Proxim

Harmony

Harmony 802.11a Network Adapter

User's Guide

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Trademarks

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Limited Warranty, Disclaimer, Limitation Of Liability

For a period of three (3) years from the date of purchase by the retail customer, Proxim warrants the Harmony 802.11a CardBus Cards (Models 8450 and 8455) and the Harmony 802.11a PCI Card (Model 8150) against defects in materials and workmanship. Proxim will not honor this warranty if there has been any attempt to tamper with or remove the product's external foil label.

This warranty does not cover and Proxim will not be liable for any damage or failure caused by misuse, abuse, acts of God, accidents, or other causes beyond Proxim's control, or claim by any entity other than the original purchaser.

If, after inspection, Proxim determines there is a defect, Proxim will repair or replace the Harmony 802.11a network adapter at no cost to you. To return defective merchandise to Proxim, please call Proxim Technical Support at 1-408-731-2640 to obtain a Return Merchandise Authorization (RMA) number.

In no event shall Proxim Corporation be responsible or liable for any damages arising:

- From the use of the product
- From the loss of use, revenue or profit of the product
- As a result of any event, circumstance, action, or abuse beyond the control of Proxim Corporation

Whether such damages be direct, indirect, consequential, special, or otherwise and whether such damages are incurred by the person to whom this warranty extends or a third party.

Warranty Return Policy

If you have a problem with a Harmony 802.11a CardBus Card (Model 8450 or 8455) or a Harmony 802.11a PCI Card (Model 8150), please call Proxim Technical Support at 1-408-731-2640. Proxim Technical Support will assist with resolving any technical difficulties you may have with your Proxim product.

After calling Proxim Technical Support, if your product is found to be defective, you may return the product to Proxim after obtaining an RMA (Return Merchandise Authorization) number. The product must be returned in its original packaging. The RMA number should be clearly marked on the outside of the box. Proxim cannot be held responsible for any product returned without an RMA number, and no product will be accepted without an RMA number.

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 against harmful interference in a residential installation. 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 the receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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.

Harmony 802.11a Network Adapter User's Guide
Part # 2050.0471
Rev. -- 8455 D6

Declaration of Conformity

Déclaration de Conformité
Konformitätserklärung

The Manufacturer: **Proxim Europe B.V.**
Le Constructeur:
Der Hersteller:

Address: **Prins Bernhardplein 200**
Addresse: **1097 JB, P.O. Box 94071,**
Addresse: **1090 GB Amsterdam, The Netherlands**

Declares that the Product:
Déclare que le Produit:
Erklärt, dass das Produkt:

Type:	**Harmony 802.11a**
Models:	**8450 CardBus Card**
	8150 PCI Card

meets the essential requirements according to article 3 of the following EC-Directive:
est conforme aux exigencies essentielles d'article 3 de la Directive CE:
die grundlegenden Anforderungen gemää Artikel 3 der nachstehenden EU-Richtlinie erfüllt:

Directive 1999/5/EC of the European Parliament and of the Council of 09 March 1999 relating to Radio and Telecommunications Terminal Equipment (R&TTE), including the mutual recognition of their conformity.

Directive 1999/5/EC du Parlement Europeen et du Conseil du 09 mache 1999 concernant les radio et equipments terminaux de telecommunications, incluant la reconnaissance mutuelle de leur conformite.

Richtlinie 1999/5/EG des Europäischen Parlaments und des Rates vom 09. März 1999 über Funkanlagen und Telekommunikationsendeinrichtungen und die gegenseitige Anerkennung ihrer Konformität.

and that the following harmonized standards have been applied:
et que les standards marmonises suivants ont ete appliqués:
und dass die folgenden harmonisierten Normen angewandt wurden:

EN301893-V1.1.1	**/ January 2001**
EN301489-17 V1.1.1	**/ September 2000**
EN60950	**/ December 2000**

Equipment Class Identifier CE 0682 ⓘ

This Product is a Class-2 under the scope of the R&TTE. Be aware that certain countries use other frequencies or have special restrictions of use. This means that products bought elsewhere might cause problems in the above these country(ies) and should be avoided. Consult your Post Telegraph and Telephone office of your country for latest details.

Amsterdam, 18 March 2002
Place and Date of the declaration
Lieu et date de la declaration – Ort und Datum der Konformitätserklärung

Name and Signature
Nom et Signature – Name und Unterschrift
Carmelo S. Amarena
International Product Manager
Proxim Corporation & Proxim Europe B.V.

PROXIM EUROPE B.V. INTERNATIONAL DEPARTMENT THE NETHERLANDS

For Indoor Use Only

These products are for indoor use only.

Uniquement pour usage d'intérieur.

Somente para uso interno.

Solamente para el uso interior.

Per uso al coperto solamente.

Für Innen Verwendung nur.

Nemlig indendørs hjælp bare.

For indoor bruk bare.

För indoor användning enda.

Voor overdekt toepassing uitsluitend.

Indoor käyttöä varten vain.

Για την εσωτερική χρήση μόνο.

Product Approvals

Proxim will only ship products that are type approved in the destination country.

Refer to Proxim's Web site at **http://www.proxim.com/support/80211acertifications/** for a list of countries that have approved Proxim's 802.11a products. This Web site also details any special requirements that govern the use of 802.11a products in a particular country.

An 802.11a product purchased for use in one country may not necessarily comply with the RF regulations in another country.

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Chapter 1

Introduction

Congratulations on your purchase of a Harmony 802.11a network adapter. These products are high performance wireless LAN adapter cards that comply with the IEEE 802.11a standard. This means that they are interoperable with IEEE 802.11a equipment from any manufacturer when operating in 802.11a mode. In addition, they support 2X™ mode*, which provides data rates of up to 108 Mbps.

The Harmony 802.11a CardBus Cards (Model 8450 and 8455) and the Harmony 802.11a PCI Card (Model 8150) support Windows XP, Windows 2000, Windows Millennium Edition (ME), Windows 98 Second Edition (SE), and Windows NT 4.0. Computers with a Harmony 802.11a network adapter installed “look” like standard network nodes to the operating system.

The Harmony 802.11a network adapters can be used with other 802.11a devices to form a stand-alone wireless Ad Hoc network* or used in conjunction with a Harmony infrastructure to provide mobile clients with wireless access to an Ethernet network.

Proxim is the pioneer in wireless broadband networking. Proxim’s unmatched expertise in radio networking technology, combined with the company’s extensive experience serving the communication needs of the mobile computing user, have kept Proxim at the forefront of the wireless LAN market.

*Available features vary by region/country.

The Harmony Family

The Harmony network adapters are members of a product family that provides a complete wireless networking solution.

- The **Harmony Access Point Controller Model 7560** centralizes the management, security, and filtering capabilities of a wireless LAN. The Access Point (AP) Controller communicates with Harmony Access Points over the Ethernet network to provide wireless network access for mobile clients. The AP Controller can support multiple APs, even if each AP complies with a different wireless standard.
- The **Harmony Access Point** is a networking bridge that operates at Layer 2 of the OSI networking model. Working in conjunction with a Harmony AP Controller, the AP forwards packets between its radio and the Ethernet network. Three models of the Harmony Access Point are available to support the IEEE 802.11a, IEEE 802.11b, or OpenAir wireless standard: the **802.11a Access Point Model 8570/8571**, the **802.11b Access Point Models 8550/8551** and the **OpenAir Access Point Model 7550**.
- The optional **Harmony Power System Model 7562** provides DC power to Harmony APs over the unused pins of a twisted pair Ethernet cable.
- The **Harmony 802.11a CardBus Card** is a wireless LAN adapter that fits into a 32-bit CardBus slot in a laptop computer and complies with the IEEE 802.11a standard. Two models are available: **Model 8450** and **Model 8455**.
- The **Harmony PC Card** is a wireless LAN adapter that fits into a PCMCIA Type II slot in a laptop computer. Two models are available to support the IEEE 802.11b (**8430 Series**) or OpenAir (**7430 Series**) wireless standard.
- The **Harmony CompactFlash Card** is a wireless LAN adapter that fits into a CompactFlash slot in a Pocket PC. Two models are available to support the IEEE 802.11b (**Model 8630**) or OpenAir (**Model 7630**) wireless standard.
- The **Harmony PCI Card** is a wireless LAN adapter that fits into a standard PCI expansion slot. Two models are available to support the IEEE 802.11a (**Model 8150**) or 802.11b (**Model 8110**) wireless standard.
- The **Harmony OpenAir USB Adapter Model 7230** is an OpenAir-compliant wireless LAN adapter that connects to a Windows 98/ME/2000 computer's Universal Serial Bus (USB) port.

The Product Package

The items included with each Harmony 802.11a network adapter are listed below. If any of these items are missing or damaged, please contact your reseller or Proxim Technical Support.

Harmony 8455 802.11a CardBus Card

Each Harmony 802.11a CardBus Card Model 8455 comes with the following:

- One 802.11a CardBus Card with two integral antennas (antennas are inside the casing and not visible to the user)
- One Harmony 802.11a Installation CD-ROM containing Proxim software and utilities and this user's guide in Portable Document Format (PDF)
- One *Harmony 8455 802.11a CardBus Card Quick Start Guide*

One warranty registration card

Harmony 8450 802.11a CardBus Card

Each Harmony 802.11a CardBus Card Model 8450 comes with the following:

- One 802.11a CardBus Card with two integral antennas (antennas are inside the casing and not visible to the user)
- One Harmony 802.11a Installation CD-ROM containing Proxim software and utilities and this user's guide in Portable Document Format (PDF)
- One *Harmony 8450 802.11a CardBus Card Quick Start Guide*
- One warranty registration card

Harmony 8150 802.11a PCI Card

Each Harmony 802.11a PCI Card Model 8150 comes with the following:

- One 802.11a PCI Card with two integral antennas (one antenna has a longer cable than the other)
- One Harmony 802.11a Installation CD-ROM containing Proxim software and utilities and this user's guide in Portable Document Format (PDF)
- One *Harmony 8150 802.11a PCI Card Quick Start Guide*
- One warranty registration card

System Requirements

To begin using a Harmony 802.11a network adapter, you must have the following minimum requirements:

- A computer that meets the following specifications:
  - Windows XP, Windows 2000, Windows Millennium Edition (ME), Windows 98 Second Edition (SE), or Windows NT (Service Pack 6 or later)* installed
  - CardBus Card users: PC Card expansion slot (32-bit CardBus)
  - PCI Card users: PCI (Peripheral Components Interconnect) expansion slot
  - At least 64 MB of memory
  - A 300 MHz processor or higher
- At least one other IEEE 802.11a-compliant device
  - Adapters sold in Europe require an 802.11a-compliant Access Point (peer-to-peer Ad Hoc mode is not available in Europe)

*A Windows NT laptop must have a third-party Plug-and-Play utility (such as Systemsoft's CardWizard) to install the Harmony 802.11a CardBus Card.

Overview of Country-Specific Features

This user's guide provides information on how to install and use the Harmony 802.11a CardBus Card and the Harmony 802.11a PCI Card. Product features vary by region/country. The following table summarizes the product differences based on region:

	U.S./Canada	Europe	Japan/Singapore
2X Mode	Available	Not available	Not available
Ad Hoc Mode	Available	Not available	Available
Number of Channels	8 (3 in 2X Mode)	8	4

Chapter 2

Installation

This chapter describes how to install a Harmony 802.11a network adapter and software in a computer running Windows XP, Windows 2000, Windows Millennium Edition (ME), Windows 98 Second Edition (SE), or Windows NT 4.0 (SP 6 or later).

Note: Run the Harmony Installation program before installing the 802.11a network adapter in the computer.

Pre-installation Considerations

Review the following pre-installation considerations before installing a Harmony 802.11a network adapter.

Regulatory Warnings

FCC Guidelines

802.11a CardBus Card Users (Models 8450 and 8455):
These devices have been tested for compliance with FCC RF Exposure (SAR) limits in a typical laptop configuration.

In order to comply with the SAR limit established in the ANSI C95.1 standard, it is recommended when using a PC card adapter that the integrated antenna is positioned more than 2.5 centimeters from your body or nearby persons during extended periods of operation. If the antenna is positioned less than 2.5 centimeters from the user, it is recommended that the user limit exposure time.

802.11a PCI Card Users (Model 8150):
It is the responsibility of the installer and users of the Harmony 802.11a PCI Card Model 8150 to guarantee that the antennas are operated at least 20 centimeters from any person. This is necessary to insure that the product is operated in accordance with the RF Guidelines for Human Exposure which have been adopted by the Federal Communications Commission.

Radio Frequency Interference Requirements

The Harmony 802.11a CardBus Cards, Models 8450 and 8455, and the Harmony 802.11a PCI Card, Model 8150, operate in the frequency range of 5.15 to 5.35 GHz; they are restricted to indoor use due to their operation in the 5.15 to 5.25 GHz frequency range. FCC 15.407(e) requires that these devices be used indoors in the frequency range of 5.15 to 5.25 GHz to reduce the potential or harmful interference to co-channel Mobile Satellite systems. Therefore the devices should be used indoor only for channel 36, 40, 44, and 48 and when 2X mode is enabled, channel 42 and 50.

High power radars are allocated as primary users of the 5.25 to 5.35 GHz and 5.725 to 5.850 GHz band. These radar stations can cause interference with and/or damage the Harmony 802.11a CardBus Cards and/or Harmony 802.11a PCI Card.

DECLARATION OF CONFORMITY

We, Proxim Corporation,
510 DeGuigne Drive
Sunnyvale, CA 94085 USA
408-731-2700

declare under our sole responsibility that the Harmony 802.11a CardBus Cards, Models 8450 and 8455, and the Harmony 802.11a PCI Card, Model 8150, comply with Part 15 of FCC Rules. Operation of either product 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.

Industry Canada Guidelines

8150 802.11a PCI Card Users:

The Harmony 8150 802.11a PCI Card has been designed to operate with an antenna having a maximum gain of 3 dBi. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication. The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website **http://www.hc-sc.gc.ca/rpb**.

Windows ME and Windows 98 SE Installation CD Requirement

Before beginning the installation of an 802.11a network adapter, confirm that you have a Windows 98 SE or Windows ME installation CD available (depending on the computer's operating system). Windows 98/ME users may be prompted to insert a Windows CD during the installation.

You should not need a Windows CD when installing an 802.11a network adapter in a Windows XP or Windows 2000 computer.

If you do not have a Windows 98/ME CD, it is possible that you already have the Windows installation files on your hard disk. These Windows installation files are known as Windows Cabinet or CAB files. The Cabinet files are commonly located in *C:\WINDOWS\OPTIONS\INSTALL* or *C:\WINDOWS\OPTIONS\CABS*.

Note: Windows 98/ME users may need the Windows CD or Cabinet files to complete the installation of an 802.11a network adapter. Proxim recommends that you do not proceed with the installation until you have confirmed that you have one of these Windows installation media available.

Windows NT Laptops Require a Plug & Play Utility

A Windows NT laptop must have a third-party Plug-and-Play utility installed in order to use the 802.11a CardBus Card. One popular Plug-and-Play utility for Windows NT 4.0 is CardWizard from SystemSoft. See **http://www.systemsoft.com** for details.

Note to Customers Using a Laptop Without a CD-ROM Drive

If you are installing the 802.11a CardBus Card in a laptop that does not have a CD-ROM drive or if your CD-ROM drive is an external device that shares a single CardBus slot with network adapter cards, you should follow the steps below prior to installing the 802.11a CardBus Card:

1. Windows 98/ME users: Confirm that the Windows cabinet (CAB) files are installed on the computer. The CAB files are typically located in *C:\WINDOWS\OPTIONS\INSTALL* or *C:\WINDOWS\OPTIONS\CABS*.
2. Windows 98/ME users: If the computer does not have the CAB files installed, copy the *Win98* or *Win9x* folder found on the Windows CD-ROM to a temporary folder on the computer.
3. Copy the contents of the Harmony 802.11a Installation CD-ROM to a temporary folder on the computer. Alternatively, you may download the software from Proxim's Web site at **http://www.proxim.com/support/.**
4. Follow the installation instructions contained in this chapter. When the instructions call for either the Windows CD or the Harmony Installation CD, search the CAB files or the temporary folders you created in Steps #2 and 3.
5. When the installation is complete, remove the temporary folders you created in Steps #2 and 3 from the computer's hard drive.

