IEEE 802.11g
Wireless Dual-Radio Bridge-AP

User's Guide

Version: 1.0

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R&TTE Compliance Statement

This equipment complies with all the requirements of DIRECTIVE 1999/5/CE OF THE EUROPEAN PARLIAMENT AND THE COUNCIL OF 9 March 1999 on radio equipment and telecommunication terminal equipment and the mutual recognition of their conformity (R&TTE).

The R&TTE Directive repeals and replaces in the directive 98/13/EEC (Telecommunications Terminal Equipment and Satellite Earth Station Equipment) as of April 8,2000.

Safety

This equipment is designed with the utmost care for the safety of those who install and use it. However, special attention must be paid to the dangers of electric shock and static electricity when working with electrical equipment. All guidelines of this and of the computer manufacture must therefore be allowed at all times to ensure the safe use of the equipment.

EU Countries Intended for Use

The ETSI version of this device is intended for home and office use in Austria, Belgium, Denmark, Finland, France (with Frequency channel restrictions), Germany, Greece, Ireland, Italy, Luxembourg, Portugal, Spain, Sweden, The Netherlands, and United Kingdom.

The ETSI version of this device is also authorized for use in EFTA member states Norway and Switzerland.

EU Countries Not Intended for Use

None.

Potential Restrictive Use

France: only channels 10, 11, 12, and 13.

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1. Introduction

1.1. Overview

The wireless Dual-Radio Bridge-AP (*DRBAP* for short) is a multifunction device that has two independently configurable IEEE 802.11g interfaces. Each IEEE 802.11g interface can be configured either as an AP (Access Point) interface or a LAN-to-LAN bridge interface. An AP interface enables wireless clients to associate with this device for IEEE 802.11 *infrastructure* applications and the wireless clients can be authenticated by IEEE 802.1x/RADIUS. A LAN-to-LAN bridge interface enables the device to connect to at most 6 other bridges wirelessly by the Wireless Distribution System (WDS) technology.

With the sleek and intuitive Web-based user interface and Windows-based user interface (Wireless Network Manager), an administrator can easily and clearly manage the dual-radio bridge-AP. With its maximal versatility and ease-of-management, this device can satisfy system integrators' various requirements.

In Chapter 2, we describe the steps to install and configure a newly acquired DRBAP. Following the steps, the DRBAP can be quickly set up to work. In Chapter 3, detailed explanation of each Web management page is given for you to understand how to fine-tune the settings of a DRBAP to meet his or her specific needs. In addition to using Web-based management user interface to configure a DRBAP, the Windows-based Wireless Network Manager can also be used to configure and monitor deployed DRBAPs. See the on-line help of Wireless Network Manager for more information.

1.2. Features

- **IEEE 802.11g**

  - **Dual interfaces.** Each of the two IEEE 802.11g interfaces can be configured, according to the operation mode, as an AP (Access Point) interface or a LAN-to-LAN bridge interface.

  - **Operational modes**

    - **Bridge Repeater**. In this mode, both WLAN interfaces are configured as LAN-to-LAN bridge interfaces. A bridge repeater forwards packets between two wireless LAN-to-LAN bridges. It's possible to use multiple bridge repeaters between two LAN-to-LAN bridges if the distance is very long.

    - **AP Repeater.** In this mode, one WLAN interface is configured as an AP interface, and the other is configured as a LAN-to-LAN bridge interface. The AP repeater is suitable for situations in which Ethernet wiring between the AP and the network backbone is impossible or costs highly.

    - **Dual AP.** In this mode, both WLAN interfaces are configured as AP interfaces. The dual AP can handle *twice* the number of wireless clients than a normal AP. It can be treated as "two APs in a box."

  - **AP interface**

    - **Enabling/disabling SSID broadcasts.** The administrator can enable or disable the SSID broadcasts functionality for security reasons. When the SSID broadcasts

functionality is disabled, a client computer cannot connect to the AP interface with an "any" SSID; the correct SSID has to be specified on client computers.

