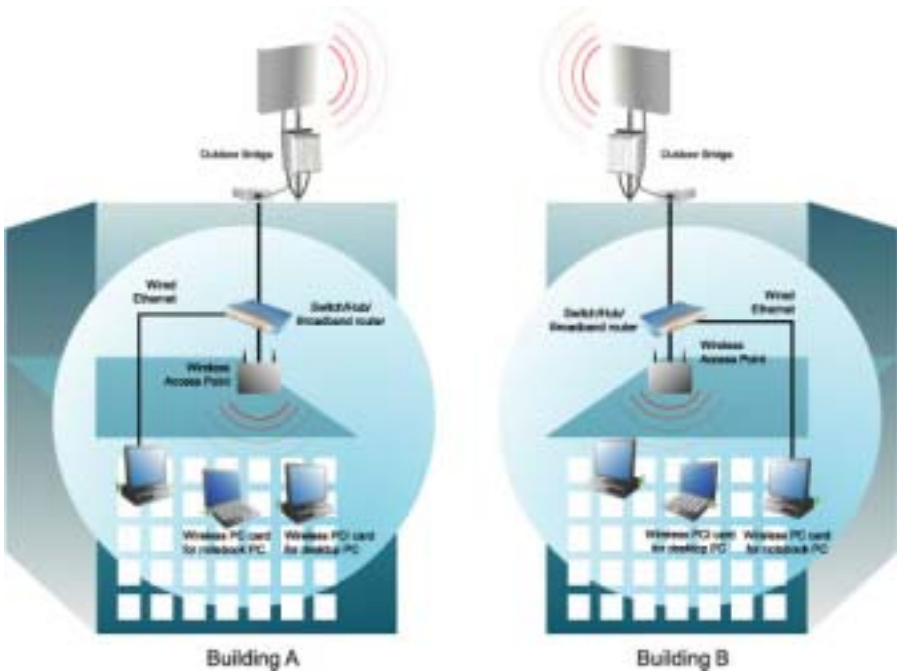


Figure 2. Connection to LAN or LAN/WLAN

Hardware Description

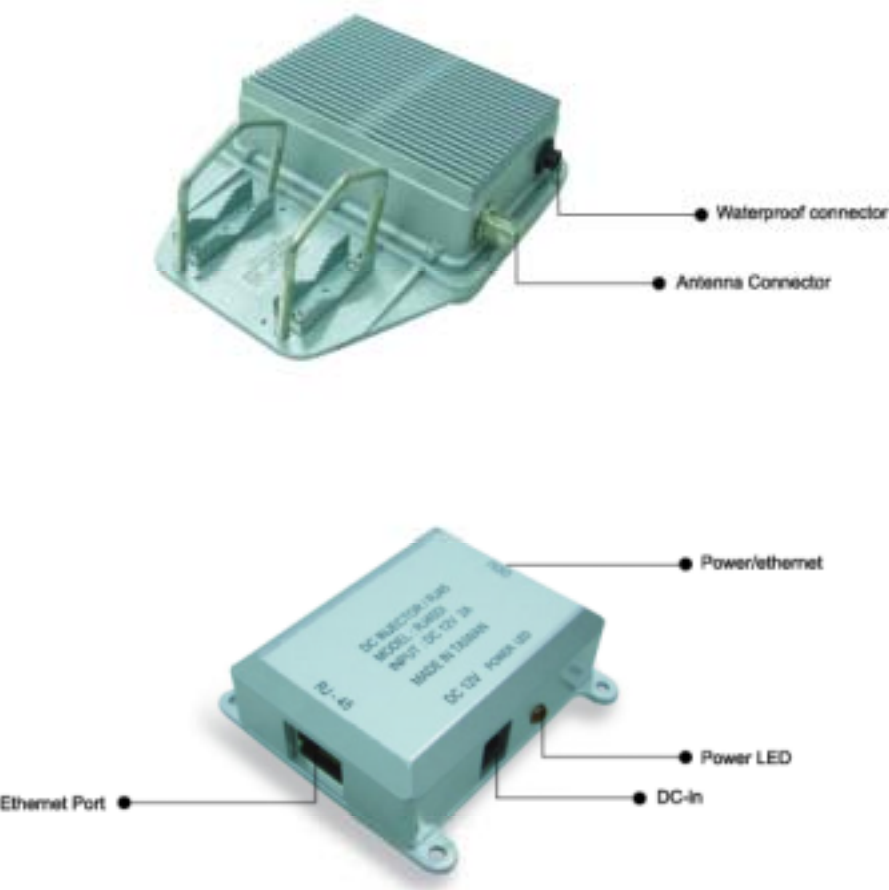


Figure 3. Wireless Outdoor Bridge and DC injector

Hardware Configuration

Before adding a Wireless Outdoor Bridge to an existing Ethernet network, you need to carry out basic configuration, e.g., set the SSID, security (WEP) parameters, bridge mode (including the peer bridge's MAC address), channel number, and IP address in order to make the bridge compatible with the existing network.

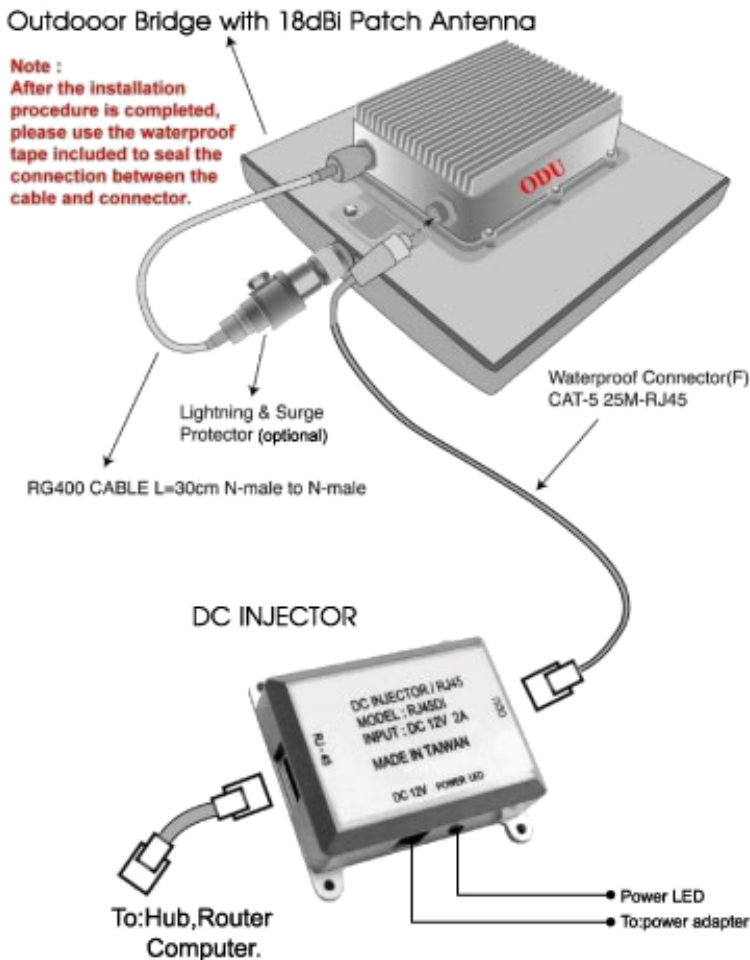


Figure 4. Wireless Outdoor Bridge Solution Installation

Pre-configuration can be carried out through WLAN Management System. As long as the outdoor bridge and the management station are on the same physical Ethernet LAN, WLAN Management System's **Kick Start** function will find the outdoor bridge and let you set basic parameters. Make connections as follows:

- step 1.** Using the supplied Category 5 waterproof cable, connect the waterproof connector port of the outdoor bridge to the ODU port of DC injector.
- step 2.** Using Category 3 or higher UTP or STP cable, connect the RJ-45 port of DC injector to a 10- or 10/100-Mbps Ethernet hub or switch, and connect the management station to a hub or switch on the same LAN.
- step 3.** Connect the output cord of the power adapter to the DC injector's DC input jack, and plug power adapter into an AC outlet to power up the outdoor bridge (see Figure 4 and Figure 5).