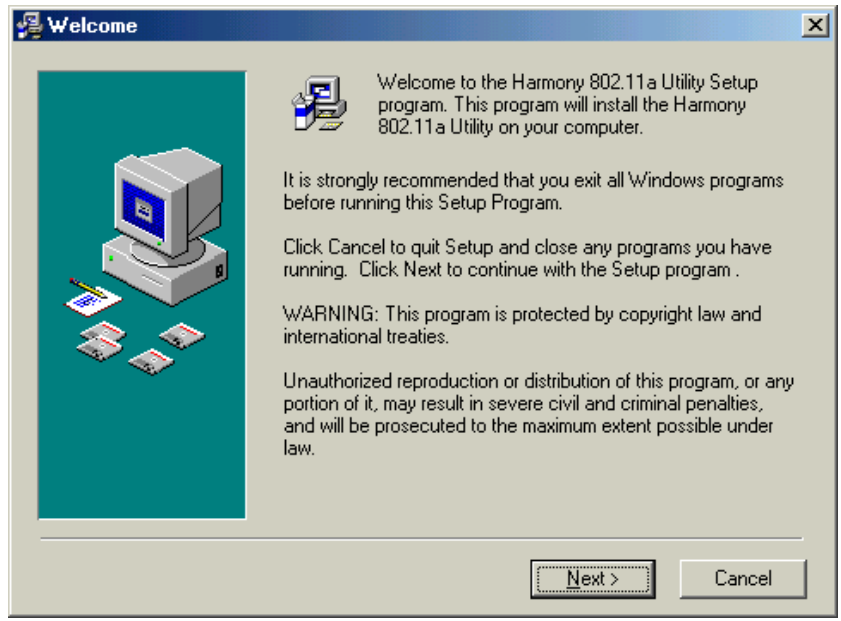
Installation Instructions

The instructions below describe how to install a Harmony 802.11a network adapter by running the Harmony Installation program before inserting the adapter into the computer. The Harmony Installation program installs the Harmony Utility first, and then it installs the Harmony 802.11a network adapter and driver. If you inserted an 802.11a adapter before running the Harmony Installation program, see “Adapter Inserted Before Running the Installation Program” on page 58 for instructions.

Windows 98SE/ME/2000/XP

Follow these steps to install a Harmony 802.11a network adapter in a Windows 98 SE, Windows ME, Windows 2000, or Windows XP computer.

1. Turn on the computer and logon to Windows, if applicable.
2. Insert the Harmony Installation CD into the computer’s CD-ROM drive.
3. If the Harmony Installation program does not launch automatically, run *SETUP.EXE* from the Harmony Installation CD to launch the program, shown in the following example.

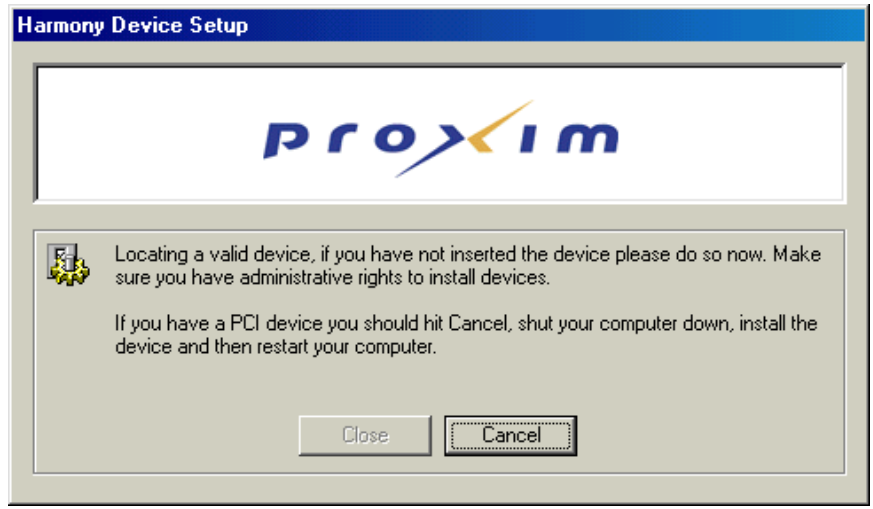


4. Click **Next** to continue.
5. Select a destination folder for the Harmony Utility files and click **Next** to continue.
6. Enter a name for the utility’s Program Manager group and click **Next.**

7. Click **Next** to install the utility.
8. Click **Finish** to view additional information about the utility.

Note: To avoid viewing the additional information, uncheck the **Read Harmony configuration instructions** box before clicking **Finish**.

9. Click **Finish** to complete the Harmony Utility installation and to continue the installation of a Harmony 802.11a network adapter.
10. The Harmony Device Setup wizard will prompt you to insert a Harmony 802.11a network adapter, as shown below.



Harmony 802.11a CardBus Card users: Insert the CardBus Card into an available CardBus slot and proceed to Step #11.

Harmony 802.11a PCI Card users: Follow these steps:

- Click **Cancel**.
- Shut down the computer, unplug its power cord from the wall outlet, and remove the computer cover.
- Locate an unused PCI slot and refer to your PC's manual for instructions on how to remove the plate that covers the slot (if applicable).
- Feed the card's antennas through the PCI slot and out the back of the computer.
- Align the PCI Card over the empty slot and firmly insert the card into the slot. See page 58 for a sample illustration.
- Secure the card's metal bracket to the computer following the directions provided in your PC's manual and replace the computer cover.

- Plug the computer's power cord back into the wall outlet.
- Attach the antenna with the longer cable to the antenna base and place it on top of your desk, computer, or monitor.
- Turn on the computer and proceed to Step #11.

11. Follow the on-screen instructions to install the network adapter. Note the following:
    - If prompted to identify the location of the file *Prox11a.sys* or *Netpr11a.cat*, direct the installation wizard to search the Harmony Installation CD.
    - Windows XP users: If prompted, select **Install the software automatically (Recommended)** and click **Next**.
    - Windows 98/ME users: Insert the Windows installation CD if prompted. If you do not have a Windows installation CD, see "Windows ME and Windows 98 SE Installation CD Requirement" on page 13.
12. Restart the computer if prompted. Otherwise, click **Close** when prompted that the Harmony 802.11a network adapter has been properly configured.

Note: If the Harmony Device Setup program or Windows Networking reports that the Harmony 802.11a network adapter has not been properly configured, follow the on-screen instructions and refer to Chapter 6 for troubleshooting suggestions.

13. The Harmony Utility's Status Monitor icon will appear in Windows Taskbar, as shown below.

14. The Harmony 802.11a network adapter is now ready for use. Use the Harmony Utility (described in Chapter 5) to configure the adapter and determine if it is communicating with other 802.11a devices.

Note: PCI Card users may need to enable Harmony Configuration before using the Harmony Utility. See "Note to Windows XP Users" on page 41 for details.

If you have one or more 802.11a Access Points, configure the Harmony 802.11a network adapter's Network Mode to Infrastructure. If your network consists of only 802.11a client adapters, set Network Mode to Ad Hoc.

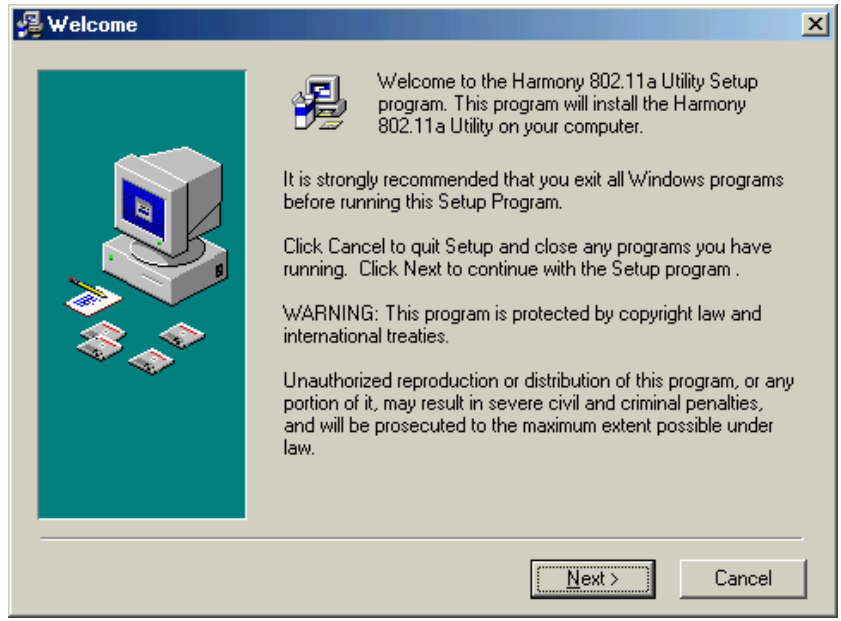
Note: Products sold in Europe do not support Ad Hoc mode.

For more information on Ad Hoc and Infrastructure networks, see Chapter 3 beginning on page 23 and "Network Mode" on page 28.

Windows NT

Follow these steps to install a Harmony 802.11a network adapter in a computer running Windows NT 4.0.

1. Turn on the computer and logon to Windows, if applicable.
2. Insert the Harmony Installation CD into the computer's CD-ROM drive.
3. If the Harmony Installation program does not launch automatically, run *SETUP.EXE* from the Harmony Installation CD to launch the program, shown in the following example.

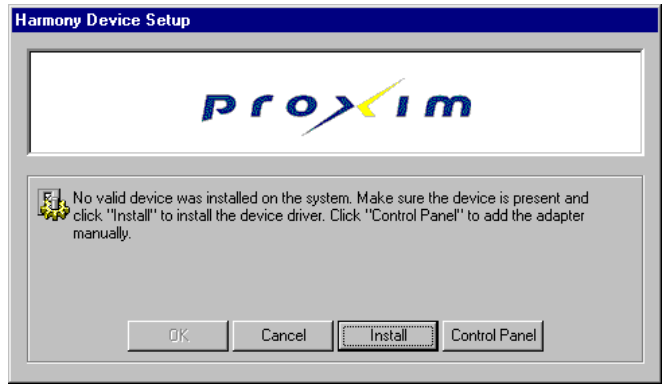


4. Click **Next** to continue.
5. Select a destination folder for the Harmony Utility files and click **Next** to continue.
6. Enter a name for the utility's Program Manager group and click **Next.**
7. Click **Next** to install the utility.
8. Click **Finish** to view additional information about the utility.

Note: To avoid viewing the additional information, uncheck the **Read Harmony configuration instructions** box before clicking **Finish**.

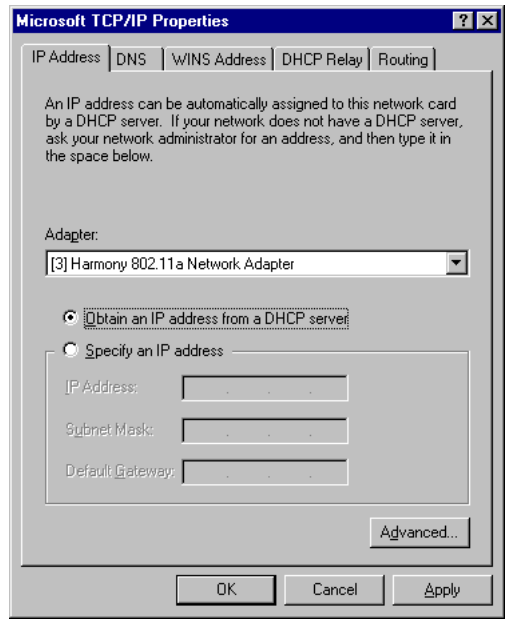
9. Click **Finish** to complete the Harmony Utility installation and to continue the installation of a Harmony 802.11a network adapter.

10. Click **Install** when prompted by the Harmony Device Setup screen, shown below.



Note: Proxim recommends that you let the installation wizard install the card for you. However, if you want to install the adapter manually, click **Control Panel** to open the Network screen's Adapter window. Click OK after you have manually installed the adapter to return to the installation wizard.

11. When the Microsoft TCP/IP Properties screen appears, select the Harmony 802.11a card from the list of network adapters and configure its IP settings (as required by your network).



12. Click **OK** to save the TCP/IP settings.
13. Click **No** when prompted to restart the computer.
14. Click **OK** to close the Harmony Device Setup screen.
15. Shut down the computer.
16. Install the Harmony 802.11a network adapter in the computer.

    Harmony 802.11a CardBus Card users: Insert the CardBus Card into an available CardBus slot. The laptop must have a third-party Plug-and-Play utility installed. See “Windows NT Laptops Require a Plug & Play Utility” on page 14 for details.

    Harmony 802.11a PCI Card users: Follow these steps:

    - Unplug the computer’s power cord from the wall outlet, and remove its cover.
    - Locate an unused PCI slot and refer to your PC’s manual for instructions on how to remove the plate that covers the slot (if applicable).
    - Feed the card’s antennas through the PCI slot and out the back of the computer.
    - Align the PCI Card over the empty slot and firmly insert the card into the slot. See page 58 for a sample illustration.
    - Secure the card’s metal bracket to the computer following the directions provided in your PC’s manual and replace the computer cover.
    - Plug the computer’s power cord back into the wall outlet.
    - Attach the antenna with the longer cable to the antenna base and place it on top of your desk, computer, or monitor.
17. Turn on the computer.
18. The Status Monitor icon will appear in Windows Taskbar, as shown below.

19. The Harmony 802.11a network adapter is now ready for use. Use the Harmony Utility (described in Chapter 5) to configure the adapter and determine if it is communicating with other 802.11a devices.

Note: If Windows Networking reports that the Harmony 802.11a network adapter has not been properly configured, follow the on-screen instructions and refer to Chapter 6 for troubleshooting suggestions.

If you have one or more 802.11a Access Points, configure the 802.11a adapter’s Network Mode to Infrastructure. If your network consists of only 802.11a adapters, set Network Mode to Ad Hoc. For more information on Ad Hoc and Infrastructure networks, see Chapter 3 beginning on page 23 and “Network Mode” on page 28.

Note: Products sold in Europe do not support Ad Hoc mode.

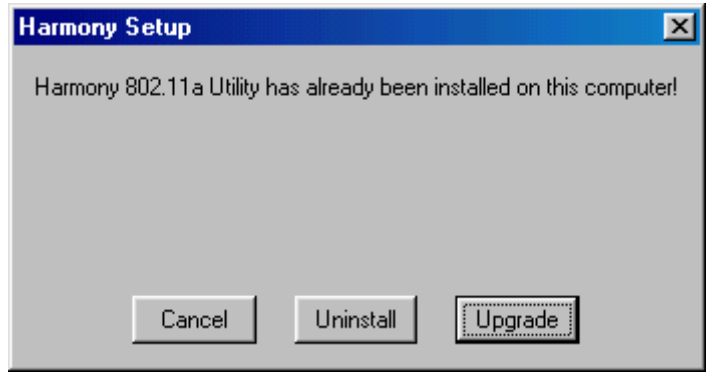
Related Topics

- See Chapter 4 beginning on page 27 for a discussion of the 802.11a configuration parameters.
- Refer to Chapter 5 beginning on page 36 for information on how to use the Harmony Utility.
- See “Configuring Networking Clients and Protocols” on page 61 for information on how to configure a networking protocol like TCP/IP (so you can configure the 802.11a network adapter’s IP settings).

Upgrading to Version 1.4

If you already have an earlier version of the Harmony 802.11a software installed, follow these steps to upgrade to version 1.4:

1. Insert the Harmony Installation CD into the CD-ROM drive. If you do not have a CD that contains software version 1.4, you can download the software from Proxim's Web site at **http://www.proxim.com**.
2. Double-click *SETUP.EXE* to begin the software upgrade.
3. Click the **Upgrade** button when prompted that the Harmony 802.11a Utility is already installed on the computer, as shown below.