- ◆ **MAC-address-based access control.** Blocking unauthorized wireless client computers based on MAC (Media Access Control) addresses. The ACL (Access Control List) can be downloaded from a TFTP server.

- ◆ **WPA (Wi-Fi Protected Access).** The AP interface supports the WPA standard proposed by the Wi-Fi Alliance (http://www.wi-fi.org). Both WPA-PSK (Pre-Shared Key) mode and full WPA mode are supported. WPA is composed of TKIP (Temporal Key Integrity Protocol) and IEEE 802.1x and serves as a successor to WEP for better WLAN security.

- ◆ **IEEE 802.1x/RADIUS.** User authentication and dynamic encryption key distribution can be achieved by IEEE 802.1x *Port-Based Network Access Control* and RADIUS (*Remote Authentication Dial-In User Service*).

- ◆ **Wireless client isolation.** Wireless-to-wireless traffic among the associated wireless clients can be blocked so that the wireless clients cannot see each other. This capability can be used in hotspots applications to prevent wireless hackers from attacking other wireless users' computers.

- ◆ **AP load balancing.** Several APs can form a load-balancing group. Within a group, wireless client associations and traffic load can be shared among the APs. This function is available when the AP is in AP/Bridge mode.

- ◆ **Link integrity.** If the Ethernet LAN interface is detected to be disconnected from the wired network, all currently associated wireless clients are disassociated by the AP and no wireless client can associate with it.

- ◆ **Association control.** When the AP is in AP/Bridge mode, it can be configured to deny association requests when it has served too many wireless clients or traffic load is too heavy.

- ◆ **Associated wireless clients status.** Showing the status of all wireless clients that are associated with the AP interface.

- ■ **LAN-to-LAN bridge interface**

  - ◆ **6 Bridge links.** The bridge provides 6 bridge links based on the WDS (Wireless Distribution System) technology, so that it can wirelessly connect to at most 6 other wireless bridges, APs, or wireless routers with WDS support.

  - ◆ **Antenna alignment assistance.** The DRBAP provides a WDS link quality indicator via Wireless Network Manager to facilitate alignment of directional antennas when deploying pairs of wireless bridges.

  - ◆ **Link health monitoring.** This feature enables the administrator to see if the WDS links of the DRBAP to other peer wireless bridges are working fine.

- ■ **RF type selection.** The RF type of each WLAN interface can be configured to work in IEEE 802.11b only, IEEE 802.11g only, or mixed mode (802.11g and 802.11b simultaneously).

- ■ **64-bit and 128-bit WEP (Wired Equivalent Privacy).** Data transmitted over AP or

bridge links can be protected by WEP encryption for better security.

- ■ **Transmit power control.** Transmit power of the DRBAP's RF modules can be adjusted to change RF coverage of the DRBAP.

- ■ **Detachable antennas.** The factory-mounted antennas can be replaced with high-gain antennas for different purposes.

- ● **DHCP client.** The DRBAP can automatically obtain an IP address from a DHCP server.

- ● **DHCP server.** The DRBAP can automatically assign IP addresses to computers or other devices by DHCP (Dynamic Host Configuration Protocol).

  - ■ **Static DHCP mappings.** The administrator can specify static IP address to MAC address mappings so that the specified IP addresses are always assigned to the hosts with the specified MAC addresses.

  - ■ **Showing current DHCP mappings.** Showing which IP address is assigned to which host identified by an MAC address.

- ● **Packet Filtering.** The DRBAP provides Layer 2, Layer 3, and Layer 4 filtering capabilities.

- ● **Firmware Tools**

  - ■ **Firmware upgrade.** The firmware of the DRBAP can be upgraded in the following methods:

    - ◆ **Xmodem-based.** Upgrading firmware over RS232.

    - ◆ **TFTP-based.** Upgrading firmware by TFTP (Trivial File Transfer Protocol).

    - ◆ **HTTP-based.** Upgrading firmware by HTTP (HeperText Transfer Protocol).