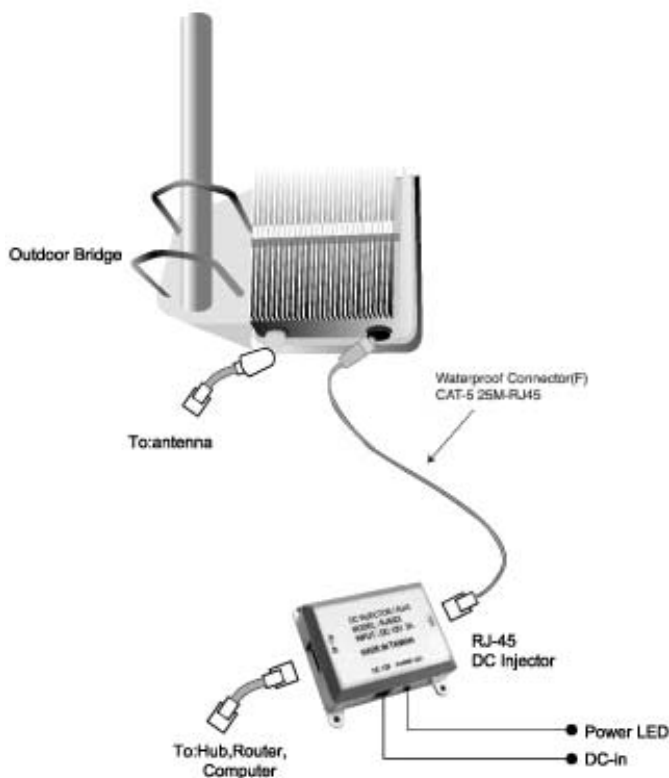


Figure 5. Wireless Outdoor Bridge Installation

11-Mbps Wireless Product Placement Guidelines

A few tips to mention that are particularly significant in a radio wave communications system:

1. Radio waves reflect or refract from buildings, walls, metal furniture, or other objects. This could result in performance degradation due to the fluctuation of the received signal.
2. Microwave ovens use the 2.45 GHz frequency band. 11-Mbps wireless devices also functions in the 2.4 ~ 2.5 GHz band, and therefore shares some of the band with microwave ovens. This means that when a nearby microwave oven is in use, it may interfere with 11-Mbps wireless signals, resulting in performance degradation on the wireless network.

Antenna Alignment

For the best performance, adjust the position of the antenna until an optimal signal quality results (see Antenna Alignment Utility for details).

Installing the WLAN Management System

- step 1.** Insert WLAN Management System Disk 1 in floppy drive A, choose **Run** from the desktop's **Start** menu, type `a:\setup.exe`, and click **OK**.
- step 2.** The setup program will prepare the InstallShield Wizard and then display a *Welcome* window.



Figure 6. Welcome screen

- step 3.** Click *Next*.



Figure 7. Important Issues window

- step 4.** Older operating systems may need to update some system files to function correctly with the WLAN Management System. If required, follow the on-screen instructions to download the required file. Click *Next* to open the **Choose Destination Location** window.



Figure 8. Choose Destination Location window

- step 5.** Click *Next*.



Figure 9. Select Program Folder window

- step 6.** Click *Next* again. Installation will begin. You may be instructed to insert disk 2 in drive A. Follow all on-screen instructions until the ***Setup Complete*** window appears.



Figure 10. Setup Complete window

- step 7.** Check “I would like to launch the Management System” and click ***Finish***.

Using the WLAN Management System

Once the outdoor bridge is connected to an Ethernet network, a network administrator can connect to it from any PC on the same network via the WLAN Management System utility.

The WLAN Management System utility is a Windows-based SNMP management tool allowing network administrators to remotely configure and monitor the outdoor bridge through an Ethernet connection. To launch the WLAN Management System utility:

step 1. Click *Start > Programs > WLAN > Management System > WLAN Management System*. The main WLAN Management System window will open. Click *Start/Start Hosts View*.

Auto-Discovery

This discovery protocol can discover all compatible wireless operating devices connected to the Ethernet LAN within the same subnet.

- step 1.** Click the Auto Discovery icon (a pair of binoculars) on the left side of the Hosts View window. All working compatible devices will automatically be discovered.
- step 2.** Select one of the wireless devices on the list. The utility buttons on the left toolbar will be enabled.
- step 3.** Right-clicking on a particular device will open a pop-up menu offering the same functions as the toolbar (Figure 11).

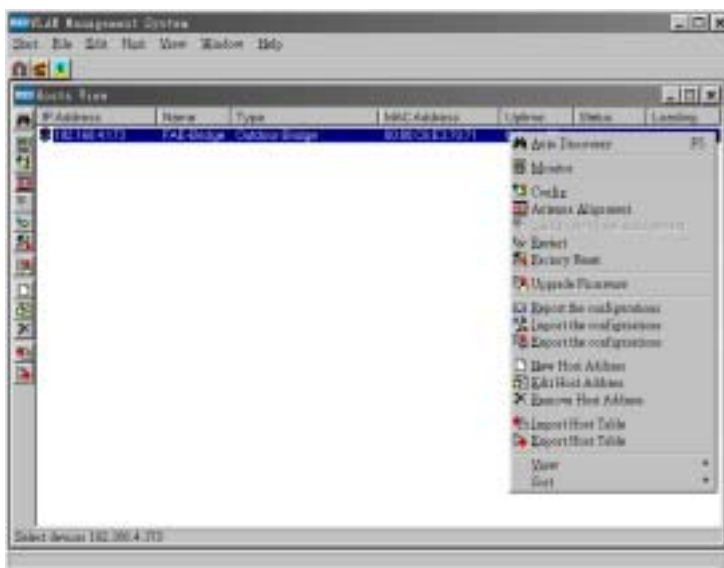


Figure 11. Main and Hosts View windows

Kick Start Function

If for any reason the outdoor bridge does not yet have a reachable IP address, it can be discovered, and a suitable IP address assigned to it, using the Kick Start function.

- step 1.** Click the Kick Start icon (a figure with one leg extended) in the top toolbar. The **WLAN Kick Start** window will appear.
- step 2.** Open the **WLAN Kick Start** window's **Start** menu and choose **Find**, or click the Find icon (a pair of binoculars), or press F5. After a few seconds the MAC addresses of all Kick Start-compatible devices on the network will appear.
- step 3.** Select the device to be configured, open the **Tools** menu and choose **Change IP Settings** (or click the Change IP Settings icon).



Figure 12. WLAN Kick Start window

This window's **Tools** menu also lets you test IP connectivity, reboot, reset the selected device, or change its password. The administrator password set on the device is “admin” as the default. The **Edit** menu is for manually adding and removing devices in the display. The **Start** menu, in addition to letting you initiate Kick Start discovery, lets you set preferences for the Kick Start and ping functions (timeout periods, number of tries, etc.).

Configuration

- step 1.** For configuration, select the outdoor bridge in the *Hosts View* window.
- step 2.** Right-click the outdoor bridge to open the pop-up menu (Figure 11).
- step 3.** Click **Config** to go to the configuration window (Figure 13).