4. When prompted, click **OK** to restart the computer.

After the computer reboots, the Harmony 802.11a network adapter will be using software version 1.4.

Chapter 3

Wireless Topologies

Harmony wireless products look and operate similar to Ethernet products. The only difference is that a radio replaces the wire between various nodes. This means that all of your existing applications that operate over Ethernet will work with Harmony without any special wireless networking software. The Harmony 802.11a network adapters support several network topologies, which are described in this chapter.

Ad Hoc

Two or more computers easily establish an ad hoc network when the units are in range of each other. Each computer can dynamically connect and reconnect to the others with no additional configuration, using off-the-shelf peer-to-peer network operating systems, as illustrated in Figure 1.

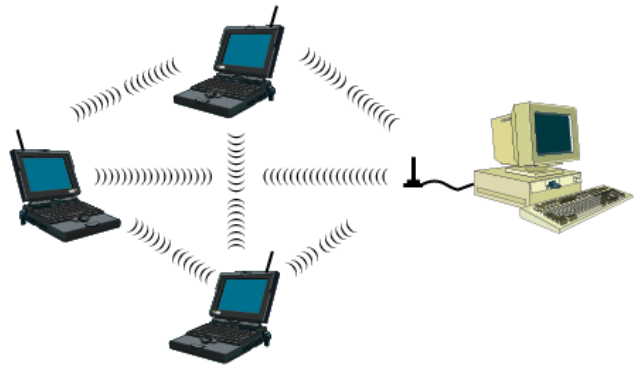


Figure 1 Ad Hoc

To use a Harmony 802.11a network adapter as a member of an Ad Hoc network with other 802.11a-compatible cards, configure the adapter to operate in Ad Hoc mode. See “Network Mode” on page 28 for details.

Note: Products sold in Europe do not support Ad Hoc mode.

Infrastructure

Many companies have an existing Ethernet or wired LAN infrastructure and want to be able to extend that capability to wireless nodes. This is accomplished by installing one or more Harmony 802.11a Access Points on the Ethernet network. You can also add a Harmony Access Point Controller to the network to simplify Access Point management and take advantage of additional features. See the *Harmony Access Point Controller User's Guide* for more information.

Connecting to a Single AP

Figure 2 depicts a Harmony network that uses a single Access Point (AP) with a Harmony Access Point Controller.

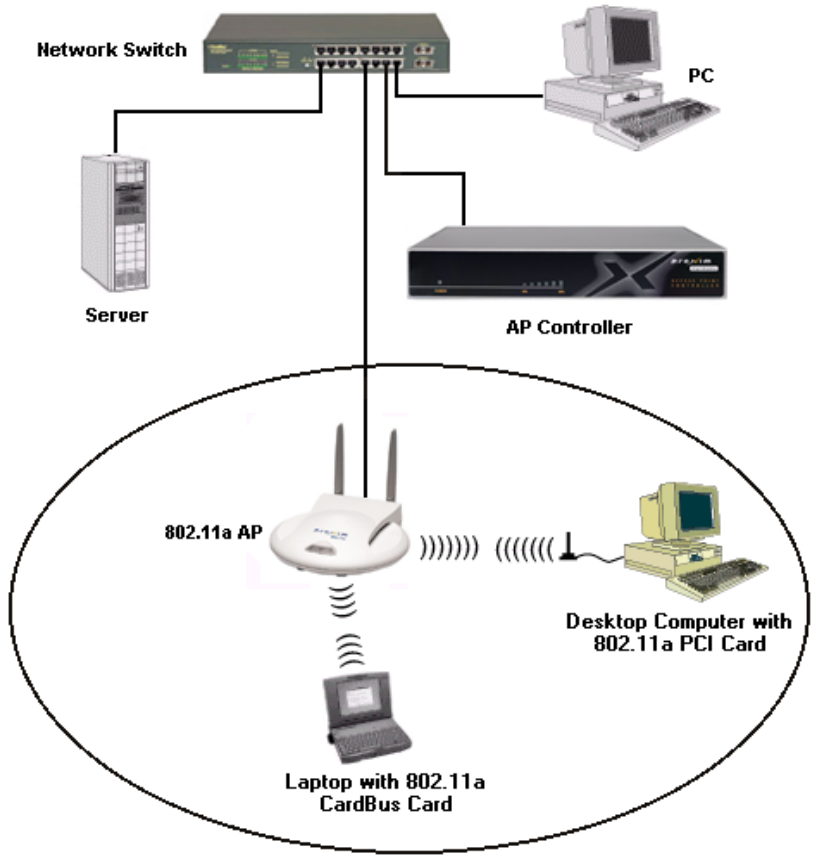


Figure 2 Single AP

Roaming Between Multiple APs

For larger environments, Harmony 802.11a client devices may roam from one Harmony 802.11a Access Point to another while maintaining the same network connection. The 802.11a Access Points establish coverage areas or cells similar in concept to those of a cellular phone network. The mobile clients will connect to any 802.11a Access Point that is within range.

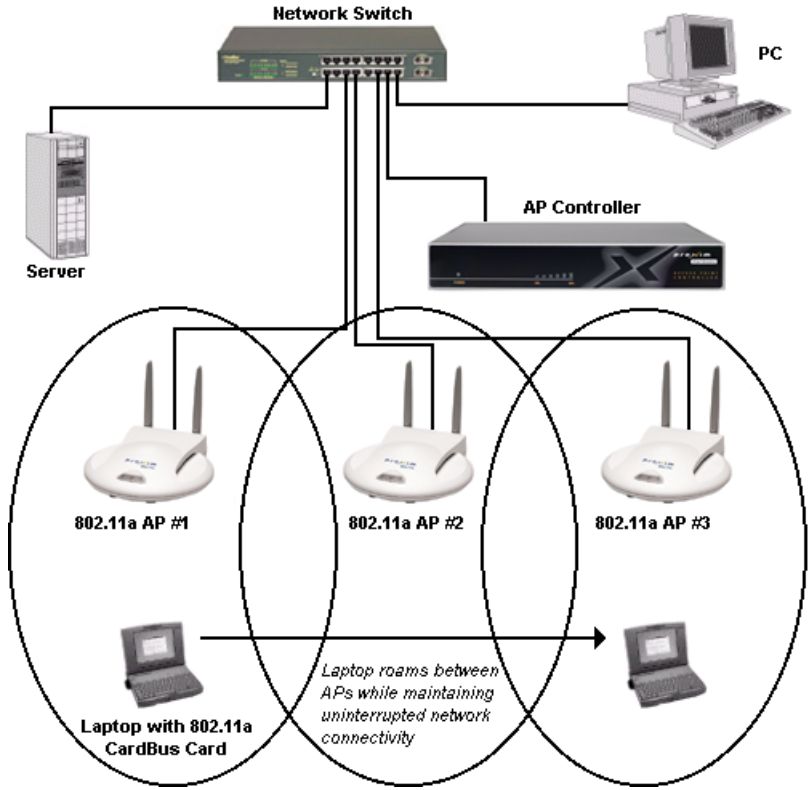


Figure 3 Roaming

Each Harmony 802.11a Access Point within a roaming network must have a unique, independent Channel, but all must have the same SSID and security settings (if applicable).

Mobile clients equipped with a Harmony 802.11a network adapter are configured to operate in Infrastructure mode and have the same SSID and security settings as the Access Points. Alternatively, the mobile client may use an SSID of “any” to associate with any available Access Point, regardless of the Access Point’s SSID.

As the mobile client seamlessly switches from cell to cell, its network connectivity is preserved. The user can move freely between the Harmony 802.11a Access Points in the network. When the roaming client leaves the transmission range of one 802.11a Access Point, the software automatically polls the other 802.11a Access Point(s) in the same Extended Service Set (ESS) to continue the network connection.

Note: The Access Points' cells must overlap to ensure that there are no gaps in coverage so that the roaming client will always have a connection available.

See Figure 3 for an example of a roaming Infrastructure network. In addition, if your network has a Harmony Access Point Controllers, you can install Harmony 802.11a Access Points on different IP subnets from the AP Controller, allowing mobile users to roam across routers. For more information on the Harmony AP Controller and Access Points, refer to the *Harmony Access Point Controller User's Guide*.

Guidelines for Roaming

- A Harmony 802.11a client can only roam between Harmony 802.11a Access Points. An 802.11a client cannot communicate with Harmony 802.11b or OpenAir Access Points.
- All Harmony 802.11a Access Points must have the same SSID.
- All workstations with Harmony 802.11a client adapters installed must use either an SSID of "any" or the same SSID as the Access Points that they will roam between.
- All 802.11a Access Points and clients must have the same security settings to communicate.
- The Access Points' cells must overlap to ensure that there are no gaps in coverage and to ensure that the roaming client will always have a connection available.
- Access Points in the same vicinity should each use a unique, independent Channel to avoid potential interference.
- Access Points that use the same Channel should be installed as far away from each other as possible to reduce potential interference.

Chapter 4

Configuration Parameters

This chapter provides information on the 802.11a wireless standard and describes the Harmony 802.11a configuration parameters.

The IEEE 802.11a Specification

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

In 1999, the IEEE modified the 802.11 standard to support devices operating in the 5 GHz frequency band, calling this new standard "802.11a." 802.11a devices are not backwards compatible with 2.4 GHz 802.11 or 802.11b devices. 802.11a radios use a radio technology called Orthogonal Frequency Division Multiplexing (OFDM) to achieve data rates of up to 54 Mbps.

In addition, the Harmony 802.11a network adapters support 2X™ Mode. This mode is not part of the IEEE 802.11a specification but it allows data rates of up to 108 Mbps. See "2X Mode" on page 29 for details. 2X Mode is not available in all countries.

802.11a Software Parameters

The following configuration parameters are available for a Harmony 802.11a network adapter. Refer to Chapter 5 for instructions on how to change these configuration settings using the Harmony Utility.

Network Mode

Network Mode configures a Harmony 802.11a network adapter to operate in either Ad Hoc mode or Infrastructure mode.

When set to Ad Hoc, all Harmony 802.11a devices must have the same SSID, Channel, and WEP Keys (if WEP is enabled) to communicate. An Ad Hoc network is a wireless network that consists of only 802.11a client adapters (i.e., a network that does not have an Access Point).

Note: Products sold in Europe do not support Ad Hoc mode.

When set to Infrastructure mode, an 802.11a network adapter must have the same SSID and security settings as the Access Points on the network to communicate. An Infrastructure network is any network that includes one or more 802.11a Access Points. By default, the adapter operates in Infrastructure mode.

SSID

The SSID (Service Set ID), which is also referred to as the ESSID (Extended Service Set ID), is a text string that all members of the same 802.11a network share.

The SSID may be up to 32 alphanumeric characters long, including spaces. Also, when configured to “any,” a Harmony 802.11a network adapter can communicate with any available Access Point regardless of the Access Point’s SSID.

In an Infrastructure network, the SSID must match on all Harmony 802.11a Access Points and 802.11a clients (unless a client’s SSID is “any”). Devices that do not share the same SSID cannot communicate.

In an Ad Hoc network without an Access Point, each 802.11a device must have the same SSID to participate in the network. A node cannot use the “any” SSID to join an Ad Hoc network.

By default, an 802.11a adapter’s SSID is set to “any”.

Power Saving Mode

The Harmony 802.11a network adapters support optional power management to conserve battery life. Power Saving Mode is only available if the adapter is operating in Infrastructure mode.

When Power Saving Mode is set to Normal or Maximum, a Harmony 802.11a network adapter enters a “doze” mode where the card becomes inactive and only wakes up periodically to receive control messages from the Access Point. The card wakes up more often in Normal mode than in Maximum mode so a card in Normal mode will respond sooner to network requests than a node in Maximum mode. However, Maximum mode draws less power than Normal mode.

When an Access Point receives a packet destined for a dozing client, it buffers the packet and includes a notification within its control message to alert the client that a packet is waiting for it. Once the card receives the control message, it polls the Access Point to request that the buffered packet be sent to it.

2X Mode

The Harmony 802.11a network adapters support **2X**™ mode, a high-speed operating mode that can provide data rates of up to 108 Mbps, twice the speed of standard 802.11a devices. By default, 2X mode is disabled.

Note: Products sold in Europe, Japan, and Singapore do not support 2X mode.

When 2X mode is disabled, a Harmony 802.11a adapter complies with the IEEE 802.11a standard, can operate on one of eight Channels, and can achieve speeds of up to 54 Mbps.

When 2X mode is enabled, a Harmony 802.11a adapter does not comply with the IEEE 802.11a standard, can operate on one of three Channels, and can achieve speeds of up to 108 Mbps.

Note: You must configure all devices in the same network to use 2X mode. A device in 2X mode cannot communicate with a device in 802.11a mode.

Roaming

The Roaming parameter allows you to determine how tolerant a Harmony 802.11a adapter is to radio phenomena that can cause the unit to roam from one Access Point to another in order to maintain a strong wireless connection.

In areas with many 802.11a Access Points that provide heavy overlapping coverage, set this parameter to Fast to maintain high throughput for each wireless adapter.

In most networks, set Roaming to Normal. Wireless adapter throughput will not change noticeably, and an overabundance of Access Points is not required.

If the coverage area provided by 802.11a Access Points is sparse, set Roaming to Slow. Harmony adapters will not roam until they are nearly out of range of the Access Point with which they are associated.

Channel

802.11a devices spread a radio signal over a range of frequencies. The IEEE 802.11a specification allocates the available frequencies in the 5 GHz band into a series of operating Channels that are identified by a Channel number and a center carrier frequency.

An 802.11a network adapter configured for Infrastructure mode receives a Channel assignment from its Access Point. You cannot configure the Channel for an adapter operating in Infrastructure mode. For an Ad Hoc network, all nodes must use the same Channel to communicate. You can configure the adapter to scan multiple Channels to locate an Ad Hoc network or you can configure it to use a specific Channel. See "Station Configuration" on page 39 for details.

The number of available Channels varies by region and model number.

For United States and Canada:

All 802.11a network adapter models can use one of eight Channels in 802.11a-compliant mode: Channel 36 (5.18 GHz), Channel 40 (5.20 GHz), Channel 44 (5.22 GHz), Channel 48 (5.24 GHz), Channel 52 (5.26 GHz), Channel 56 (5.28 GHz), Channel 60 (5.30 GHz), and Channel 64 (5.32 GHz).

In addition, the Model 8455 CardBus Card supports five Channels in the 5.725-5.850 GHz band in 802.11a-compliant mode: Channel 149 (5.745 GHz), Channel 153 (5.765 GHz), Channel 157 (5.785 GHz), Channel 161 (5.805 GHz), and Channel 165 (5.825 GHz).

All 802.11a network adapter models can use one of three Channels in 2X mode: Channel 42 (5.21 GHz), Channel 50 (5.25 GHz), and Channel 58 (5.29 GHz). The Model 8455 CardBus Card also supports two additional Channels in 2X mode: Channel 152 (5.760 GHz) and Channel 160 (5.800 GHz).

If you wish to install multiple Ad Hoc networks in the same vicinity, configure each network with a unique Channel to avoid interference between networks. Keep in mind that each Channel in 2X mode overlaps multiple Channels in 802.11a mode. For example, if an Ad Hoc network in 2X mode is using Channel 50, do not configure nearby networks in 802.11a mode for Channel 42, 48, 52, or 56.

Note: See "Radio Frequency Interference Requirements" on page 13 for important regulatory information concerning Channel selection.

For Europe:

All 802.11a network adapter models can use one of eight Channels: Channel 36 (5.18 GHz), Channel 40 (5.20 GHz), Channel 44 (5.22 GHz), Channel 48 (5.24 GHz), Channel 52 (5.26 GHz), Channel 56 (5.28 GHz), Channel 60 (5.30 GHz), and Channel 64 (5.32 GHz).