  - ■ **Configuration backup.** The configuration settings of the DRBAP can be backed up to a file via TFTP or HTTP for later restoring.

  - ■ **Configuration reset.** Resetting the configuration settings to factory-default values.

- ● **Management**

  - ■ **Windows-based Wireless Network Manager** for configuring, monitoring, and diagnosing the local computer and neighboring APs. The management protocol is MAC-based.

  - ■ **Web-based Network Manager** for configuring and monitoring the DRBAP via a Web browser. The management protocol is HTTP (HeperText Transfer Protocol)-based.

  - ■ **SNMP.** SNMP (Simple Network Management Protocol) MIB I, MIB II, IEEE 802.1d, IEEE 802.11, IEEE 802.1x, and Enterprise MIB are supported.

  - ■ **UPnP.** The DRBAP responds to UPnP discovery messages so that a Windows XP user can locate the DRBAP in My Network Places and use a Web browser to configure it.

  - ■ **System log.** For system operational status monitoring.

    - ◆ **Local log.** System events are logged to the on-board RAM of the DRBAP and can

be viewed using a Web browser.

- ◆ **Remote log by SNMP trap.** Systems events are sent in the form of SNMP traps to a remote SNMP management server.

- ● **Power over Ethernet (optional).** Supplying power to a DRBAP over an Ethernet cable using PowerDsine (http://www.powerdsine.com) technology (IEEE 802.3af compliant in the future). This feature facilitates large-scale wireless LAN deployment.

- ● **Hardware Watchdog Timer.** If the firmware gets stuck in an invalid state, the hardware watchdog timer will detect this situation and restart the DRBAP. This way, the DRBAP can provide continuous services.

1.3. LED Definitions

There are several LED indicators on the housing of the DRBAP. They are defined as follows:

- ● **ALV**: *Alive*. Blinks when the DRBAP is working normally.
- ● **RF**: IEEE 802.11g interfaces activity
- ● **LAN**: Ethernet LAN interface activity
- ● **PWR**: Power

2. First-Time Installation and Configuration

2.1. Selecting a Power Supply Method

Optionally, the DRBAP can be powered by the supplied power adapter or POE (Power over Ethernet). The DRBAP automatically selects the suitable one depending on your decision.

To power the DRBAP by the supplied power adapter:

1. Plug the power adapter to an AC socket.

2. Plug the connector of the power adapter to the power jack of the DRBAP.

> **NOTE:** This product is intended to be power-supplied by a Listed Power Unit, marked "Class 2" or "LPS" and output rated "5V DC, 1 A minimum" or equivalent statement.

To power the DRBAP by POE:

1. Plug one connector of an Ethernet cable to an available port of an active Ethernet switch that can supply power over Ethernet.

2. Plug the other connector of the Ethernet cable to the **LAN/Config** port of the DRBAP.

2.2. Mounting the DRBAP on a Wall

The DRBAP is wall-mountable.

1. Stick the supplied sticker for wall-mounting.

2. Use a φ6.5mm driller to drill a 25mm-deep hole at each of the cross marks.

3. Plug in a supplied plastic conical anchor in each hole.

4. Screw a supplied screw in each plastic conical anchor for a proper depth so that the wireless DRBAP can be hung on the screws.

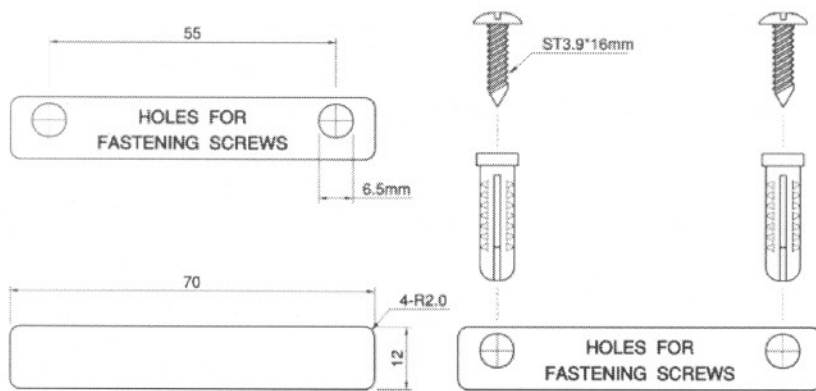5. Hang the wireless DRBAP on the screws.