Figure 13. Configuration window — IP panel

IP

IP Address Setting: The outdoor bridge is a DHCP client. It will automatically ask the DHCP server to assign it an IP address. An administrator can assign a fixed IP to an outdoor bridge by unchecking the *Obtain IP Settings Automatically (by DHCP)* box (Figure 13). You may also configure a subnet mask and add a default gateway.

If you assign a fixed IP address to an outdoor bridge, make sure that all outdoor bridges within the same network have the same TCP/IP subnet address.

Obtain IP Settings Automatically (by DHCP)	Automatically retrieves an IP address for the outdoor bridge from a Dynamic Host Configuration Protocol (DHCP) server. This option is enabled by default.
IP Address	Manually assigns an IP address to the outdoor bridge.
Subnet Mask	Manually assigns a subnet mask to the outdoor bridge.
Default Gateway	Manually specifies the default gateway IP address (if required).

Note: An outdoor bridge will directly transfer SNMP response packets (confirmation packets) to a management PC if it is within the same LAN (the same subnet mask). If an SNMP response packet from an outdoor bridge is destined for a management PC on another LAN, the SNMP response packet needs to be forwarded by routers. The default gateway is the closest router to

the outdoor bridge. If the correct default gateway is set, you can use a manager (i.e. a PC running WLAN Management System) physically located in a different subnet to manage this outdoor bridge.

Filter

The next panel in the configuration dialog box is *Filter* (Figure 14).



Figure 14. Configuration window — Filter panel

This is a one-way protocol filtering mechanism that prevents the bridge from transmitting specified protocols packet from a wired Ethernet LAN into the wireless LAN. If you do not require particular protocols on the wireless part of your network, you can save bandwidth by enabling the protocol filter.

From the **Filter** panel, some, all, or none of the protocols listed may be selected for filtering out:

- IP Protocol
- IPX Protocol
- NetBEUI Protocol
- AppleTalk Protocol
- Other Protocols

- Internet Multicast Frames

Wireless

The *Wireless* panel (Figure 15) provides access to the Wireless settings.



Figure 15. Configuration window — Wireless panel

These settings are explained in the following table.

<i>Name</i>	Assigns the outdoor bridge a unique name that allows the outdoor bridge to be easily identified on the network.
<i>SSID</i>	Identifies the wireless domain that this outdoor bridge is in. A wireless domain, in the case of outdoor bridges, is ordinarily composed of two or more outdoor bridges that are in communication with each other via radio links. Wireless outdoor bridges that will be in communication with each other must be set to use the same SSID in order to be able to establish a wireless link or links. You can type an existing domain name or create a new one. An SSID is case-sensitive and can contain up to 32 characters.
<i>Transmission Rate</i>	Sets the transmission rate at which data packets are transmitted by the outdoor bridge. In high-interference environments, a lower rate can increase overall transmission speed by reducing resends of lost packets.

Basic Rates	This value determines the basic rates used and reported by the outdoor bridge. The highest rate specified is the rate that the outdoor bridge will use when transmitting broadcast/multicast and management frames. Available options are: • 1, 2 Mbps • All (1, 2, 5.5, and 11) Mbps
Channel Number	You can change the channel number from here. Wireless outdoor bridges that will be in communication with each other must be set to use the same channel in order to be able to establish a wireless link or links.
Regulatory Domain	Identifies the country where the outdoor bridge is used. Each country has defined its available channel numbers and transmission power

Important:

In a multiple cell network topology, overlapping and/or adjacent cells using different channels can operate simultaneously without interference if the difference between the center frequencies is at least 30 MHz. For example, channels 1, 7, and 13 are non-overlapping frequency channels.

Bridge Mode



Figure 16. Bridge Mode – Point to Point

Point to Point

Each bridge has to know its peer bridge’s MAC address. For example, if Bridge A is to connect with Bridge B, then Bridge B’s MAC address must be entered on this page for Bridge A, and Bridge A’s MAC address must be entered here for Bridge B.



Figure 17. Bridge Mode – Point to Multipoint

Point to Multipoint

If a large wireless network using more than two outdoor bridges is to be constructed, at least one of the outdoor bridges must be set to Point-to-Multipoint mode. Other outdoor bridges can be set to either Point-to-Point or Point-to-Multipoint mode. In this mode, up to six other bridges can be connected. Their MAC addresses must be entered here.

For example; if Bridge A is the master bridge and needs to connect with Bridge 1 and Bridge 2, then when setting Bridge A, the MAC addresses of Bridge 1 and Bridge 2 must be entered on the Bridge Mode page (Figure 17). Likewise, Bridge 1 and Bridge 2 must be set to Point to Point mode, and Bridge A’s MAC address must be entered as the peer bridge MAC address (Figure 16).

Encryption

Click the *Encryption* tab (Figure 18) to set up the security options.



Figure 18. Configuration window — Encryption panel

The default setting is *WEP Disabled* and initially the key sections are blank.

The pull-down *Method* box lists two options:

- WEP: Disable - Disable data encryption
- WEP: Enable - Enable data encryption

If enabled data encryption, there are two options in the pull-down *Key Length* box:

- 40-bit WEP - Enable use of 40-bit WEP
- 128-bit WEP - Enable use of 128-bit WEP

Key Generation - There are two ways to generate a security key. The first is by entering any text in the *Passphrase* field. Click the **Generate** button. For 40-bit WEP, it will generate four keys, Key 1, Key 2, Key 3, and Key 4. Select a key number from the dropdown list of the *Default Key* box. If you do not manually select a key, key 1 will be selected. For 128-bit WEP, only one key will be generated. Click **OK**.

Another WEP key generation method is to insert the key values directly from the keyboard. Enter your own key into one of the *Key 1~4* fields. Select that field number in the *Default Key* field.

SNMP Access Control

The outdoor bridge contains an SNMP access table to limit access to its configurations. By default there is no restriction on accessing the outdoor bridge. To avoid chaos on the network, access to the outdoor bridge configuration should be restricted to only those who require access.

When you select SNMP Access Control, the system will display four blank wireless devices for setting (maximum of 4 SNMP devices can be set). Right-click on a blank in the list and click *Edit Address* (Figure 19).

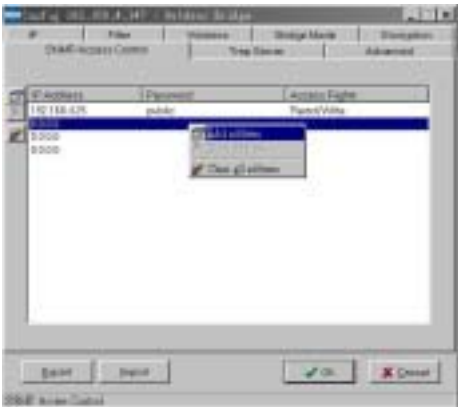


Figure 19. Configuration window — SNMP Access Control panel
The *New/Edit Address* dialog box will open (Figure 20).



Figure 20. New/Edit Address dialog box

11-Mbps Wireless Outdoor Bridge 25

Two levels of access rights may be assigned:

Read	Read-only rights. The user may read everything except the Access Control settings, but is not allowed to alter anything
Read/Write	The user may read and alter all settings

Note: Do not set all the stations in the Access Control table to Read only. Once this is set and enabled, it will be impossible to modify the outdoor bridge. Should this situation occur, you need to restore the outdoor bridge to the factory configuration by using Kick Start (see FAQs for details).

To set a stations' access right, enter a station's IP address and password and choose *Read* or *Read/Write*.

When a setting is made, click **OK**. Repeat the procedure for the next station. When all settings are made, click **OK** in the configuration dialog box to make the changes effective.

Trap Server

When the outdoor bridge is powered on, or an Ethernet port becomes active, an event log will be generated indicating the time, the IP address of the reporting outdoor bridge, and the event. You can view and save the event logs from the station as a Trap Server.