In addition, the Model 8455 CardBus Card supports eleven Channels in the 5.470-5.725 GHz band: Channel 100 (5.500 GHz), Channel 104 (5.520 GHz), Channel 108 (5.540 GHz), Channel 112 (5.560 GHz), Channel 116 (5.580 GHz), Channel 120 (5.600 GHz), Channel 124 (5.620 GHz), Channel 128 (5.640 GHz), Channel 132 (5.660 GHz), Channel 136 (5.680 GHz), and Channel 140 (5.700 GHz).

For Japan:

All 802.11a network adapter models can use one of four Channels: Channel 34 (5.17 GHz), Channel 38 (5.19 GHz), Channel 42 (5.21 GHz), or Channel 46 (5.23 GHz). If you wish to install multiple Ad Hoc networks in the same vicinity, Proxim recommends that you configure each network with a unique Channel to avoid interference between networks.

For Singapore:

All 802.11a network adapter models can use one of four Channels: Channel 36 (5.18 GHz), Channel 40 (5.20 GHz), Channel 44 (5.22 GHz), or Channel 48 (5.24 GHz).

Send Rate

The IEEE 802.11a specification supports eight data rates: 54 Mbps, 48 Mbps, 36 Mbps, 24 Mbps, 18 Mbps, 12 Mbps, 9 Mbps, and 6 Mbps. Harmony's 2X mode supports eight data rates: 108 Mbps, 96 Mbps, 72 Mbps, 48 Mbps, 36 Mbps, 24 Mbps, 18 Mbps, and 12 Mbps.

As a mobile client travels away from an 802.11a Access Point (when in Infrastructure mode) or from other 802.11a nodes (when in Ad Hoc mode), the data rate automatically decreases in order to maintain a usable radio connection.

For example, in an Infrastructure network that is using 2X mode, a client that is close to an Access Point may operate at 108 Mbps, but a client that is far away from the Access Point may operate at 12 Mbps.

By default, a Harmony 802.11a network adapter automatically adjusts the transmit rate depending on the mode of operation (802.11a-compliant or 2X). However, you can also manually configure a specific send rate that an adapter will use.

For example, if you configure the Send Rate to 36 Mbps, a Harmony 802.11a adapter will operate at 36 Mbps.

Fragmentation

The Harmony 802.11a network adapters support an optional feature called Fragmentation. In harsh radio environments, 802.11a devices may have difficulty transmitting large packets that exceed a certain size. However, when Fragmentation is enabled, an 802.11a device can break up large packets into a number of smaller packets (called "fragments") that can be successfully transmitted to another 802.11a device. The receiving 802.11a device then reassembles the original packet once it has received all of the fragments.

You can configure a Harmony 802.11a network adapter to never use Fragmentation or to fragment only those packets that exceed a certain size. For example, if the Fragmentation Threshold is set to 1000 Bytes, then a sending radio will fragment any packet 1000 Bytes or larger before transmitting.

The Fragmentation Threshold supports a range between 256 and 2345 Bytes. If set to 256, then a sending radio will fragment all packets 256 Bytes or larger. If set to 2345, then a sending radio will fragment only those radio packets that are 2345 Bytes or larger.

By default, Fragmentation is disabled.

RTS/CTS

The 802.11a standard supports optional RTS/CTS communication based on packet size. By default, RTS/CTS communication is disabled.

Without RTS/CTS, a sending radio listens to see if another radio is already using the medium before transmitting a data packet. If the medium is free, the sending radio transmits its packets. However, there is no guarantee that another radio is not transmitting a packet at the same time, causing a collision.

When RTS/CTS occurs, the sending radio first transmits a Request to Send (RTS) packet to confirm that the medium is clear. When the receiving radio successfully receives the RTS packet, it transmits back a Clear to Send (CTS) packet to the sending radio. When the sending radio receives the CTS packet, it sends the data packet to the receiving radio. The RTS and CTS packets contain a reservation time to notify other radios that the medium is in use for a specified period. This helps to minimize collisions.

While RTS/CTS adds overhead to the radio network, it is particularly useful for large packets that take longer to resend after a collision occurs.

You may configure a Harmony 802.11a network adapter to never use RTS/CTS (i.e., disable RTS/CTS) or to use RTS/CTS for packets over a certain size. For example, if the RTS/CTS Threshold is set to 1000 Bytes, then a sending radio will use RTS/CTS before transmitting any packet 1000 Bytes or larger.

The RTS/CTS Threshold parameter supports a range between 1 and 2345 Bytes. When set to 1, a sending radio will use RTS/CTS before transmitting any packet.

Security Options

The Harmony 802.11a adapters offer four security options: No Security, Use WEP for Authentication and Encryption, Use the Harmony Security Protocol, and 802.1x.

WEP Encryption and Authentication

The IEEE 802.11a standard specifies an optional encryption feature, known as Wired Equivalent Privacy or WEP, that is designed to provide a wireless LAN with a security level equal to what is found on a wired Ethernet network. WEP encrypts the data portion of each packet exchanged on the 802.11a network using a 64-bit, 128-bit, or 152-bit encryption key (also known as a WEP Key). In addition, Harmony 802.11a devices use WEP with Shared Key Authentication to prevent unauthorized devices from associating with an 802.11a network.

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

WEP Keys

An 802.11a device with WEP enabled uses a WEP Key to encrypt and decrypt information. A user must manually enter the network's WEP Keys on each 802.11a device. If the WEP Keys do not match on two radios, no data communication will take place between these devices.

A Harmony 802.11a network adapter can support up to four WEP Keys (all four Keys must have the same Key Size). A Harmony 802.11a adapter can decrypt information that was encrypted with any of its four WEP Keys, but it will only use the Default Key to encrypt outgoing information.

For 64-bit encryption, a WEP Key is 10 hexadecimal digits (0-9 and A-F); for 128-bit encryption, a WEP Key is 26 hexadecimal digits (0-9 and A-F); and for 152-bit encryption, a WEP Key is 32 hexadecimal digits (0-9 and A-F).

Note: When WEP is enabled, Proxim recommends that you configure all 802.11a devices in the Extended Service Set with the same WEP Keys in the same order (but the devices do not need to use the same default Key).

Harmony Security Protocol

The Harmony Security Protocol automates encryption management, assigning a unique and dynamic WEP Key to each user. The Harmony Security Protocol includes the following features:

- Uses 152-Bit WEP Encryption
- Generates a unique WEP Key for each user that is valid only for the current network session
- Periodically renews the user's Harmony session and assigns a new WEP Key without requiring any end user interaction
- Incorporates the end user's logon prompt into Microsoft Windows' standard logon procedure on the client device

Each Harmony device plays a role in the Harmony Security Protocol: the AP Controllers maintain a database of user name and passwords to authenticate users; the Access Points block all network traffic to or from a client until after the user has been successfully authenticated by the Harmony System; and the Harmony client adapters include a software utility that incorporates the Harmony logon prompt into the standard Windows logon procedure.

When the Harmony Security Protocol is enabled on a client adapter, the user is prompted to enter his or her Harmony User Name and Password during boot up, either immediately before or after the Windows logon prompt (depending on the device configuration).

Once the user has been authenticated by the Harmony System, the 802.11a adapter receives a unique 152-bit WEP Key from the Harmony System, and it can begin to exchange data with the Ethernet network. Refer to the *Harmony Access Point Controller User's Guide* for more information on the Harmony Security Protocol.

Harmony Security Protocol Guidelines

- If you want to use the Harmony Security Protocol on your network, you must enable the protocol on all of your network's Harmony 802.11a Access Points and Harmony 802.11a clients.
- At this time, the Harmony Security Protocol's client application supports Windows 98 SE, Windows ME, Windows 2000 Professional, and Windows XP. The protocol does not support Windows 2000 Server or Windows NT 4.0.
- The Harmony Security Protocol is only available for clients that are operating in Infrastructure mode.
- A network administrator who manages the network's Harmony Access Point Controller(s) must assign each user a Harmony User Name and Password and enter this information into the Harmony System's User Database. Refer to the *Harmony Access Point Controller User's Guide* for details.
- If you enable the Harmony Security Protocol, you do not need to configure WEP Keys on an 802.11a client (the Harmony System will generate keys for you).

802.1x

802.1x is an IEEE security standard for authenticating users on local area networks based on the Extensible Authentication Protocol (EAP). For more information on this standard, refer to the IEEE Web site at **http://www.ieee.org/**.

On a wireless LAN with 802.1x enabled, an Access Point will block all traffic from a wireless client until after the user has been authenticated by the network's RADIUS (Remote Authentication Dial-In User Service) server. Proxim supports the following RADIUS servers for use with Harmony 802.11a products:

- Microsoft Windows 2000 Internet Authentication Service (IAS) Server
- Funk Odyssey Server

Note: You may also need to install additional components based upon the server's requirements and EAP authentication type. For example, EAP-TLS requires a Certificate Authority (CA) and that digital certificates be installed on the RADIUS server and each wireless device.

EAP is a flexible protocol which does not specify an authentication type. The available authentication types will vary based upon your RADIUS server and your client software; many offer advanced features such as mutual authentication between client and server and data encryption. For data encryption, a RADIUS server generates a unique WEP Key for each user following authentication. This WEP Key is used to encrypt unicast packets between the Access Point and wireless client. To encrypt broadcast packets, the Access Point and its clients use the AP's configured Global WEP Keys.

The Harmony Utility does not include configuration settings for 802.1x. To enable 802.1x support and configure 802.1x settings (like EAP authentication type), you need to use a client utility provided by a RADIUS server manufacturer, like Microsoft or Funk Software. Refer to Microsoft's (**http://www.microsoft.com/**) and Funk Software's (**http://www.funk.com/**) Web sites or the documentation that came with your 802.1x solution for details. Also, see "802.1x" on page 49 for additional configuration information.

Chapter 5

Harmony Utility

Proxim provides a software utility that simplifies the management and configuration of a Harmony 802.11a network adapter. Chapter 2 describes how to install the utility. This chapter describes how to use the Harmony Utility after it has been installed.

Status Monitor Icon

After you have installed the utility, the Status Monitor icon will appear in Windows Taskbar.

If the adapter cannot locate an Access Point (AP) or Ad Hoc network (either because the 802.11a settings do not match or the other devices are out of range), the icon will appear as follows:

When the adapter is associated with an AP or has joined an Ad Hoc network, the icon will appear as follows:

When connected to an 802.11a network, you can view additional information about the adapter's status when the mouse cursor is placed over it, as shown below.

If the adapter has the Harmony Security Protocol enabled and it is has not been authenticated by the Harmony System, the icon will appear as follows:

Right-click the icon to view configuration options for the Status Monitor:

- Select **Run 802.11a Configuration Utility** from the drop-down menu to launch the 802.11a Configuration Utility. Double-clicking the icon also launches the utility.
- Select **Disable Device Radio** to turn off the adapter's radio. You should disable the radio if you intend to use an 802.11a-equipped laptop on an airplane. A check mark appears next to this option when the radio is disabled. Select this option again to enable a disabled radio.
- Select **Remove Status Monitor From Task Bar** to close the Status Monitor.

Configuration Utility

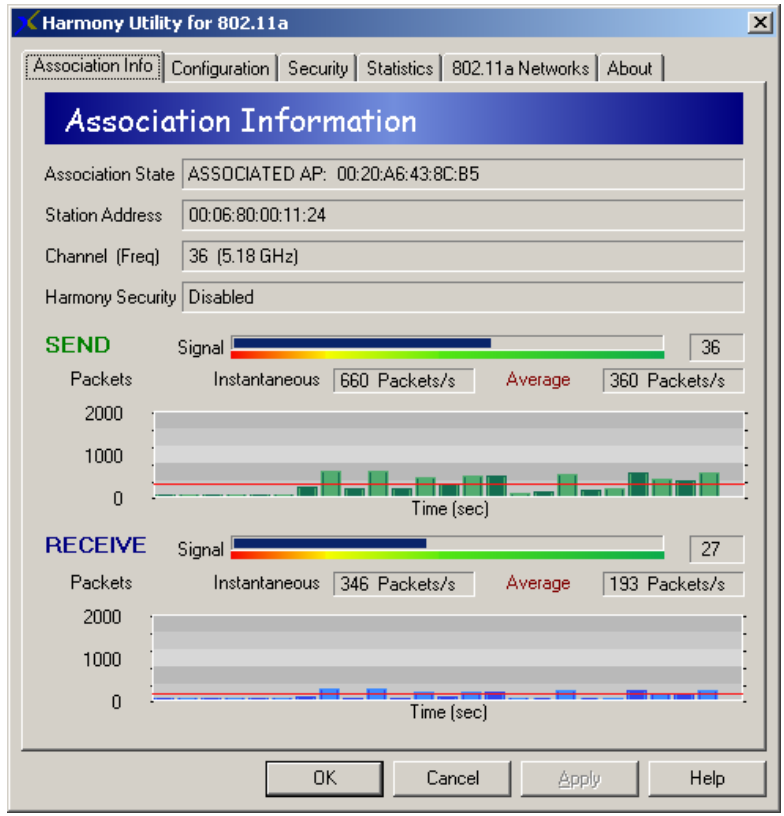
The Harmony Utility includes several tools for diagnostic and configuration purposes. Each of the utility's screens is described below. For additional information about the Harmony Utility, click **Help** on any screen to view on-line Help documentation.

Association Information

The Association Information screen, shown in the example on the next page, displays information about the adapter's connection with the 802.11a network.

The Association Information screen reports the following statistics:

- **Association State:** This field reports if the adapter is communicating with an Access Point (AP) or Ad Hoc network. When communicating with an AP, this field reports "ASSOCIATED AP" and displays the AP's physical address. When communicating with an Ad Hoc network, this field displays "JOINED AD HOC MODE." If no AP or Ad Hoc network is found, this field displays "NOT JOINED."
- **Station Address:** This field displays the adapter's physical address (also known as MAC address). This address is configured at the factory.
- **Channel (Freq):** This field displays the current Channel and center frequency that the adapter is using. See "Channel" on page 30 for details.
- **Harmony Security**: Reports the status of the Harmony Security Protocol: "Disabled," "Enabled," "Not Authenticated," "User Not Logged In," "User Associated," and "User is using Unique Encryption Key" (with time of login). The Harmony Security Protocol only supports Infrastructure mode; if a client is in Ad Hoc mode, this field reports: "Harmony Security does not support Ad Hoc Mode." This field is not visible on computers running Windows NT or Windows 2000 Server.

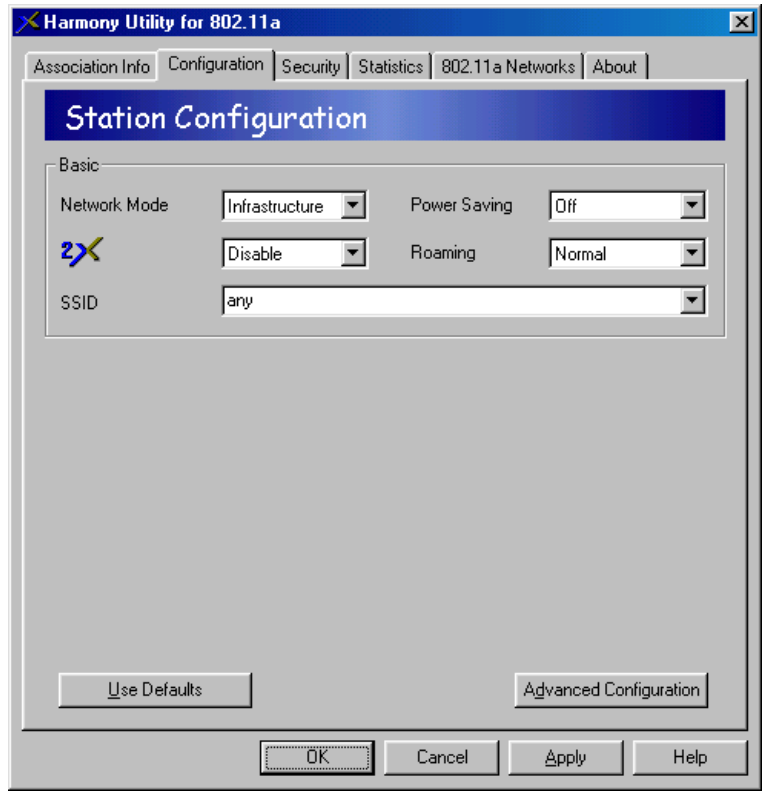


- **Send Signal Strength:** The Signal bar displays the signal strength for the last acknowledgment (ACK) received by the adapter. Signal strength is reported in decibels (dB). The color-coded chart below the Signal bar indicates the relative strength of the signal: a signal in the red or orange section indicates a weak connection; a signal in the yellow or light green section indicates a good connection; a signal in the darker green section indicates an excellent connection.
- **Instantaneous Packets/Sec Sent:** This statistic displays the current rate at which the adapter is transmitting packets to another 802.11a device. This information is represented as the number of packets sent per second by the adapter and is plotted on the graph located below the Packets/sec field. Note that this statistic will remain zero unless the adapter is transmitting data to another device.
- **Average Packets/Sec Sent:** This statistic displays the average number of packets transmitted by the adapter each second since the utility was launched.