Fig. 1. Mounting the DRBAP on a wall.

2.3. Preparing for Configuration

For you to configure a DRBAP, a *managing computer* with a Web browser is needed. For first-time configuration of a DRBAP, an Ethernet network interface card (NIC) should have been installed in the managing computer. For maintenance-configuration of a deployed DRBAP, either a wireless computer (if the DRBAP is configured to act as an **AP Repeater** or **Dual AP**) or a wired computer can be employed as the managing computer.

NOTE: If you are using the browser, *Opera*, to configure a DRBAP, click the menu item **File**, click **Preferences...**, click **File types**, and edit the MIME type, **text/html**, to add a file extension ".sht" so that Opera can work properly with the Web management pages of the DRBAP.

Since the configuration/management protocol is HTTP-based, we have to make sure that **the IP address of the managing computer and the IP address of the *managed DRBAP* are in the same IP subnet** (the default IP address of a DRBAP is **192.168.0.1** and the default subnet mask is **255.255.255.0**.)

2.3.1. Connecting the Managing Computer and the DRBAP

To connect the Ethernet managing computer and the managed DRBAP for first-time configuration, you have two choices as illustrated in Fig. 2.
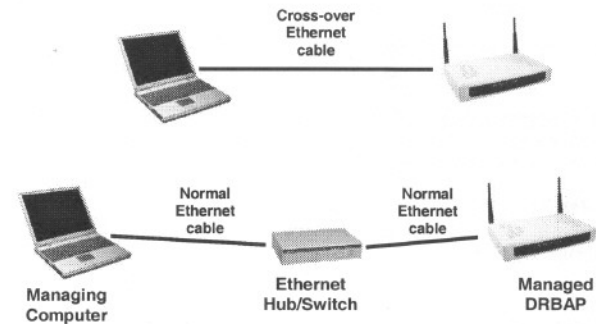

Fig. 2. Connecting a managing computer and a DRBAP via Ethernet.

You can use either a *cross-over* Ethernet cable (included in the package) or a switch/hub with 2 normal Ethernet cables.

NOTE: One connector of the Ethernet cable must be plugged into the **LAN/CONFIG** Ethernet jack of the DRBAP for configuration.

2.3.2. Changing the TCP/IP Settings of the Managing Computer

Use the **Windows Network Control Panel Applet** to change the TCP/IP settings of the managing computer, so that the IP address of the computer and the IP address of the DRBAP are in the same IP subnet. Set the IP address of the computer to **192.168.0.xxx** (the default IP address of a DRBAP is **192.168.0.1**) and the subnet mask to **255.255.255.0**.

NOTE: For some versions of Windows, the computer needs to be restarted for the changes of TCP/IP settings to take effect.

TIP: After you have connected the managing computer and the DRBAP via Ethernet, you can install Wireless Network Manager on the managing computer and use it to configure the DRBAP without being concerned about the TCP/IP settings of the managing computer. Refer to the on-line help of Wireless Network Manager for more information.

2.4. Configuring the DRBAP

After the IP addressing issue is resolved, launch a Web browser on the managing computer. Then, go to "**http://192.168.0.1**" to access the *Web-based Network Manager* start page.

TIP: For maintenance configuration of a DRBAP, the DRBAP can be reached by its *host name* using a Web browser. For example, if the DRBAP is named "DRBAP", you can use the URL "http://DRBAP" to access the Web-based Network Manager of the DRBAP.