To assign a trap server, click *Trap Server* (Figure 21).



Figure 21. Configuration window — Trap Server panel

Assign a station as a trap server by entering its IP address. Right-click on a blank in the list and click **Edit address**.

To remove a trap server from the list, right-click it and click **Clear address**. Click **Clear all address** to remove all assigned trap servers from the list (Figure 22).

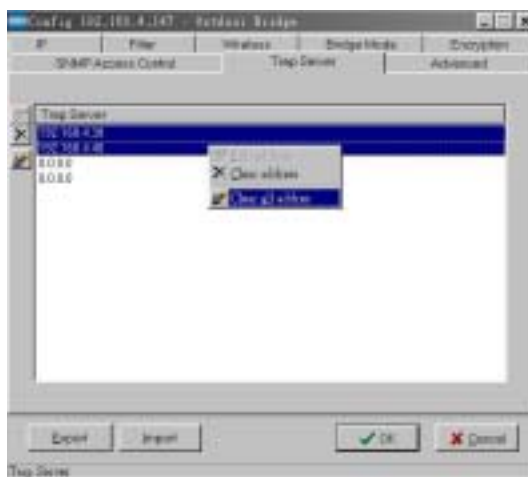


Figure 22. Configuration window — Clear all Address function

Trap View

To view trap log information, click the *Start Trap View* icon (a ringing telephone) in the upper left corner of the main WLAN Management System window. A window such as that shown below will appear (Figure 23).

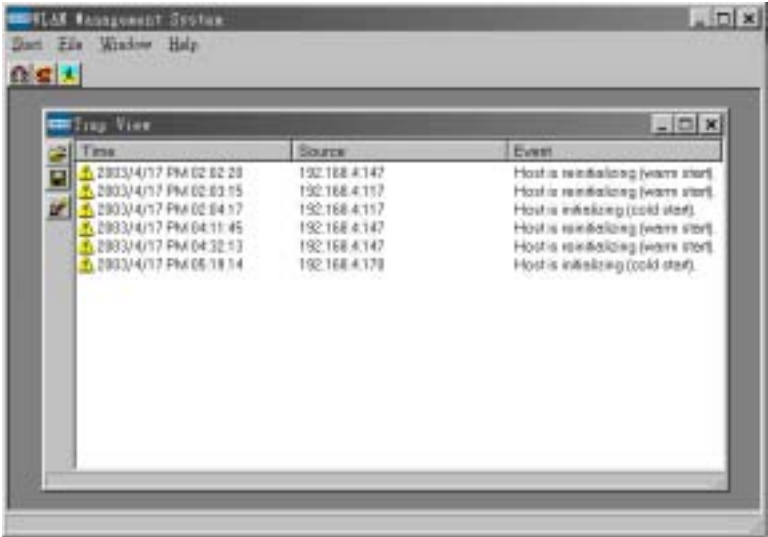


Figure 23. Trap View window

The log shows the time, the IP address of the reporting outdoor bridge, and the event. You can save, open, and delete log files through the *File* menu.

Advanced

You may set packet size thresholds in the **Advanced** section.

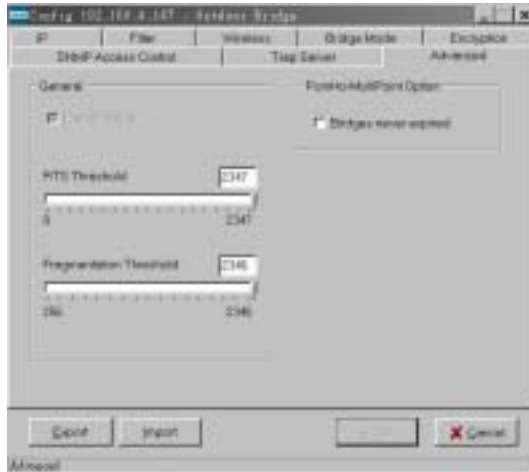


Figure 24. Configuration window — Advanced panel

RTS Threshold: Transmitters contending for the medium may not be aware of each other. The RTS (Request to Send) mechanism can solve this “Hidden Node Problem”. If the packet size is smaller than the present RTS threshold size, the RTS mechanism will NOT be enabled.

Fragment Threshold: In the 802.11 Standard, the MAC Layer may fragment and reassemble directed data units. The fragmentation and defragmentation mechanisms allow for fragment re-transmission.

Important:

Once all configurations have been completed, click **OK**. You will be reminded that a reset is required to make the changes effective. Click **Yes**.



Figure 25. Warning before bridge reset

Monitor

The Monitor tool allows the outdoor bridge’s status, Ethernet statistics, wireless statistics, and other configuration information to be viewed/monitored.

In the *Hosts View* window, select a bridge and click the **Monitor** button on the toolbar or on the pop-up menu.

An information window will appear. The first of two panels in this window, the Identity panel, will be visible (Figure 26).



Figure 26. Monitor window — Identity panel

Identity Information

The information shown (see table below) is read-only.

Device Name	System default category name
Name	Human-friendly name assigned by the user for easier identification
S/W Version	Shows the device software version number
H/W Version	Shows the device hardware version number
Current Channel	Shows the wireless channel currently in use on the device
Current BSSID	Shows the BSSID of the device (same as the device MAC address)

Statistics

The Statistics window shows both Ethernet and wireless transmission/reception statistics. To refresh the statistics, click on the ► button to continually refresh the information. Click on the ■ button to stop updating the information.

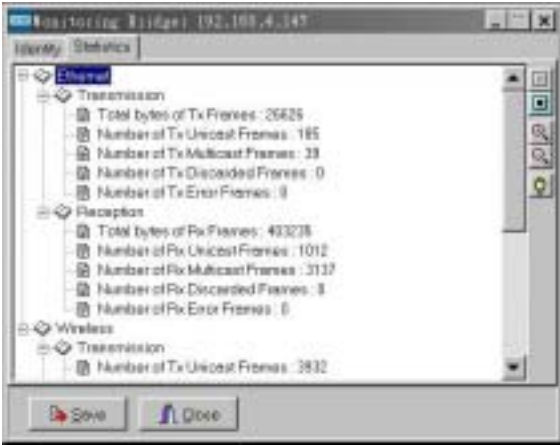


Figure 27. Monitor window — Statistics panel

Restart

Restarting the outdoor bridge will take about 30 seconds (Figure 28).

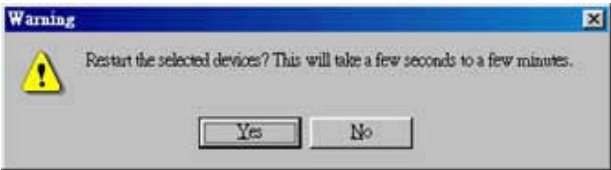


Figure 28. Warning before bridge restart

During this period, the WLAN Management System will not be able to query the outdoor bridge via the SNMP protocol and the outdoor bridge will not be available to its client stations.

Factory Reset

Click *Factory Reset* if you want to return the device to its factory default settings. A warning dialog box will open (Figure 29).

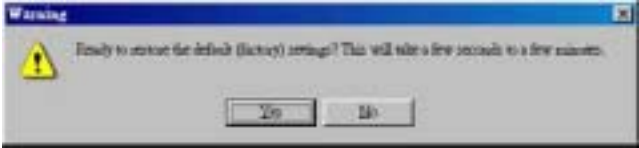


Figure 29. Warning before factory defaults are loaded

Click **Yes** to return the outdoor bridge to the factory default settings.

Upgrade Firmware

The outdoor bridge’s embedded software is contained in “flash” ROM, and can be updated over your LAN via the WLAN Management System. To download new embedded software to the device, click *Upgrade Firmware*. The *Upgrade Firmware* dialog box will open (Figure 30).