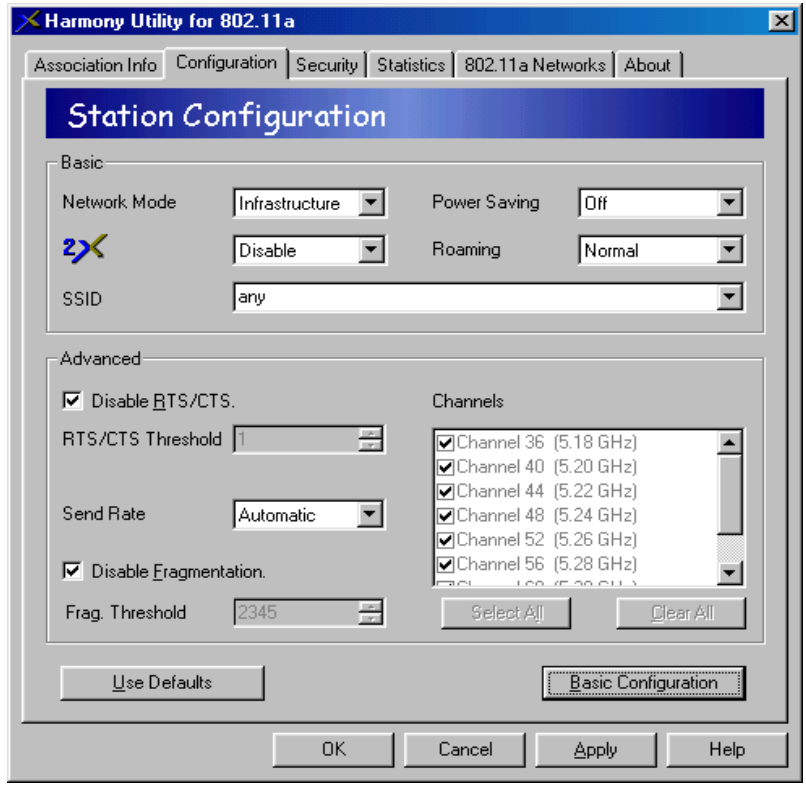
- **Receive Signal Strength:** The Signal bar displays the signal strength for the last packet received by the adapter. Signal strength is reported in decibels (dB). The color-coded chart below the Signal bar indicates the relative strength of the signal: a signal in the red or orange section indicates a weak connection; a signal in the yellow or light green section indicates a good connection; a signal in the darker green section indicates an excellent connection.
- **Instantaneous Packets/Sec Received:** This statistic displays the current rate at which the adapter is receiving packets from another 802.11a device. This information is represented as the number of packets received per second and is plotted on the graph located below the Packets/sec field. Note that this statistic will remain zero unless the adapter is receiving data from another device.
- **Average Packets/Sec Received:** This statistic displays the average number of packets received by the adapter each second since the utility was launched.

Station Configuration

Click the **Configuration** tab to view the Station Configuration screen, shown below.



Edit the configuration parameters as necessary and click **Apply** to save your changes. To change the operating Channel, Send Rate, RTS/CTS, and Fragmentation settings, click the button labeled **Advanced Configuration** to display these parameters.



The configuration parameters are described in Chapter 4 beginning on page 27; some options may not be available in all countries (see “Overview of Country-Specific Features” on page 11 for details).

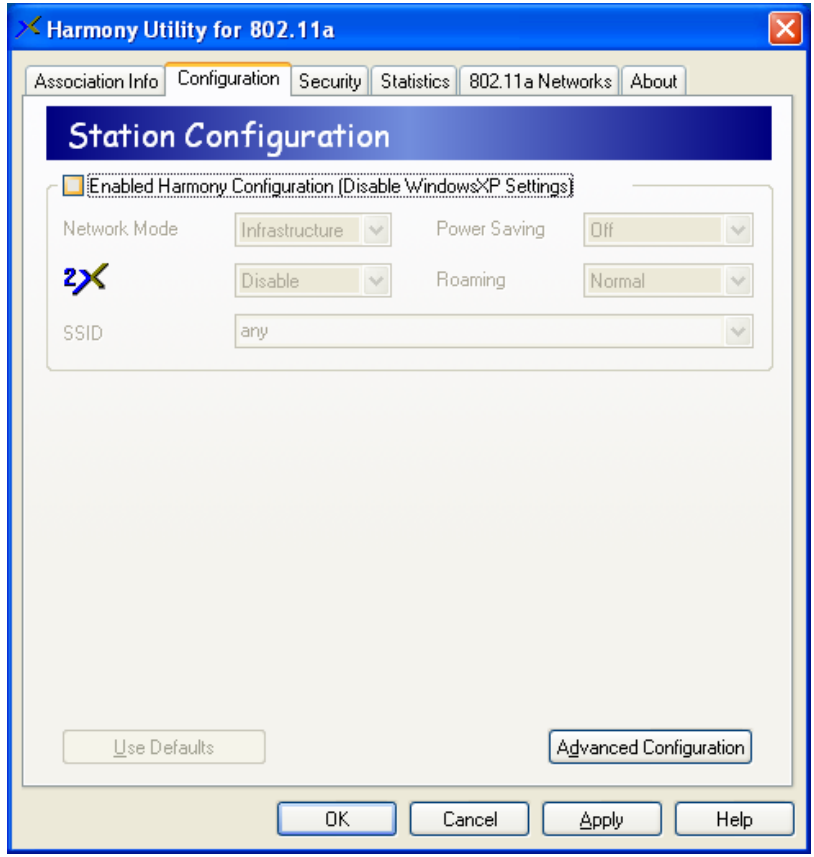
Note that the Channel selection box is unavailable when the Network Mode is set to Infrastructure. When Network Mode is set to Ad Hoc, you can configure one or more Channels for the adapter to scan. If you select multiple Channels, the adapter will scan each Channel looking for an Ad Hoc network to join that uses the same SSID as the adapter.

Note to Windows XP Users

Windows XP provides built-in support for wireless networks. Windows XP's wireless network management features are used in lieu of the Harmony Utility. For PCI Card users, support for the Harmony Utility is disabled by default (i.e., Windows XP wireless settings are enabled); for CardBus Card users, support for the Harmony Utility is enabled by default (i.e., Windows XP wireless settings are disabled).

To turn Harmony Configuration on or off, check or uncheck the box labeled **Enabled Harmony Configuration (Disable Windows XP Settings)** within the Station Configuration screen.

When this option is disabled, the Station Configuration parameters, the Security parameters, and the 802.11a Network screen's Transmission Test and Associate features are unavailable within the Harmony Utility (as shown in the example below).



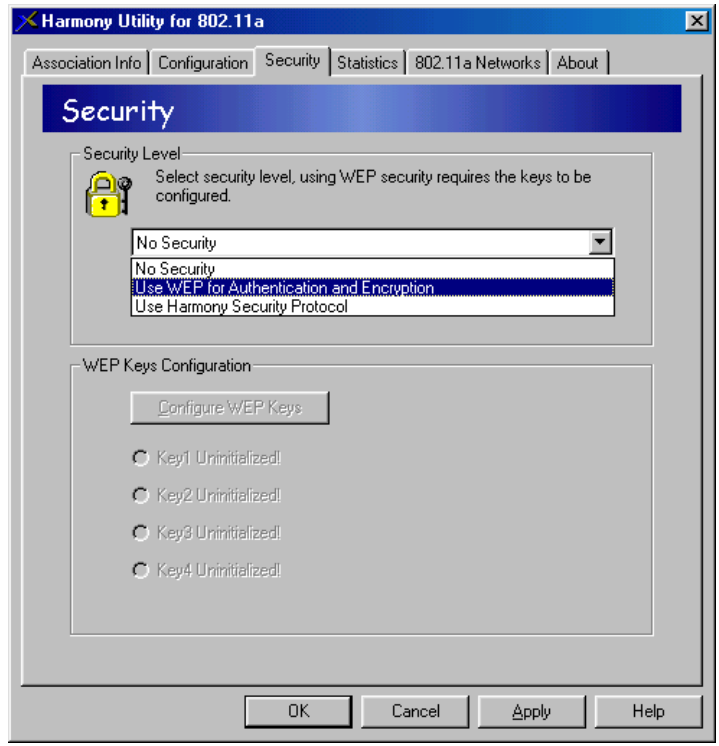
Security

Click the **Security** tab to configure the adapter's security settings. From within this screen, you can enable WEP for Authentication and Encryption, enable the Harmony Security Protocol, and configure the adapter's WEP Keys. See "Security Options" on page 32 for more information on these settings.

WEP for Authentication and Encryption

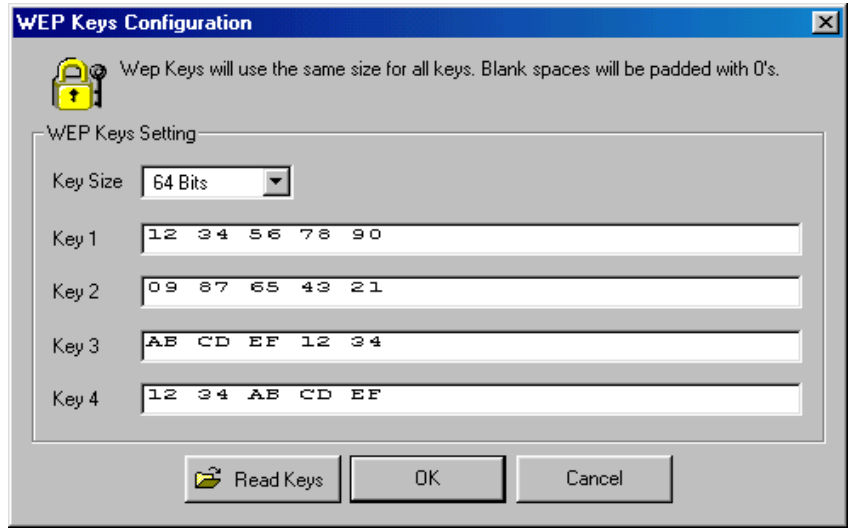
Follow these steps to enable WEP for Authentication and Encryption:

1. Select **Use WEP for Authentication and Encryption** from the Security Level box, shown below.



2. Click **Configure WEP Keys**.
3. Select a **Key Size** from the drop-down menu (64 Bit, 128 Bit, or 152 Bit).

4. Enter one to four WEP Keys in the fields provided, as shown in the following example.



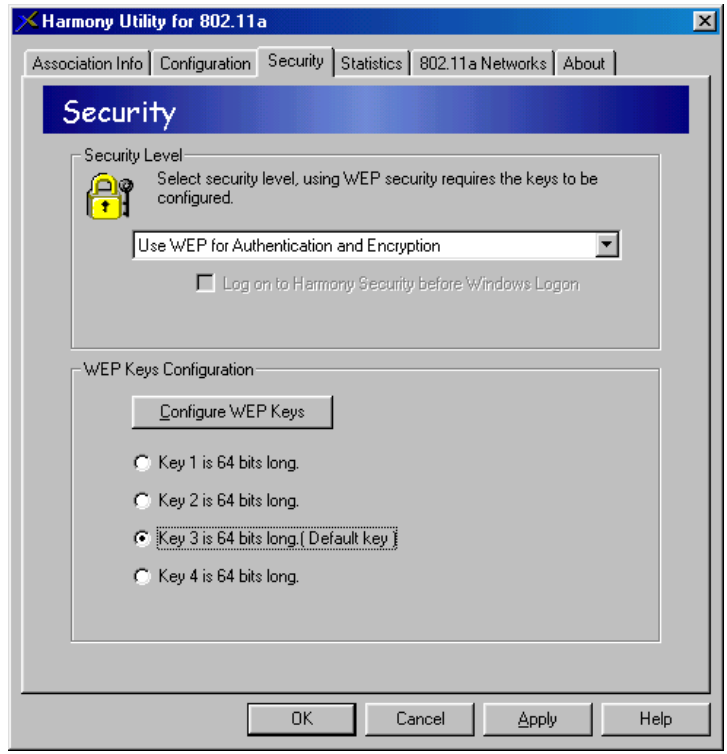
5. Use only hexadecimal digits (i.e., 0-9 and A-F). For 64-bit encryption, enter 10 digits for each Key; for 128-bit encryption, enter 26 digits for each Key; for 152-bit encryption, enter 32 digits for each Key.

Note: If you created a text file that contains the WEP Keys, click **Read Keys** to upload those Keys to the adapter. See "Read Key File Format" on page 44 for formatting information.

6. Click **OK** to save the WEP Keys.

7. Select one of the Keys you configured as the **Default Key**.

In the following example, Key 3 is the Default Key.



A Harmony 802.11a network adapter can decrypt information that was encrypted with any of its four WEP Keys but it will only use the Default Key to encrypt outgoing information.

8. Click **Apply** or **OK** to save the new WEP settings.

9. If you need to change a WEP Key at a later date, click **Configure WEP Keys** and enter one to four new WEP Keys. Note that any Keys you entered previously will not be visible (stars appear in place of the digits).

Read Key File Format

If you have multiple clients to configure, you can avoid having to enter each WEP Key manually by creating a text file that contains the Keys. Once you have the text file, you can upload the Keys to a client by clicking the **Read Keys** button found on the WEP Keys Configuration screen.

To create the text file, use a text program such as Microsoft Notepad or WordPad. The text file should have a ".txt" extension. The first line of the text file must read "[WEP_KEY_VALUE]". Then, enter one to four Keys in the following format: "key#=‹key value›", where # indicates the Key number (1-4) and *‹key value›* is the specified Key's hexadecimal digits.

Each Key must be contain hexadecimal digits only (0-9 and A-F), and you must use the same number of digits for each Key. The number of digits depends upon the Key Size you select in the WEP Keys Configuration screen:

- For 64 Bit, use 10 digits per Key.
- For 128 Bit, use 26 digits per Key.
- For 152 Bit, use 32 digits per Key.