2.4.1. Entering the User Name and Password

Before the start page is shown, you will be prompted to enter the user name and password to gain the

right to access the Web-based Network Manager. For first-time configuration, use the default user name "**root**" and default password "**root**", respectively.

Fig. 3. Entering the user name and password.

NOTE: It is strongly recommended that the password be changed to other value for security reasons. On the start page, click the **General, Password** link to change the value of the password (see Section 3.3.1 for more information).

TIP: Since the start page shows the current settings and status of the DRBAP, it can be saved or printed within the Web browser for future reference.
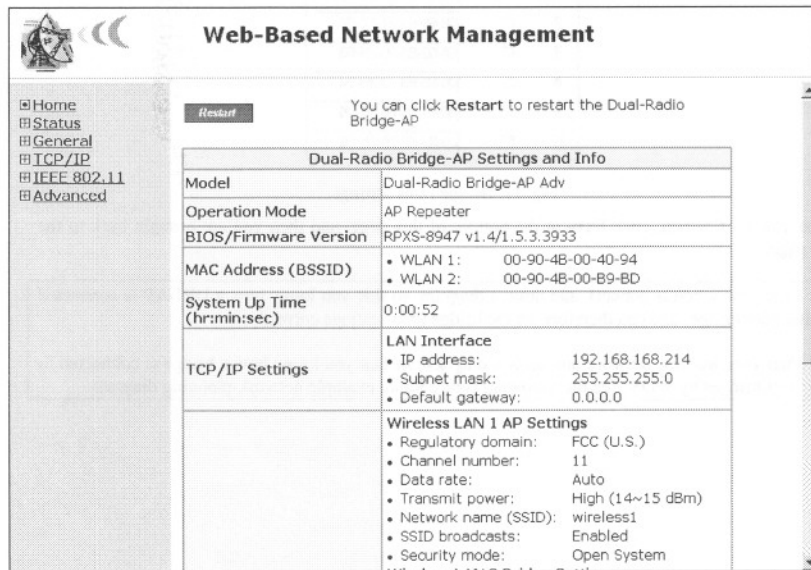

Fig. 4. The Start page.

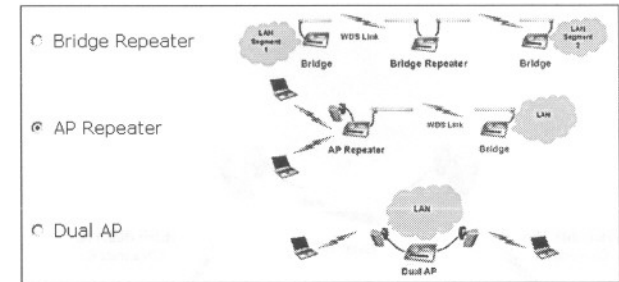## 2.4.2. Step 1: Selecting an Operational Mode

Fig. 5. Operational modes.

Go to the **General, Operational Mode** section to select an operational mode for the DRBAP. There are 3 operational modes—*Bridge Repeater*, *AP Repeater*, and *Dual AP*.

- **Bridge Repeater**. In this mode, both WLAN interfaces are configured as LAN-to-LAN bridge interfaces. A bridge repeater forwards packets between two wireless LAN-to-LAN bridges. It's possible to use multiple bridge repeaters between two LAN-to-LAN bridges if the distance is very long.
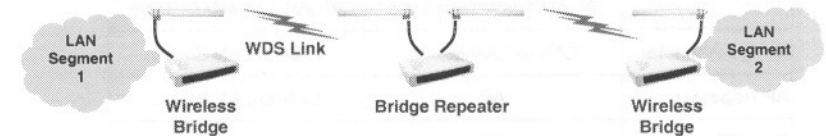

Fig. 6. **Bridge Repeater** mode.