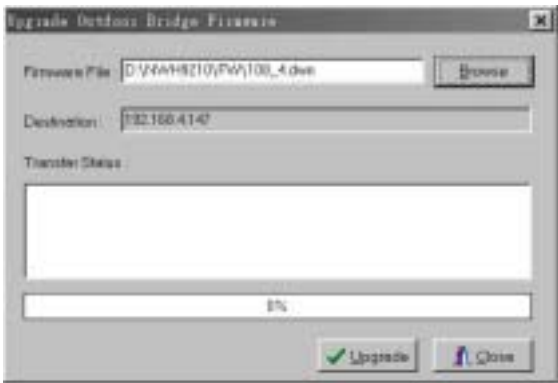


Figure 30. Upgrade Firmware dialog box

Browse for the file to be uploaded to the outdoor bridge, or type the path and file name into the *Firmware File* field.

The *Upgrade* button will then become enabled. Click **Upgrade** to start downloading the file to the outdoor bridge. The WLAM Management System and the outdoor bridge's built-in Trivial File Transfer Protocol (TFTP) client/server will load the new executable into the outdoor bridge's flash ROM area. If the download activity fails, an error message will be shown in the message box. Once the file transfer is complete, click **Close** to close the window.

Antenna Alignment Utility

The wireless bridge is usually used to connect two separate LANs via the radio link with a directional antenna to extend the distance between two wireless bridges. Sometimes the distance between two LANs might be several kilometers. Owing to the nature of the directional antenna, the higher the antenna gain is, the narrower the angle of the wave propagation will be. In order to achieve the best radio performance of wireless outdoor bridge, the antenna alignment utility is developed to help the technician in easily installing the antenna as well as achieving the best radio performance.

Features

The Antenna Alignment Utility features:

- Integrated together within WLAN Management System
- Easy to use
- Real-time display of radio performance
- Two-dimensional or three dimensional graphic presentation of test results
- The historical test data and setup conditions can be stored and retrieved to compare with the latest test results.

Using the Antenna Alignment Feature

Step 1: Access the Antenna Alignment function

After wireless outdoor bridge and the antenna have been successfully installed, antenna alignment can be carried out. Connect a notebook PC directly to an outdoor bridge. Start up WLAN Management System on the notebook PC. Click the Auto-discovery icon. The outdoor bridge connected to the notebook PC will be found and shown on the screen. Select the outdoor bridge and then click the right mouse button. The available tools for a wireless bridge will be shown. Then, select **Antenna Alignment**.

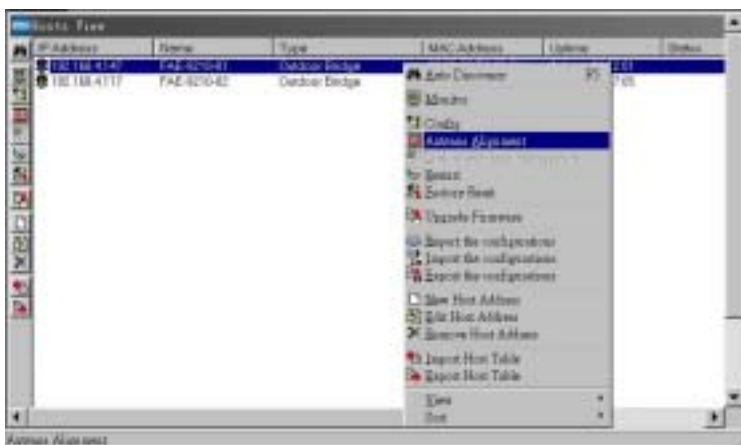


Figure 31. Antenna alignment for bridges

Step 2: Set the parameters for testing

The calculation of the antenna alignment is conducted by the following procedure:

- Bridge A sends a packet to Bridge B
- When Bridge B successfully receives the packet from Bridge A, it will automatically echo the packet back.
- When Bridge A receives the packet echoed back by Bridge B, it can calculate the throughput and can present it as PPS (packets per second) and KBPS (kilobytes per second). The higher the throughput is, the better alignment is achieved.

Since every installation is different (for example, the difference in distance, temperature, humidity, and alignment angle) no standard reference can be given.

The user can specify the following parameters for each test:

- **Packet Length:** Ranges from a minimum of 64 bytes to a maximum of 1514 bytes, as Ethernet does. The larger the packet size is, the higher the error rate is likely to be.
- **Packet Count:** The packet number to be sent during the test. The larger the packet count is, the more time the test will take.

- **Peer Bridge:** In a Point to Multi-Point application environment, all the wireless bridges configured to communicate with each other are shown in the pull-down *Peer Bridge* box. A peer bridge has to be specified by indicating its MAC address before starting the antenna alignment test. The selected bridge must be set up to be able to communicate with the bridge initializing the alignment test.

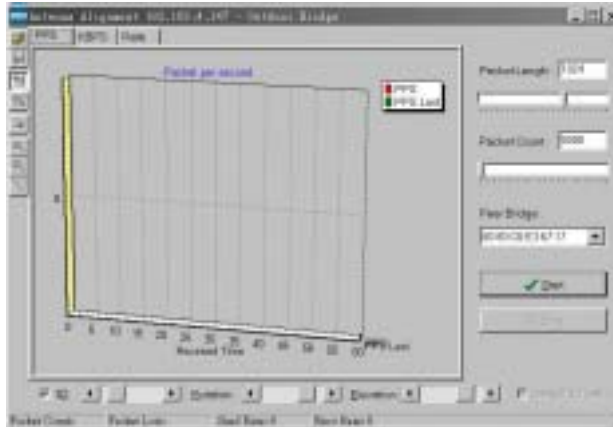


Figure 32. Antenna Alignment Tool

Tips in setting the parameters:

1. **Rough alignment:** When the bridges are first set up, the antennas of the bridges are not yet aligned under an optimum condition. It is recommended to use a shorter size and a smaller packet count to perform the test so that test results can be obtained quickly.
2. **Fine Alignment:** Once the test reveals that the antenna is just about aligned, enter a longer packet size and larger packet count for the fine alignment.

Step 3: Execute the test and evaluate the performance

After all the parameters have been properly entered, click **Start** on the right side of the window to execute the test. Test results are immediately presented as a three-dimension graphic (Figure 33).

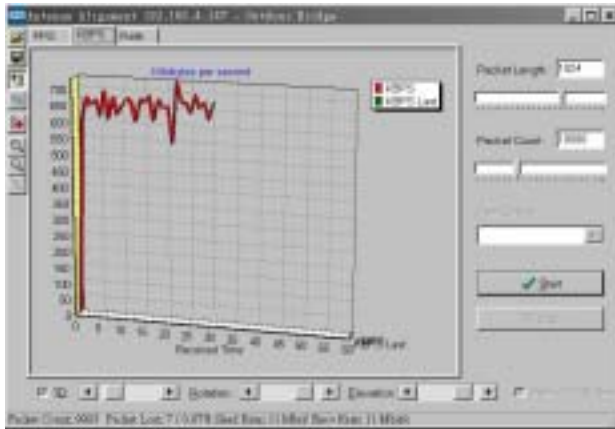


Figure 33. Throughput presented as a 3D graphic

During the antenna alignment test, the bridge might receive interference owing to some unexpected reason. Under this circumstance, the wireless communication data rate will automatically fall back. The numbers of packets sent or received at different data rates can be viewed as shown below (Figure 34).