The following example illustrates the WEP Key file format for 64-bit encryption:

```
[WEP_KEY_VALUE]
key1=1234567890
key2=0987654321
key3=ABCDEF1234
key4=ABCDEFABCD
```

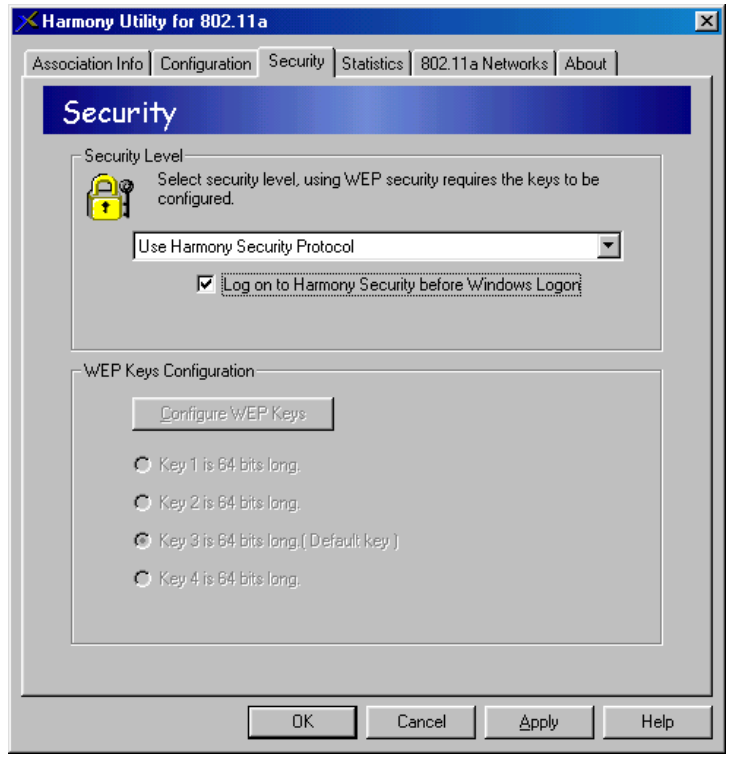
Harmony Security Protocol

Follow these steps to enable the Harmony Security Protocol:

Note: The Harmony Security Protocol is not available on computers running Windows 2000 Server or Windows NT.

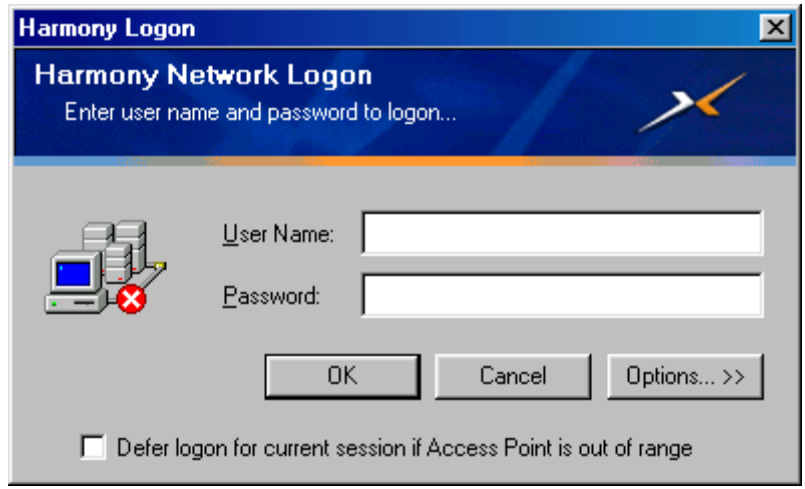
1. Select **Use Harmony Security Protocol** within the Security Level box.
2. Place a check mark in the **Log on to Harmony Security before Windows Logon** box if you want to connect to the wireless network before logging on to the Windows operating system.

Note: You should enable the **Log on to Harmony Security before Windows Logon** option if your computer connects to a Windows Domain Controller, connects to a Novell network, automatically reconnects to shared network drives during Windows logon, or runs networking software (e.g., PC Anywhere) before connecting to the network.



3. Click **Apply** or **OK** to save the new security settings.
4. Log off Windows or restart the computer.
5. Log on to Windows when prompted (if the **Log on to Harmony Security before Windows Logon** option is disabled).
6. The Harmony logon prompt will appear. Enter your Harmony User Name and Password in the fields provided.

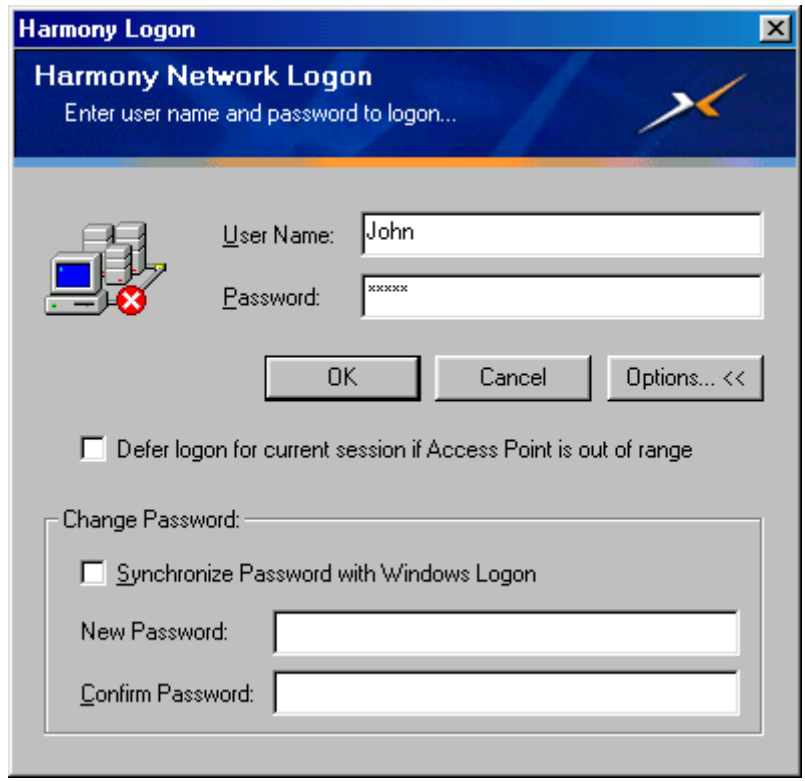
The Windows 98/ME logon prompt is shown below.



Note: The Harmony logon prompt will not appear if your Windows User Name and Password match your Harmony User Name and Password, you are within range of a properly configured Access Point, and the **Log on to Harmony Security before Windows Logon** option is disabled.

7. If you are not in range of a Harmony Access Point, place a check mark in the box labeled **Defer logon for current session if Access Point is out of range**. The Harmony software will store your User Name and Password and automatically initiate the logon procedure without any user intervention once the 802.11a network adapter has associated with an Access Point.

8. If desired, click **Change Password** (Windows XP/2000 Professional) or **Options...** (Windows 98/ME) to modify your Harmony user account. The Windows 98/ME logon prompt is shown below.



- Enter a new password twice in the fields provided to change your Harmony Password. The Password can be up to 32 characters and is case sensitive.
- To reset your Harmony Password to match your Windows Password, check the box labeled **Synchronize Password with Windows Logon**.

9. Click **Logon** to log on to the Harmony System.
10. Log on to Windows when prompted (if the **Log on to Harmony Security before Windows Logon** option is enabled).

Note: See "Common Technical Support Questions" on page 65 for troubleshooting suggestions if you have difficulty logging onto the network.

802.1x

The Harmony Utility does not include configuration settings for 802.1x. To enable 802.1x support, you need to use a client utility provided by a RADIUS server manufacturer, such as Microsoft or Funk Software.

Note: Confirm that the Harmony Utility's **Security Level** is set to **No Security** before enabling 802.1x support using a third-party client utility.

As of the release of this user's guide, Microsoft provides 802.1x support for Windows XP users only as part of the operating system. To enable 802.1x on a Windows XP computer, you need to disable the Harmony Configuration options.

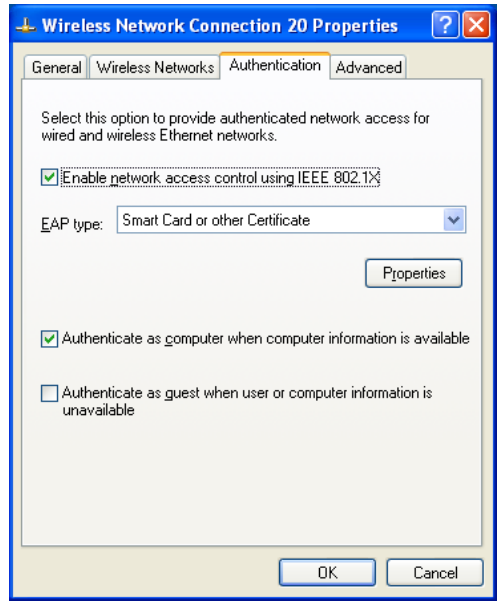
Follow these steps to enable 802.1x on a Windows XP computer:

1. Open the Harmony Utility.
2. Click the **Configuration** tab.
3. Remove the check mark from the box labeled **Enabled Harmony Configuration (Disable Windows XP Settings)**. This will disable the Harmony Configuration options.
4. Click **OK** to save this change and close the Harmony Utility.
5. Click the networking icon in the Windows Taskbar to open Windows XP's built-in wireless network utility.

WinXP Networking Icon

6. Click **Properties** (if associated with an AP) or **Advanced** (if not associated).

7. Click the **Authentication** tab.



8. Configure the 802.1x settings. Contact your network administrator or refer to Windows XP's on-line Help if you need assistance configuring these settings.

Note: Depending on the network's EAP authentication type, your network administrator may need to provide you with a smart card or install a digital certificate on your computer.

9. Click the **Wireless Networks** tab.

10. Access the Wireless Network Properties for your network.
    - If your network is listed in **Available networks**, highlight it and click **Configure**.
    - If your network is listed in **Preferred networks**, highlight it and click **Properties**.
    - If your network is not listed, click **Add** and enter the network's SSID.

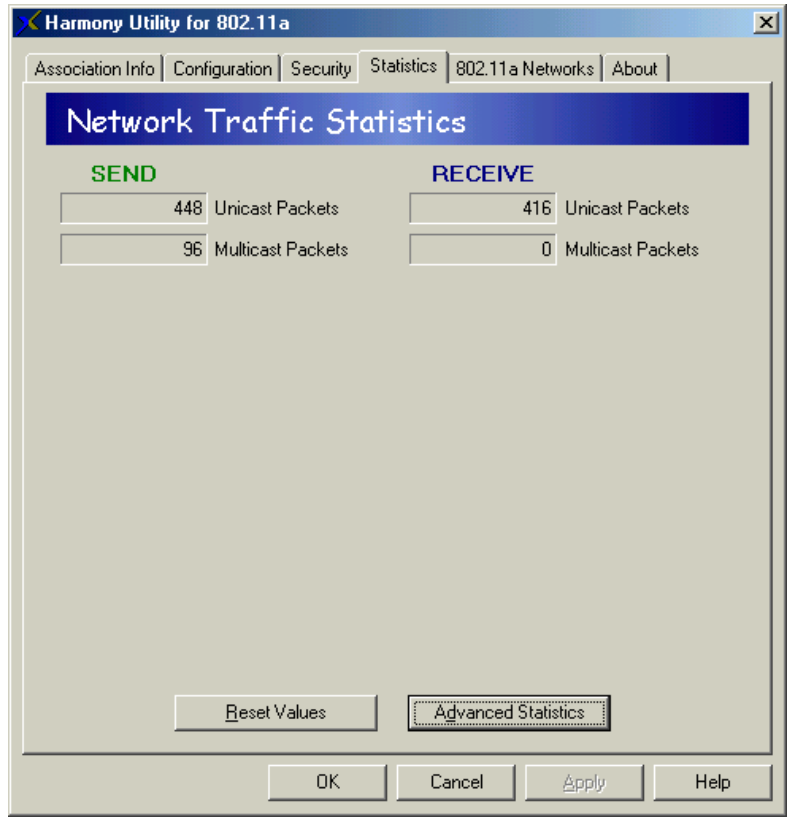
11. Configure the network's WEP settings.

Note: If your EAP type supports dynamic WEP keys, place a check mark next to the **Data encryption (WEP enabled)** and **The key is provided for me automatically** options.

12. Click **OK** twice to exit the network's properties window.

Network Traffic Statistics

Click the **Statistics** tab to view information about the number of packets sent and received by the adapter, as shown below.



The default Statistics screen displays the following statistics:

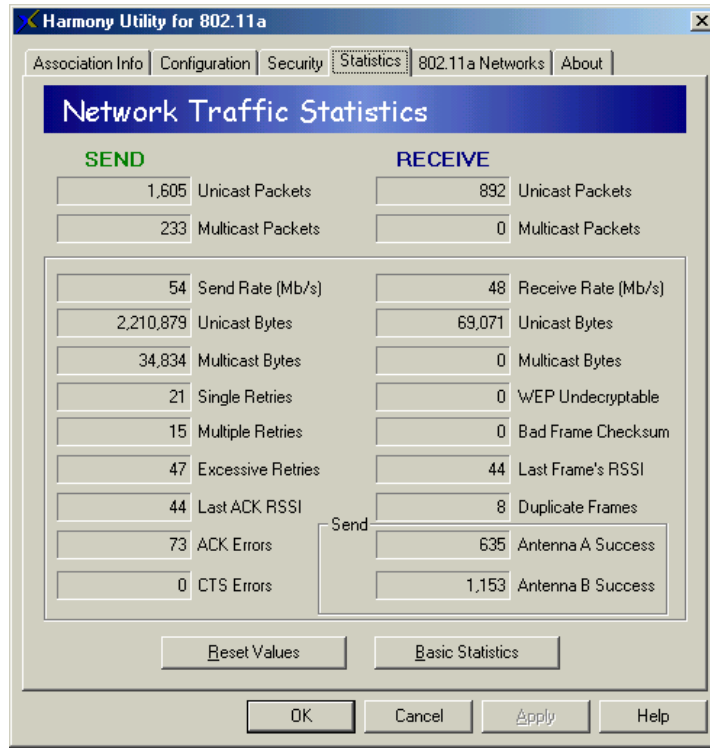
- **Unicast Packets Sent:** This statistic reports the number of packets transmitted by the adapter that were destined for a single network node.
- **Multicast Packets Sent:** This statistic reports the number of packets transmitted by the adapter that were destined for more than one network node.
- **Unicast Packets Received:** This statistic reports the number of packets received that were destined only for this adapter.
- **Multicast Packets Received:** This statistic reports the number of packets received that were destined for more than one network node.

You can view additional statistics by clicking **Advanced Statistics**, as shown on the next page.

The advanced Statistics screen displays the following additional statistics:

Send

- **Send Rate:** This field reports the adapter's current transmit rate.
- **Unicast Bytes Sent:** This statistic reports the total number of bytes contained in the unicast packets transmitted by the adapter.
- **Multicast Bytes Sent:** This statistic reports the total number of bytes contained in the multicast packets transmitted by the adapter.
- **Single Retries:** After the adapter sends a packet, it waits for an acknowledgment from the receiving radio to confirm that the packet was successfully received. If an acknowledgment is not received within a fixed period of time, the adapter will retransmit the packet. This statistic reports the number of packets that required one retry before the adapter received an acknowledgment.
- **Multiple Retries:** This statistic reports the number of packets that required more than one retry before the adapter received an acknowledgment.
- **Excessive Retries:** This statistic reports the number of packets that were not successfully transmitted because the adapter did not receive an acknowledgment within the maximum number of retries.