- **AP Repeater.** In this mode, one WLAN interface is configured as an AP interface, and the other is configured as a LAN-to-LAN bridge interface. The AP repeater is suitable for situations in which Ethernet wiring between the AP and the network backbone is impossible or costs highly.
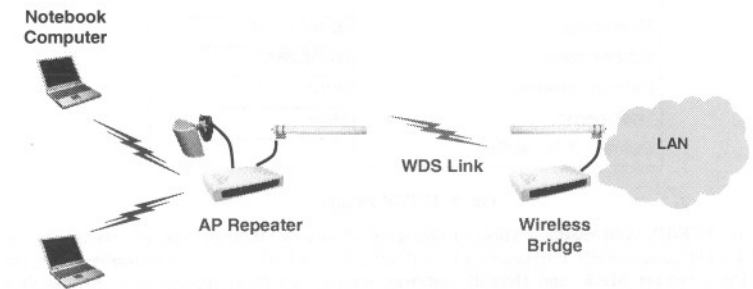

Fig. 7. **AP Repeater** mode.

- **Dual AP.** In this mode, both WLAN interfaces are configured as AP interfaces. The dual AP can

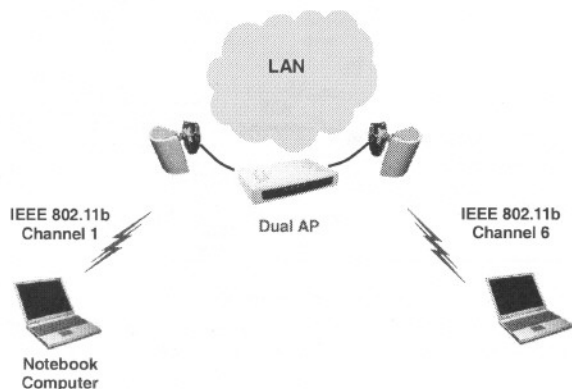handle *twice* the number of wireless clients than a normal AP. It can be treated as "two APs in a box."

Fig. 8. **Dual AP** mode.

The following table shows the type of each WLAN interface for each operational mode.

	WLAN 1 Interface Type	WLAN 2 Interface Type
Bridge Repeater	LAN-to-LAN Bridge	LAN-to-LAN Bridge
AP Repeater	AP	LAN-to-LAN Bridge
Dual AP	AP	AP

2.4.3. Step 2: Configuring TCP/IP Settings

Fig. 9. TCP/IP settings.

Go to the **TCP/IP, Addressing** section to configure IP address settings. The IP address can be manually set or automatically assigned by a DHCP server on the LAN. If you are manually setting the **IP Address**, **Subnet Mask**, and **Default Gateway** settings, set them appropriately, so that they comply with your LAN environment. In addition, you can specify the **Host Name** and **Domain** (DNS suffix) of the DRBAP. When you are finished, click **Save** at the bottom of this page, and then you are brought back to the start page.

2.4.4. Step 3: Configuring IEEE 802.11 Settings

Go to the **IEEE 802.11, Communication** section to configure IEEE 802.11g-related communication settings, including *Regulatory Domain*, *Channel Number*, *Network Name (SSID)*, and *Bridge Links*, for both WLAN interfaces, depending on their interface types. No matter the type of a WLAN interface is AP or LAN-to-LAN bridge, Regulatory Domain, Channel Number, and Network Name have to be configured.

The number of available RF channels depends on local regulations; therefore you have to choose an appropriate regulatory domain to comply with local regulations. **For two wireless devices to communicate with each other, they must be set to identical SSID (Service Set IDentifier).**

Fig. 10. Basic IEEE 802.11g communication settings.

For a LAN-to-LAN bridge interface, also set the MAC address of each peer bridge according to your planned network topology. Specify an MAC address, and then select its corresponding checkbox.

Fig. 11. Bridge links settings.

When you are finished, click **Save** at the bottom of this page, and then you are brought back to the start page.

TIP: Plan your wireless network and draw a diagram, so that you know how a DRBAP is connected to other peer bridges and can therefore set the bridge links settings correctly.

TIP: Plan your wireless network and draw a diagram, so that you know how a bridge is connected to other peer bridges by WDS. See the following figure for an example network-planning diagram.