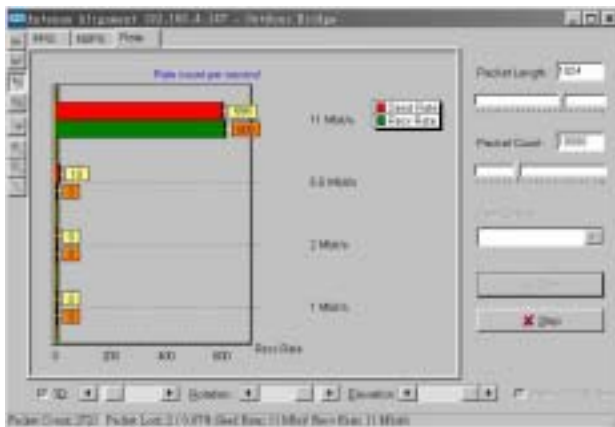


Figure 34. 3D view of data rate distribution

Step 4: Save the test results to a file

The tests may be repeated as described in Step 3 until the antenna is aligned at the optimum position. Then store the test configuration and test results in a file for later

use. Click the *Save Current Alignment Info* icon (a floppy disk) on the toolbar to open the *Save As* box (Figure 35).

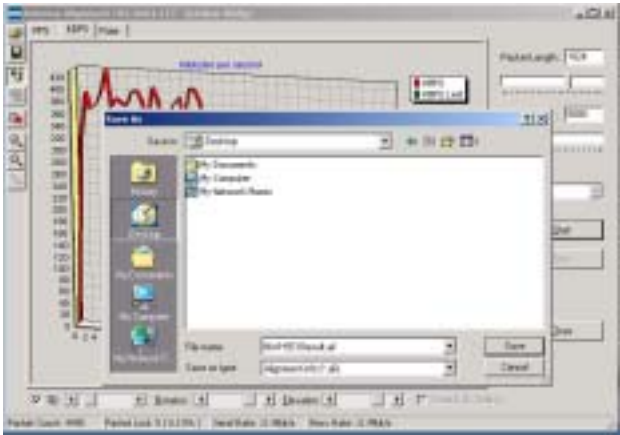


Figure 35. Saving the test results to a file

A previously saved test data file can also be restored back and shown in the window. Use the previously stored file as a reference to compare with the latest test results and evaluate the difference between them. In the following figure (Figure 36), the red line represents the latest test results and the green line represents the previous test results.

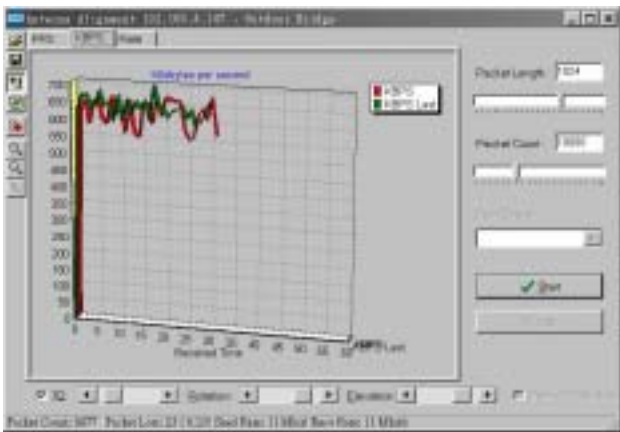


Figure 36. 3D view of past and latest test results

Step 5: View test results as a three-dimensional graphic

The Antenna Alignment utility allows the user to view the test results in multiple ways:

- 2D (two-dimensional) or 3D (three-dimensional)
- Zoom in for a magnified view or zoom out for a wider view
- Rotation: rotate the view angle from side view
- Elevation: rotate the view angle from top view

Zooming in for a magnified view: Click the *Zoom In* icon (a magnifying glass and a plus sign [+]) from the toolbar. Click the right button of the mouse and drag the graphic window to adjust the result's focus.

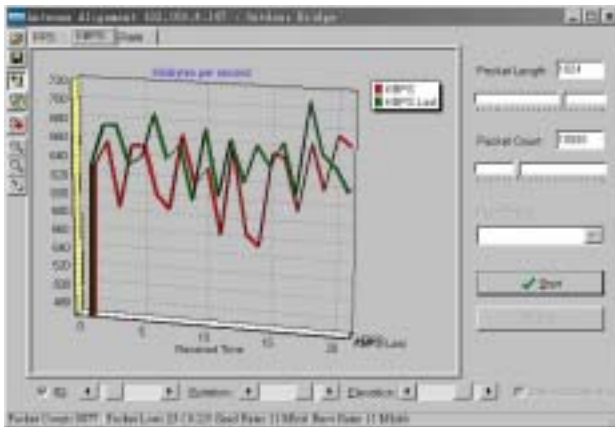


Figure 37. Zooming in for a magnified view

Zooming out for a wider view: Click the *Zoom Out* icon (magnifying glass and a minus sign [-]) from the toolbar.

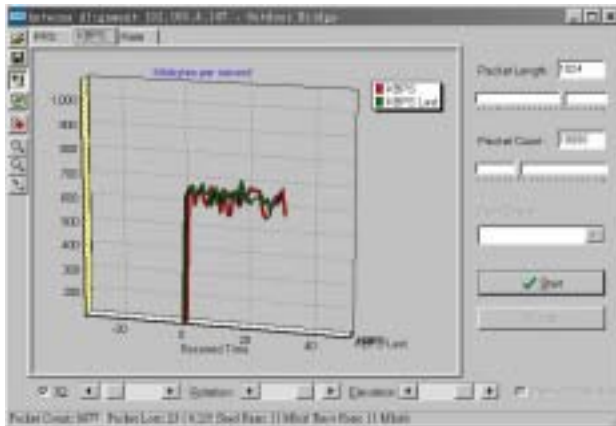


Figure 38. Zooming out for a wider view

3D Enhancement: Adjust the 3D slider at the bottom of the window.

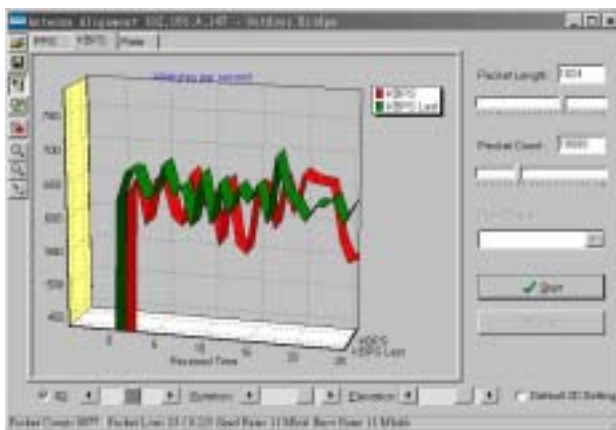


Figure 39. Enhanced 3D effect

Rotation and Elevation for X, Y, and Z axes: Adjust the *Rotation* and *Elevation* sliders at the bottom of the window.

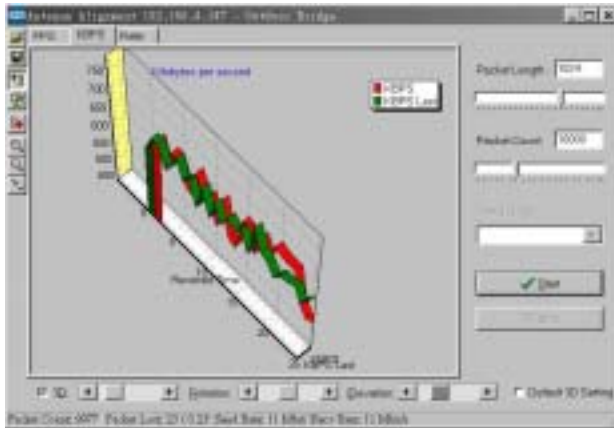


Figure 40. Rotation and elevation effects

Step 6: Export the chart to file or clipboard

Click *Export Chart* icon on the toolbar to select ‘Save to File’ or ‘Copy to Clipboard’ buttons.