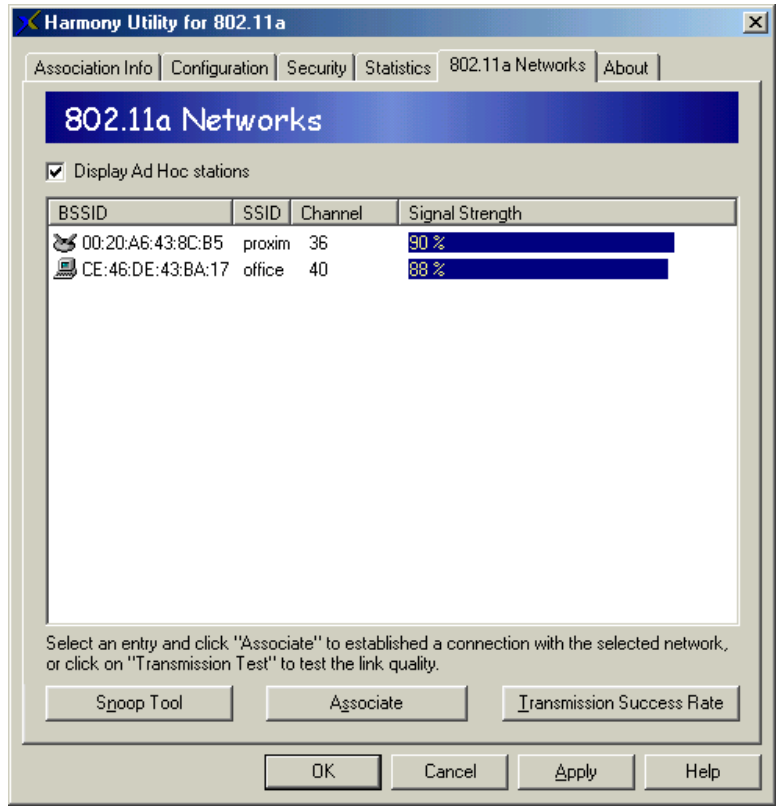
- **Last ACK RSSI:** This statistic reports the RSSI (Received Signal Strength) for the last acknowledgment (ACK) received by the adapter. RSSI is reported in decibels (dB) and typically ranges from 0 to 75. In general, an RSSI less than 15 indicates a weak signal and an RSSI greater than 30 indicates a strong signal.
- **ACK Errors:** This statistic reports the number of unicast transmit attempts for which no acknowledgement (ACK) was received.
- **CTS Errors:** This statistic reports the number of Clear To Send (CTS) errors. When the adapter uses RTS/CTS before transmitting a packet, it first sends a Request to Send (RTS) message to the packet's recipient. The packet's recipient then returns a CTS message to the adapter. When the adapter receives the CTS, it sends the packet to the recipient. However, if the adapter does not receive a CTS within a fixed period of time, it will resend the RTS. After a fixed number of retries, the adapter will record a CTS Error if a CTS has not been received.
- **Antenna A Success:** The adapter provides **antenna diversity**. This means that it automatically switches between its two antennas (referred to as Antenna A and Antenna B) to provide the strongest possible signal to a receiving radio. This statistic reports the number of packets successfully transmitted using Antenna A.
- **Antenna B Success**: This statistic reports the number of packets successfully transmitted using Antenna B.

Receive

- **Receive Rate:** This field reports the data rate at which the adapter is currently receiving packets sent by another 802.11a device.
- **Unicast Bytes Received:** This statistic reports the total number of bytes contained in the unicast packets received by the adapter.
- **Multicast Bytes Received:** This statistic reports the total number of bytes contained in the multicast packets received by the adapter.
- **WEP Undecryptable:** This statistic displays the number of packets that were discarded due to a problem during decryption, such as mismatched WEP Keys.
- **Bad Frame Checksum:** This statistic displays the number of received packets that failed the CRC (Cyclic Redundancy Check) of the Frame Check Sequence (FCS).
- **Last Frame's RSSI:** This statistic reports the RSSI (Received Signal Strength) for the last packet received by the adapter. RSSI is reported in decibels (dB) and typically ranges from 0 to 75. In general, an RSSI less than 15 indicates a weak signal and an RSSI greater than 30 indicates a strong signal.
- **Duplicate Frames:** This statistic displays the number of duplicate packets received by the adapter. When the adapter successfully receives a packet, it sends an acknowledgment (ACK) to the transmitting node. If the ACK does not reach the transmitting node within a specified period of time after it sent the packet (due to interference or some other type of delay), it will resend the packet to the recipient. In this case, the adapter then receives the packet a second time, records that it received a duplicate packet, and sends an ACK again.

802.11a Networks

Click the **802.11a Networks** tab to view the list of Access Points or Ad Hoc stations within range of the adapter. In the example below, the utility detected one Access Point and one Ad Hoc node.



Note: To display only Access Points, uncheck the **Display Ad Hoc stations** box.

The 802.11a Networks screen reports the following information for each Access Point or Ad Hoc node detected by the adapter:

- **BSSID:** This field reports the physical (or MAC) address of the detected Access Point or the Basic Service Set ID of the detected Ad Hoc node.
- **SSID:** This field reports the detected device's SSID or Service Set Identifier. See "SSID" on page 28 for more information.
- **Channel:** This field displays the Channel used by the detected device. See "Channel" on page 30 for more information.
- **Signal Strength:** This field displays the strength of the radio signal received from the detected 802.11a device.

If you want the adapter to associate with one of the detected Access Points or join the same Ad Hoc network as one of the detected Ad Hoc nodes, highlight the node within the device list and click **Associate**. The adapter's Network Mode and/or SSID will automatically change to match the selected device's configuration settings.

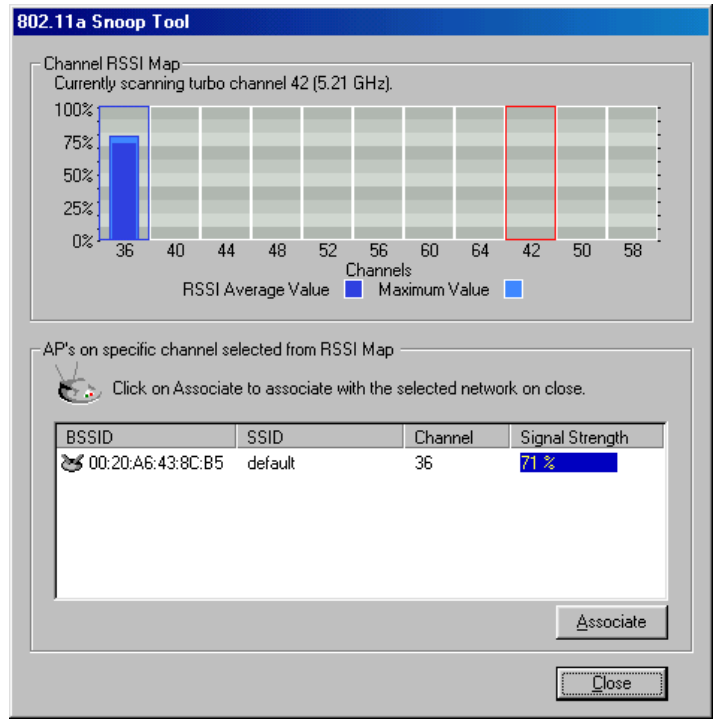
In addition, you can use the **Snoop Tool** to monitor the amount of radio traffic in your area or perform a **Transmission Success Rate** test with any of the detected Access Points.

Note: A drop-down menu appears when you right-click an entry within the 802.11a Networks list. The menu contains **Associate** and **Transmission Test** options.

Snoop Tool

The Snoop Tool sweeps the available 802.11a Channels in the 5 GHz band and reports the radio activity it detects. The tool scans each Channel in turn, as indicated by the red outline. When a signal is detected, the tool displays the signal's maximum and average RSSI (Received Signal Strength Indicator) value. This value is reported as a percentage; a higher percentage means a stronger signal.

If there are no other 802.11a products operating in the area, received signals indicate potential sources of interference. If there are 802.11a Access Point or Ad Hoc networks operating nearby, the tool will report their signal strength.



Click one of the Channels in the **Channel RSSI Map** to determine if any 802.11a devices are transmitting at that frequency. A selected Channel has a blue outline. If one or more 802.11a Access Points are using the selected Channel, information about these Access Points will appear in the **APs on specific channel selected from RSSI Map** box. This is the same information that is reported in the 802.11a Networks screen (BSSID, SSID, Channel, and Signal Strength).

To associate with one of the detected Access Points, highlight the Access Point's entry in the **APs on specific channel selected from RSSI Map** box and click **Associate**. The 802.11a adapter will automatically associate with the selected Access Point once the Snoop Tool is closed.

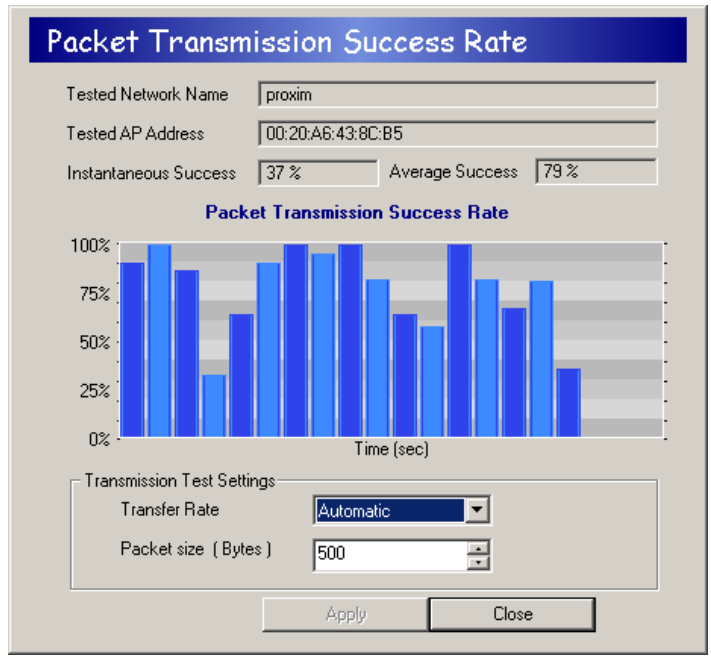
Packet Transmission Success Rate

Select one of the detected Access Points in the 802.11a Networks screen and click **Transmission Success Rate** to determine the link quality between the adapter and the selected device.

Note: Performing a Transmission Test will reset the adapter's statistics.

The Packet Transmission Success Rate screen displays the Network Name (i.e., SSID) and MAC address of the selected Access Point.

The adapter sends a series of packets to the selected device and monitors the number of replies it receives. This information is converted to a percentage and plotted on a graph, as shown in the following example.



In addition, the utility displays the current success rate in the **Instantaneous Success** field and the average success rate (since the beginning of the test) in the **Average Success** field.

By default, the adapter uses a packet size of 500 Bytes and automatically switches between all rates as necessary during the test (greater range generally means a lower transfer rate). However, you can also specify a transfer rate and/or a packet size (between 1 and 1500 Bytes) using the drop-down menu. If you change either the Transfer Rate or the packet size, click **Apply** for these changes to take effect. Click **Close** to exit the Packet Transmission Success Rate screen.

Note: You can only perform a transmission test with an Access Point; you cannot perform a transmission test with an Ad Hoc node.

Version Information

Click the **About** tab to view version information for the 802.11a driver and utility.

Chapter 6

Troubleshooting

The Harmony 802.11a network adapters are designed to be very easy to install and operate. However, if you experience any difficulties, use the information in this chapter to help diagnose and solve the problem. If you still cannot resolve the problem, contact Proxim Technical Support as described in Appendix B, “Technical Support and Training,” on page 72.

How to Obtain Help with Your LAN Installation

If you require assistance to install your LAN, Proxim can put you in touch with an 802.11a reseller in your area. The reseller is an expert in the design, installation, and maintenance of LANs and will be able to examine your needs and recommend the most cost-effective solution for your LAN whether you are installing a new LAN or adding on to an existing one. For the location of the Harmony reseller nearest you, contact Proxim at 1-800-229-1630 or 1-408-731-2700 and ask for the Sales Department.

Common Installation Problems

Chapter 2 describes how to install a Harmony 802.11a network adapter in a computer running Windows 98 Second Edition (SE), Windows Millennium Edition (ME), Windows 2000, Windows XP, or Windows NT. This section provides suggestions to resolve some of the common installation problems with a Harmony 802.11a network adapter.

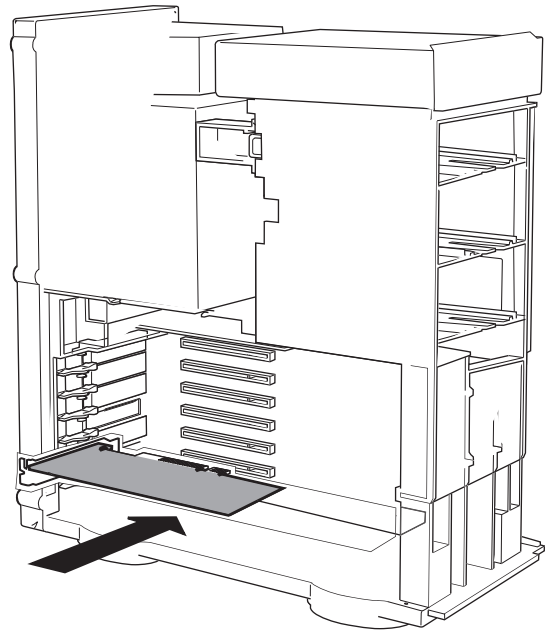
Adapter Inserted Before Running the Installation Program

If you inserted the Harmony 802.11a network adapter into a Windows computer before running the Harmony Installation program, you can install the adapter using Microsoft’s Add New Hardware Wizard (not available for Windows NT users).

Follow these steps:

Note: PCI Card users should begin at Step #1. CardBus Card users should begin at Step #8.

1. Turn off the computer, unplug its power cord from the wall outlet, and remove the computer cover.
2. Locate an unused PCI slot and refer to your PC's manual for instructions on how to remove the plate that covers the slot (if applicable).
3. Feed the card's antennas through the PCI slot and out the back of the computer.
4. Align the PCI Card over the empty slot and firmly insert the card into the slot, as illustrated below.



5. Secure the card's metal bracket to the computer following the directions provided in your PC's manual and replace the computer cover.
6. Plug the computer's power cord back into the wall outlet.
7. Attach the antenna with the longer cable to the antenna base and place the antenna with the longer cable on top of your desk, computer, or monitor.
8. Turn on the computer and logon to Windows, if applicable.
9. CardBus Card users: Insert the 802.11a adapter into an available CardBus slot.
10. Be patient while Windows automatically detects the adapter and launches the Add New Hardware Wizard.

11. Insert the Harmony Installation CD into the computer's CD-ROM drive.
12. Follow the on-screen instructions to install the Harmony 802.11a network adapter using the Add New Hardware Wizard.
    - Windows 98/ME users: Insert the Windows installation CD if prompted. If you do not have a Windows installation CD, see "Windows ME and Windows 98 SE Installation CD Requirement" on page 13.
    - Windows NT users: Proceed to Step #14 if the card is not automatically detected.
13. If prompted, restart the computer and logon to Windows.
14. Run *SETUP.EXE* from the Harmony Installation CD to launch the Harmony Utility Setup program.
15. Follow the on-screen instructions to install the Harmony Utility.

Refer to Chapter 5 beginning on page 36 for information on how to use the Harmony Utility.

Windows 98/ME/2000/XP Troubleshooting

Adapter Not Listed in Device Manager

Follow these steps if you have installed an 802.11a network adapter but it doesn't appear as a network adapter in the Device Manager:

1. Open the Device Manager (located within the Control Panel's System icon).
2. Check the Other Devices category for a **PCI Ethernet Controller** or **Ethernet Controller** entry.
3. If the entry appears in the Other Devices category, highlight it and click **Remove**.
4. Close the Device Manager.
5. Shut down the computer and remove the Harmony 802.11a network adapter from the computer.
6. Follow the installation instructions in Chapter 2 to install the Harmony driver and utility.

802.11a Network Adapter Not Installed Properly

If the Harmony Device Setup program or Windows Networking reports that the Harmony 802.11a network adapter has not been properly installed or configured after you have completed the Harmony Installation program, open the Device Manager and locate the Harmony 802.11a entry in the Network adapters category.

If a yellow exclamation point ("!") appears next to the Harmony 802.11a adapter's Device Manager entry, then the adapter is not working properly. Follow these steps:

1. Uninstall the adapter as described in "Uninstalling a Harmony 802.11a Network Adapter" on page 63.
2. Reinstall the adapter following the installation instructions in Chapter 2.

Configuring Networking Clients and Protocols

A Harmony 802.11a network adapter will bind to any existing networking components, such as Client for Microsoft Networks and the Internet Protocol (TCP/IP). Refer to the steps below that correspond to your computer's operating system to configure the adapter's networking components.