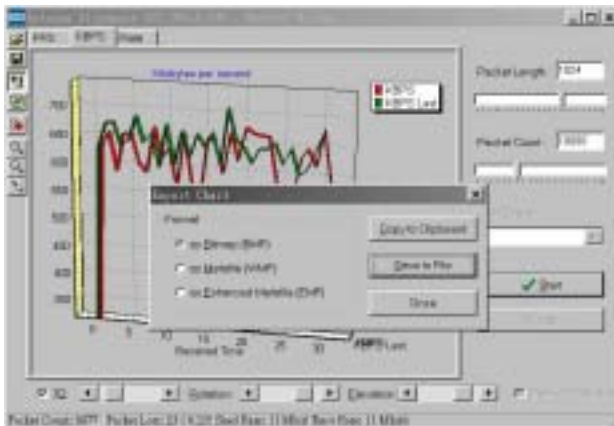


Figure 41. Exporting the chart to a file

Advanced Management

Batch mode operation

In order to maximize the efficiency of wireless LAN management, you can use batch mode operation to manage your outdoor bridges. You can sort wireless devices by device type first. Then select the multiple outdoor bridges you would like to manage. Next, click the right mouse button to open the pop-up menu; then choose the functional tool you would like to use to work on these specific outdoor bridges.

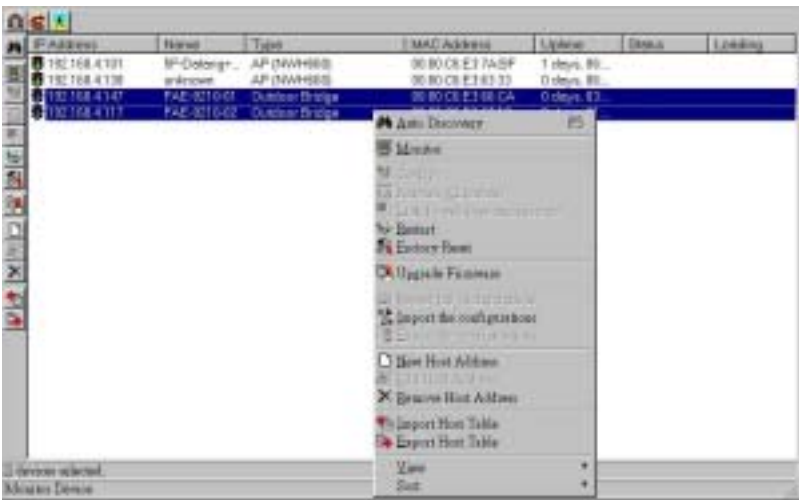


Figure 42. Batch mode operation list

Manage WLAN Management System Host Table

Partition the network according to the physical location

The Host Table is a very powerful function to support a mass deployment of 11-Mbps wireless products. You can combine several outdoor bridges together with access points and other compatible devices to form a group with a specific Host Table name so that you can divide the wireless network into many small groups.

Create Host Table via Automatic Discovery

Click the Automatic Discovery icon to find all compatible devices. Select the desired outdoor bridges (for example, those located in Building A). Click the right mouse button to open the pop-up menu. Choose ***Export Host Table*** to save the Host Table to a file (for convenience, you can save the Host table on a network disk for ease of access).

Import Host Table to check device's availability

Import the Host Table from a file (for convenience, you can retrieve the Host table from a network disk for the ease of access). Once the Host Table is imported, WLAN Management System will automatically check the availability of outdoor bridges listed in the Host Table. This is an extremely powerful feature to make up for a shortcoming of the Auto-Discovery function. Auto-Discovery can only find compatible devices when they are alive. Failed devices cannot be found via Auto-Discovery. The devices listed in the Host Table should be available and provide the service. If they do not exist, WLAN Management System can report their absence immediately so that the system administrator can take appropriate action.

New/Edit/Delete a Host Address on Host Table

Click the *Add New Address* button to open the New/Edit Address dialog box (Figure 43). After the outdoor bridge's IP address has been entered, WLAN Management System will automatically find the device and list it in the Host Table. You can also select any outdoor bridge in the table and click the *Remove Host Address* button to delete it whenever it is no longer necessary.



Figure 43. New/Edit Address dialog box

Exporting a Configuration Profile to a File

The configuration file can be saved to a text file and safely stored. To do this, first click the *Export* button in the *Configuration* window. Then enter the file name for the configuration profile to be saved to. Click **Export** again.



Figure 44. Exporting a configuration profile to a file

Importing a Configuration Profile from a File

A configuration file can also be imported to recover the outdoor bridge's original settings. This profile can also be copied to the other outdoor bridges. To do this, first click the *Import* button in the *Configuration* window. Then enter the file name for the configuration profile to be imported from. Click *Next*.



Figure 45. Importing a configuration profile from a file (1)

In the Step 2 display (Figure 46), you can select or uncheck the sessions of the configuration profile to be imported. Click *Next*.



Figure 46. Importing a configuration profile from a file (2)

Encryption

The configuration profile does not contain the security key settings. The attributes of security keys are externally **write-only** and cannot be saved in the configuration file. If you select an encrypted session to be imported, the Encryption window (Figure 47)

will appear before the Step 3 display (Figure 48), and you will be asked to enter the security key settings manually.

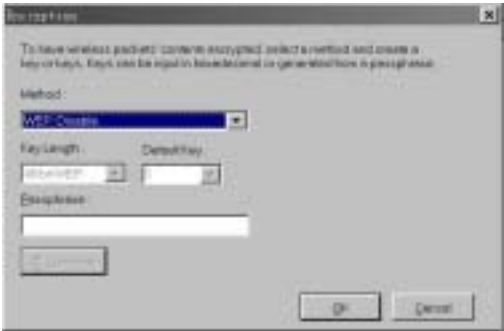


Figure 47. Encryption dialog when importing a configuration profile

In the Step 3 display (Figure 48), click *Import*.



Figure 48. Importing a configuration profile from a file (3)

FAQs

The FAQs section attempts to answer the most commonly asked questions about the 11-Mbps Wireless Outdoor Bridge.

<i>Question</i>	<i>Answer</i>
<i>How can I manage the bridge?</i>	The bridge does not have a console port. You may easily configure and manage the bridge remotely via its standard RJ-45 Ethernet network interface. Configure the bridge using the method described in this manual.
<i>Can wireless clients associate with the bridge?</i>	No, the bridge is a transparent bridge, NOT an access point.
<i>At what radio frequency does a bridge communicate?</i>	In the US, wireless LAN radios transmit and receive on one of 11 channels in the 2.4-GHz frequency band. This is a public frequency, and is unlicensed by the FCC.
<i>How do I secure the data crossing a bridge's radio link?</i>	Enable Wired Equivalency Protocol (WEP) to encrypt the payload of packets sent across a radio link.
<i>What is the typical range for a bridge?</i>	The typical range depends on many factors, including the following: data rate (bandwidth) desired, antenna type, antenna cable length, and device receiving the transmission. In an outdoor antenna installation, range can be up to 1.5 km or more.
<i>What is the speed of the bridge's Ethernet port?</i>	The bridge's Ethernet port supports 10 Mbps over a 10Base-T RJ-45 connector (half-duplex only).
<i>What are possible sources of interference for the radio frequency link of the bridge?</i>	Interference can come from a number of sources, including 2.4-GHz cordless phones, improperly shielded microwave ovens, and wireless equipment manufactured by other companies. Police radar, electrical motors, and moving metal parts of machinery can cause interference too.

<i>How do I set the outdoor bridge back to its factory default settings?</i>	You can apply <i>Factory Reset</i> option from the menu of the WLAN Management System or use <i>Kick Start</i> function by the following way: 1. Connect the outdoor bridge to your PC. Please make sure the Ethernet connection is normal. 2. Open WLAN Management System application and click Kick Start icon. 3. Click <i>Find</i> icon from WLAN Kick Start window or press <F5> key to search for outdoor bridges. 4. Right-click the outdoor bridge that you want to reset and select <i>Restore Default</i> option.
<i>What security features does the bridge support?</i>	Data security: The bridge supports 40-bit and 128-bit Wired Equivalent Protocol (WEP). Management Security: SNMP Access Control.
<i>In what modes can the bridge operate?</i>	The bridge can operate in Point-to-Point mode and Point-to-Multiple Point mode
<i>Do the antennas need line of sight to function?</i>	The antennas connecting to a bridge need not only visual line of sight, but also radio line of sight. Radio line of sight includes an elliptical region around the visual line of sight called the Fresnel zone. For optimal performance, make sure the Fresnel zone is clear of all obstructions including trees, power lines, buildings, and geographic obstacles.

Troubleshooting

This section provides you with some troubleshooting info should you encounter installation or operation problems on 11-Mbps Wireless Outdoor Bridges. If the problems still cannot be remedied after going through the Troubleshooting section, check the FAQs on page 47 of this manual.

If your problems still cannot be remedied after going through the FAQs and this Troubleshooting section, contact your network equipment supplier for assistance (see “Technical Support,” page 51).

<i>Symptom</i>	<i>Suggested Solutions</i>
<i>The WLAN Management System cannot detect an Outdoor Bridge on the same network.</i>	1. Make sure the outdoor bridge is powered on and connected to an Ethernet work. 2. Check the IP addresses assigned to the outdoor bridge and management terminal PC. They should be in the same subnet and unique. For example, if the outdoor bridge's IP address is 192.168.1.5 with a mask of 255.255.255.0, then the PC's IP address should be 192.168.1.x with a mask of 255.255.255.0.
<i>Transmission performance is slow or erratic.</i>	1. Change the direction of the antenna slightly. 2. There may be interference, possibly caused by a microwave oven, 2.4GHz wireless phone, or metal objects. Move these interference sources or change the location of the wireless PC or AP. 3. Change the wireless channel on the outdoor bridge. 4. Check that the outdoor bridge's antenna, connectors, and cabling are firmly connected.

Technical Support

If assistance is required, call your supplier for help. Have the following information ready before you make the call.

1. LED status
2. A list of the product hardware (including revision levels), and a brief description of the network structure
3. Details of recent configuration changes, if applicable

If it appears that more in-depth support is required, have the following information on hand before seeking assistance:

- What you were doing when the error occurred
- What error messages you saw
- Whether the problem can be reproduced
- The serial number of the product
- The firmware version and the debug information

From time to time updated firmware may be released. Contact your network equipment supplier for details

Limited Warranty

Hardware

The manufacturer warrants its products to be free of defects in workmanship and materials, under normal use and service, for a period of 12 months from the date of purchase from the manufacturer or its Authorized Reseller, and for the period of time specified in the documentation supplied with each product.

Should a product fail to be in good working order during the applicable warranty period, the manufacturer will, at its option and expense, repair or replace it, or deliver to the purchaser an equivalent product or part at no additional charge except as set forth below. Repair parts and replacement products are furnished on an exchange basis and will be either reconditioned or new. All replaced products and parts will become the property of the manufacturer. Any replaced or repaired product or part has a ninety (90) day warranty or the remainder of the initial warranty period, whichever is longer.

The manufacturer shall not be liable under this warranty if its testing and examination disclose that the alleged defect in the product does not exist or was caused by the purchaser's, or any third party's misuse, neglect, improper installation or testing, unauthorized attempt to repair or modify, or any other cause beyond the range of the intended use, or by accident, fire, lightning, or other hazard.

Software

Software and documentation materials are supplied "as is" without warranty as to their performance, merchantability, or fitness for any particular purpose. However, the media containing the software is covered by a 90-day warranty that protects the purchaser against failure within that period.

Limited Warranty Service Procedures

Any product (1) received in error, (2) in a defective or non-functioning condition, or (3) exhibiting a defect under normal working conditions, can be returned to the manufacturer by following these steps:

You must prepare:

- Dated proof of purchase
 - Product model number and quantity
 - Product serial number
 - Precise reason for return
 - Your name/address/email address/telephone/fax
1. Inform the distributor or retailer.
 2. Ship the product back to the distributor/retailer with prepaid freight. The purchaser must pay the shipping fee from the distributor/retailer to the manufacturer. Any package sent C.O.D. (Cash On Delivery) will be refused.
 3. Charges: Usually RMA (Returned Material Authorization) items will be returned to the purchaser via airmail, prepaid by the manufacturer. If returned by another carrier, the purchaser will pay the difference. A return freight and handling fee will be charged to the purchaser if the manufacturer determines that the product was not faulty or that the damage was caused by the user.

Warning

The manufacturer is not responsible for the integrity of any data on storage equipment (hard drives, tape drives, floppy diskettes, etc.). We strongly recommend that the customers back their data up before sending such equipment in for diagnosis or repair.

Service after Warranty Period

After the warranty period expires, all products can be repaired for a reasonable service charge. The shipping charges to and from the manufacturer's facility will be borne by the purchaser.

Return for Credit

In the case of a DOA (Dead on Arrival) or a shipping error, a return for credit will automatically be applied to the purchaser's account, unless otherwise requested.

Limitation of Liability

All expressed and implied warranties of a product's merchantability, or of its fitness for a particular purpose, are limited in duration to the applicable period as set forth in this limited warranty, and no warranty will be considered valid after its expiration date.

If this product does not function as warranted, your sole remedy shall be repair or replacement as provided for above. In no case shall the manufacturer be liable for any incidental, consequential, special, or indirect damages resulting from loss of data, loss of profits, or loss of use, even if the manufacturer or its authorized distributor/dealer has been advised of the possibility of such damages, or for any claim by any other party.

Regulatory Domains and Channels

This appendix lists the channels supported by the world’s regulatory domains.

The channel numbers, channel center frequencies, and regulatory domains are shown in the table.

<i>Channel Number</i>	<i>Center Frequency (MHz)</i>	<i>FCC/ Canada</i>	<i>ETSI</i>	<i>Spain</i>	<i>France</i>	<i>Japan</i>
1	2412	O	O			O
2	2417	O	O			O
3	2422	O	O			O
4	2427	O	O			O
5	2432	O	O			O
6	2437	O	O			O
7	2442	O	O			O
8	2447	O	O			O
9	2452	O	O			O
10	2457	O	O	O	O	O
11	2462	O	O	O	O	O
12	2467		O		O	O
13	2472		O		O	O
14	2484					O

Index

Auto-discovery	3, 16, 33, 42	Monitor	30
Basic Rates	22	Peer Bridge	23
Bridge Mode	23	Radio frequencies	6, 22, 46, 53
BSSID	6	Reset	18, 29, 31, 32, 47
Channel number	10, 22, 31, 46, 48, 53	Restart	31
Channel overlap	22	SNMP Access Control	25
Domain		SSID	6, 21
Regulatory	6, 22, 53	Statistics	31
Wireless LAN	6, 21	Summary Information	30
Encryption	6, 24, 44	System Requirements	5
Filter	20	Transmission Rate	22
Generate	25	Trap Log Information	28
Host Table	41, 42	Trap Server	27
IP Setting	19	Upgrade Firmware	32
Kick Start	11, 17, 18, 47	WEP	6
Load Default	32	Wired Equivalent Privacy	6
MAC ID	6	Wireless	21
Media Access Control ID	6		