Windows XP/2000

Follow these steps to configure a Harmony 802.11a adapter's networking clients and protocols in a Windows XP or Windows 2000 computer:

1. Open the Control Panel's **Network and Dial-up Connections** (Windows 2000) or **Network Connections** (Windows XP) icon.
2. Scroll through the list of network connections and right-click the Local Area Connection that corresponds to the Harmony 802.11a adapter.
3. Select **Properties** from the drop-down menu to view the connection's properties screen.
4. Select a client or protocol from the list of installed components and click **Properties** to configure its settings.

   For example, if you want to assign the Harmony 802.11a adapter a static IP address, highlight **Internet Protocol (TCP/IP)** and click **Properties**.

Note: To add a new client or protocol, click **Install...** and follow the on-screen instructions.

Windows ME/98 SE

Follow these steps to configure a Harmony 802.11a adapter's networking clients and protocols in a Windows 98/ME computer:

1. Open the Control Panel's **Network** icon.
2. Select a client or protocol from the list of installed components and click **Properties** to configure its settings.

   For example, if you want to assign the Harmony 802.11a adapter a static IP address, highlight **TCP/IP** or **TCP/IP -> Harmony 802.11a Network Adapter** and click **Properties**.

Note: To add a new client or protocol, click **Add...** and follow the on-screen instructions.

Windows NT

Follow these steps to configure a Harmony 802.11a adapter's networking protocols in a Windows NT computer:

1. Open the Control Panel's **Network** icon.
2. Click the **Protocols** tab.
3. Select a protocol from the list of installed components and click **Properties** to configure its settings.
4. Select the Harmony 802.11a network adapter from the list of installed adapters.
5. Configure the protocol as necessary.
6. Click **OK** or **Apply** save your changes.
7. Close the Network screen and restart the computer if prompted.

Note: To add a new client or protocol, click **Add...** and follow the on-screen instructions.

Uninstalling a Harmony 802.11a Network Adapter

Follow these steps if you need to uninstall a Harmony 802.11a network adapter:

Note: You do not need to uninstall the current software to upgrade to the latest Harmony software. See "Upgrading to Version 1.4" on page 22 for details.

1. Right-click the Status Monitor and choose **Remove Status Monitor From Task Bar**.
2. Open the Control Panel and double-click the **Add/Remove Programs** icon.
3. Select **Harmony 802.11a** from the list of installed programs and click **Add/Remove...** (Windows 98/ME/NT) or **Change/Remove** (Windows XP/2000).
4. Select **Automatic** from the list of uninstall options and click **Next**.
5. Click **Finish** to continue.
6. Click **Remove** to remove the Harmony 802.11a Network Adapter.
7. Click **Close** or **OK** after the Harmony 802.11a Network Adapter has been removed.
8. If prompted, click **Cancel** to prevent the computer from restarting.
9. Remove the following driver files, if present:

Note: By default, Windows will hide some of these file types. Confirm that you have configured Windows to show all files before assuming that these files are not present. The Hidden Files option is available under the Folder Options heading of the Windows Explorer's View or Tools menu.

Windows 98/ME computers:

- *C:\WINDOWS\INF\NETPR11A.INF*
- *C:\WINDOWS\INF\OTHER\PROXIM,INC.NETPR11A.INF*
- *C:\WINDOWS\SYSTEM32\DRIVERS\PROX11A.SYS*
- *C:\WINDOWS\SYSTEM\PROX11A.SYS*

Windows NT computers:

- *C:\WINDOWS\SYSTEM32\PROX11AN4.DLL*
- *C:\WINDOWS\SYSTEM32\DRIVERS\PROX11AN4.SYS*

Windows 2000 computers:

- *C:\WINNT\SYSTEM32\DRIVERS\PROX11A.SYS*
- *C:\WINNT\INF\NETPR11A.INF*
- *C:\WINNT\INF\NETPR11A.PNF*

Windows XP computers:

- *C:\WINDOWS\SYSTEM32\DRIVERS\PROX11A.SYS*
- *C:\WINDOWS\INF\NETPR11A.INF*
- *C:\WINDOWS\INF\NETPR11A.PNF*

10. Shut down the computer.
11. Remove the Harmony 802.11a network adapter from the computer.

Range

Every environment is unique with different obstacles, barriers, materials, etc., and, therefore, it is difficult to determine the exact range that will be achieved without testing. Radio signals may reflect off of some obstacles or be absorbed by others depending on their construction.

The IEEE 802.11a specification supports eight data rates: 54 Mbps, 48 Mbps, 36 Mbps, 24 Mbps, 18 Mbps, 12 Mbps, 9 Mbps, and 6 Mbps. Harmony's 2X mode supports eight data rates: 108 Mbps, 96 Mbps, 72 Mbps, 48 Mbps, 36 Mbps, 24 Mbps, 18 Mbps, and 12 Mbps. Operation at 6 Mbps or 12 Mbps provides greater range than operation at 54 Mbps or 108 Mbps.

Note: Products sold in Europe, Japan, and Singapore do not support 2X mode.

By default, a Harmony 802.11a network adapter will automatically adjust the data rate to maintain a usable radio connection. Therefore, in 802.11a mode a client that is close to an Access Point may operate at 54 Mbps while a client that is on the fringe of coverage may operate at 6 Mbps.

Proper antenna placement can help improve range. Try to keep the adapter's antennas free of obstructions (particularly metal objects) and do not place a sheet of metal (like a filing cabinet) between two antennas. Also, Proxim recommends that you use the Harmony Utility to evaluate the signal strength and link quality between 802.11a devices.

CardBus Card LED Indicators

The Harmony 802.11a CardBus Card includes two green LED indicators on the top of the card near the antenna.

These LEDs display the following behavior:

- Both LEDs are off when the adapter is not receiving power or when the Harmony driver is not installed.
- The LEDs blink in an alternating pattern when the adapter is searching for an Access Point (in Infrastructure mode) or Ad Hoc network (in Ad Hoc mode).
- The LEDs blink in unison every second when the adapter has associated with an Access Point or joined an Ad Hoc network.
- When there is network activity, the LEDs blink at a faster rate; the LEDs will blink in unison more often as the adapter's Send or Receive Rate increases.

Common Technical Support Questions

This section discusses some of the most common problems using a Harmony 802.11a network adapter and offers possible solutions.

Symptom/Question	Possible Solution/Answer
I installed the adapter card in the computer before running *SETUP.EXE*. What should I do?	Follow the on-screen instructions to install the adapter using Microsoft's Add New Hardware Wizard. When prompted, point the Wizard to search the Harmony Installation CD for driver files. Then, after you have installed the driver, run *SETUP.EXE* from the Harmony Installation CD to install the Harmony utility.
My office has an existing 802.11b network. Are the Harmony 802.11a adapters compatible?	No. 802.11a devices are not compatible with 802.11b devices.
I want to install a Harmony 802.11a network in my office that has an existing 802.11b network. Will the 802.11a network interfere with the 802.11b network?	No. 802.11a and 802.11b devices will not interfere with each other since they operate at different frequencies. 802.11a devices operate in the 5 GHz band, and 802.11b devices operate in the 2.4 GHz band.
Is a Harmony 802.11a network adapter compatible with 802.11a products from other vendors?	Yes, the Harmony 802.11a adapters are interoperable with 802.11a-compliant products from other vendors. However, if you use 2X mode to achieve data rates up to 108 Mbps, a Harmony 802.11a adapter is only compatible with other 802.11a products from Proxim.
In throughput tests, the 802.11a network adapter doesn't seem to transfer data as quickly as I'd expect.	Data rate is the raw signaling rate of a networking device; it does not equal data throughput. Actual data throughput is always less than the data rate since some of the available bandwidth is used to send control messages and regulate activity over the wireless medium. Also, throughput will depend on several factors such as network overhead, the file transfer program in use, the computer's operating system, and the computer's processor speed.

Symptom/Question	Possible Solution/Answer
How do I determine where to install 802.11a Access Points to ensure that users can access the wireless network from anywhere in my facility?	Proxim recommends that you perform a site survey following the procedure outlined in Proxim's Introduction to Enterprise Wireless Networking and Harmony Technical Training class. If you would like to learn more about the site survey procedure, you should consider signing up for a Proxim Technical Training class in your area. Refer to Proxim's Web site at **http://training.proxim.com/** for more information.
I've entered my Harmony User Name and Password but I can't log on to the network.	Either your User Name or Password is incorrect or you are not in range of an Access Point. To determine whether or not you are in range of an Access Point, click **Cancel** to access the Windows desktop and locate the Association State field within the Harmony Utility. Then, log on to Windows again to bring up the Harmony logon prompt. If you are out of range of an Access Point, check the **Defer logon for current session if Access Point is out of range** box and click **Logon**. If your User Name or Password is incorrect, contact your network administrator for assistance.
I deferred my Harmony logon until my computer was in range of an Access Point. However, once the 802.11a adapter associated with an Access Point, I could not access the network.	Open the Harmony Utility's Association Information screen and locate the Harmony Security Protocol field. If the field reports "User is not authenticated," then either your User Name or Password is incorrect. Try logging on to Windows again. If problems persist, contact your network administrator to confirm your User Name and Password.

Symptom/Question	Possible Solution/Answer
My Harmony User Name and Password are synchronized with my Windows User Name and Password so the Harmony logon prompt does not appear after I logon to Windows. But now I want to change my Harmony Password. What can I do?	Change your Windows Password; the Harmony logon prompt will reappear after you log on to Windows once your Windows Password and Harmony Password no longer match. Otherwise, contact your network administrator who can change your Password via the Harmony System's User Database.
My computer can't reestablish a network connection when the Harmony Security Protocol is enabled.	You need to logon to Harmony Security first before logging on to Windows to gain immediate access to network resources. Open the Harmony Utility's Security screen and place a check mark next to the **Log on to Harmony Security before Windows Logon** option. Then, save your changes and logon to Windows again.
Do the Harmony adapters support IEEE 802.1X Authentication?	Yes, but you cannot configure 802.1x using the Harmony Utility; you need to use a configuration utility supplied by your RADIUS server vendor. Also, Windows XP provides native support for the IEEE 802.1x standard. See "802.1x" on page 34 and page 49 for details.
How long will my battery last when using the Harmony 802.11a CardBus Card?	Battery life will vary from unit to unit and depends on many factors including battery type, length of battery life without the CardBus Card inserted, and how frequently the CardBus Card transmits and receives data. Frequent network activity will drain the battery faster than if the card were left idle in doze mode. Configuring the CardBus Card to use one of the Power Saving modes will prolong battery life. However, you should perform some tests under normal operating conditions to accurately determine a device's battery life with the 802.11a CardBus Card.

Appendix A

Technical Specifications

The following technical specification is for reference purposes only. Actual product's performance and compliance with local telecommunications regulations may vary from country to country. Proxim Corporation will only ship products that are type approved in the destination country.

Technical Specifications

General

Compatibility ..... Fully interoperable with IEEE 802.11a compliant products in 802.11a mode

Warranty ..... 3-years parts and labor (return to factory)

LED Indicators ..... Two (2) LEDs indicate Power On, Sleep Mode, Transmit Activity, Association and Power Off

Network Information

Security ..... 40, 128 & 152-bit Wired Equivalent Privacy (WEP) data encryption; Harmony Security Protocol; 802.1x authentication

Network Architecture ..... Supports Ad Hoc peer-to-peer networks and communication to wired infrastructure networks via Access Points

Installation & Diagnostics ..... Complete configuration utility application included; Utility's site survey tool surveys other wireless units and reports packet throughput; Desktop icon continuously reports status

Operating System Support ..... Windows 98SE, 2000, ME, XP, NT 4.0 (Service Pack 6 or later)

Roaming.....Seamless among 802.11a compliant access points, including across subnets via Harmony AP Controller

Radio

Radio Data Rate .....54 Mbps, 48 Mbps, 36 Mbps, 24 Mbps, 18 Mbps, 12 Mbps, 9 Mbps, 6 Mbps in 802.11a mode; 108 Mbps, 96 Mbps, 72 Mbps, 48 Mbps, 36 Mbps, 24 Mbps, 18 Mbps, 12 Mbps in 2X mode

Media Access Protocol.....IEEE 802.11a

Frequency Band.....Models 8450 & 8150: 5.15-5.35 GHz

Model 8455: 5.15-5.35 & 5.725-5.850 GHz and 5.470-5.725 GHz in Europe (extended European band)

Radio Type .....Orthogonal Frequency Division Multiplexing

Modulation .....64 QAM, 16 QAM, QPSK, BPSK

Channels.....Varies by country. See “Channel” on page 30.

Environmental

Operating Temperature .....0ºC to +60ºC

Storage Temperature.....-65ºC to 150ºC

Humidity .....5% to 95% non-condensing

Physical

Bus Interface .....32-bit CardBus for Models 8450 & 8455; PCI (Peripheral Components Interconnect) for Model 8150

CardBus Card Voltage.....3.3 Volts

Weight .....1.41 ounces (40 g)

Parameters

Parameter	Range	Default
Network Mode	Ad Hoc*, Infrastructure	Infrastructure
Power Saving (Infrastructure only)	Off, Normal, Maximum	Off
2X Mode*	Enabled, Disabled	Disabled
SSID	Up to 32 characters	any
Channel (Configurable in Ad Hoc mode; assigned by AP in Infrastructure mode)	**All Models** **U.S. & Canada:** In 802.11a mode: Channels 36, 40, 44, 48, 52, 56, 60 & 64; In 2X mode: Channels 42, 50 & 58 **Europe:** Channels 36, 40, 44, 48, 52, 56, 60 & 64 **Japan:** Channels 34, 38, 42 & 46 **Singapore:** Channels 36, 40, 44 & 48 **8455 CardBus Card Only** **U.S. & Canada:** In 802.11a mode: Channels 149, 153, 157, 161 & 165; In 2X mode: Channels 152 & 160 **Europe:** Channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136 & 140	All selected
RTS/CTS	Enabled, Disabled	Disabled
RTS/CTS Threshold	1 to 2345	1
Send Rate	Automatic or select one of the following: 54 Mbps, 48 Mbps, 36 Mbps, 24 Mbps, 18 Mbps, 12 Mbps, 9 Mbps, and 6 Mbps in 802.11a mode; 108 Mbps, 96 Mbps, 72 Mbps, 48 Mbps, 36 Mbps, 24 Mbps, 18 Mbps, and 12 Mbps in 2X mode	Automatic (all rates in 802.11a mode)
Fragmentation	Enabled, Disabled	Disabled
Fragmentation Threshold	256 to 2345	2345
Security Level	No Security, Use WEP for Authentication and Encryption, Use Harmony Security Protocol	No Security
Key Size	64 Bit, 128 Bit, 152 Bit	64 Bit

*Ad Hoc mode not available in Europe; 2X mode not available in Europe, Japan, or Singapore.

Parameter	Range	Default
WEP Keys (When Security Level is set to Use WEP for Authentication and Encryption)	Up to 4 Keys: 10 hexadecimal digits per key for 64 Bit, 26 hexadecimal digits per key for 128 Bit, 32 hexadecimal digits per key for 152 Bit	Blank
Default Key	One of the four configured WEP Keys	WEP Key 1

Appendix B

Technical Support and Training

If you are having a problem using a Harmony 802.11a network adapter and cannot resolve it with the information in Chapter 6, gather the following information and contact Proxim Technical Support:

- What kind of network are you using?
- What were you doing when the error occurred?
- What error message did you see?
- Can you reproduce the problem?
- What version of the Harmony 802.11a driver are you using?

You can reach Proxim Technical Support by voice, fax, e-mail, or mail:

Tel:	1-800-477-6946 (Toll-free in the U.S. and Canada) 1-408-731-2640 (International)
Fax:	1-408-731-3676
Web:	**http://www.proxim.com/**
E-mail:	support@proxim.com
	Proxim Corporation Attn: Technical Support 935 Stewart Drive Sunnyvale, CA 94085

In addition, Proxim offers technical training courses across the United States throughout the year that are designed to teach customers how to maximize the benefits of Proxim products. These classes are taught by experienced Proxim Systems Engineers and have a technical focus. For class and registration information, visit Proxim's Web site at **http://training.proxim.com**.

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