# proxim
## Harmony

**Harmony 802.11a Access Point**

User's Guide

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## Limited Warranty, Disclaimer, Limitation Of Liability

For a period of one (1) year from the date of purchase by the retail customer, Proxim warrants the Harmony 802.11a Access Point 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 Access Point 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, Incorporated 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, Inc.

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 the Harmony 802.11a Access Point, 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.

# Table of Contents

# Chapter 1

## Introduction

Thank you for choosing Proxim's Harmony 802.11a Access Point, a member of Proxim's Harmony wireless infrastructure family. The Harmony 802.11a Access Point complies with the IEEE 802.11a wireless standard to provide mobile clients with network connectivity at high speed data rates of up to 54 Mbps (up to 108 Mbps in 2X™ mode).

The Harmony 802.11a Access Point is used in conjunction with a Harmony Access Point Controller as part of a wireless networking solution that supports all current and future wireless network standards including IEEE 802.11a, IEEE 802.11b, and OpenAir simultaneously within a single, homogeneous architecture. A Harmony System, which includes Access Point Controllers and Access Points, provides centralized management, configuration, and security for a wireless 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.

# The Harmony Family

The Harmony 802.11a Access Point is member 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 AP are available to support the IEEE 802.11a, IEEE 802.11b, or OpenAir wireless standards: the **802.11a Access Point Model 8569/8570/8571**, the **802.11b Access Point Models 8550/8551**, and the **OpenAir Access Point Model 7550**.

- The optional **Harmony Power System Model 7563** provides DC power to Harmony APs over the unused pins of a twisted pair Ethernet cable.

- The **Harmony 802.11a CardBus Card Model 8450** 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.

- 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 standards.

- 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 standards.

- 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 standards.

- 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.

## System Requirements

To begin using the Harmony 802.11a Access Point, you must have the following items installed on your local network:

- A Harmony AP Controller (with firmware version 2.0 or greater installed)

- A 10Base-T Ethernet or 100Base-TX Fast Ethernet switch or hub

- At least one 802.11a adapter

## The Product Package

Each Harmony 802.11a Access Point package includes:

- One Harmony 802.11a Access Point
  - Model 8569/8570 with two integral antennas, or
  - Model 8571 with two SMA antenna connectors

- One power adapter (12V, 1 Amp)

- One Wall Mounting Kit

- One Harmony CD-ROM containing this user's guide in Portable Document Format (PDF)

- One *Harmony 802.11a Access Point Quick Start Guide*

- One warranty registration card

If any of these items are missing or damaged, please contact your reseller or Proxim Technical Support.

# Harmony 802.11a Access Point Models

There are three models of the Harmony 802.11a Access Point available.  They are all essentially the same device with a few differences.

### Model 8569

- Includes two integral antennas that provide antenna diversity; these antennas cannot be removed from the unit
- Provides eight independent Channels in 802.11a mode and three independent Channels in 2X mode
- Does not support Power-over-Ethernet; not compatible with the Harmony Power System

### Model 8570

- Includes two integral antennas that provide antenna diversity; these antennas cannot be removed from the unit
- Provides eight independent Channels in 802.11a mode and three independent Channels in 2X mode
- Supports Power-over-Ethernet; use with Harmony Power System Model 7563

### Model 8571

- Includes two SMA antenna connectors for use with high-gain antennas (high-gain external antennas and antenna cabling are sold separately)
- Provides three independent Channels in 802.11a mode and one independent Channel in 2X mode
- Supports Power-over-Ethernet; use with Harmony Power System Model 7563

Contact your Proxim sales representative or reseller for list of available antennas in your area.

# Access Point Overview



*Figure 1: Harmony 802.11a Access Point Model 8570*

## Top Panel LEDs

The top panel LEDs are (from left to right) the Status ⓘ Wireless (((•))) and

Ethernet 🔗 LEDs.

### Status LED

The Status LED gives information about the Access Point.

**Status LED**

| LED Behavior | Indication |
|---|---|
| Off | Unit not powered on |
| Lit solid amber | Unit is initializing or is not partnered with an AP Controller |
| Blinking amber | Unit needs new firmware |
| Lit solid green | Unit is partnered with an AP Controller and operational |
| Blinking red | Problem with unit |

**Wireless LED**

The Wireless LED blinks green when the Access Point receives data packets over the wireless network.

**Ethernet LED**

The Ethernet LED blinks green when the Access Point receives data packets over the Ethernet port.

# Rear Panel



*Figure 2: Harmony 802.11a Access Point Model 8570 Rear Panel*

**Ethernet Port**

This port connects the Access Point to your 10/100Base-T Ethernet network using a straight-through Ethernet cable.

**Ethernet Link/Activity LED**

The Link LED is lit solid green when the Access Point is connected at 100 Mbps to the Ethernet network, and lit solid amber when connected at 10 Mbps.  It will blink to indicate activity on the Ethernet network.

**Power Port**

The Harmony 802.11a Access Point has a power port on its back panel. The voltage range for the Access Point's power connector is 10-26 VDC. Proxim recommends that you connect only the Class 2 power supply (12V, 1 Amp) provided with the product to the power port.

In addition, Model 8570 and 8571 can accept power from a Harmony Power System Model 7563, which is an alternative power source to the supplied Class 2 power supply. The Harmony Power System is sold separately. Refer to Proxim's Web site or the *Harmony Power System User's Guide* for more information.

**Note:**     The Access Point requires power from either a Harmony Power System or from an external power supply. If you are not using the Harmony Power System, connect the power supply that came with your Harmony 802.11a Access Point to the power port.

# Chapter 2

## Installation

The Harmony 802.11a Access Point requires a Harmony Access Point (AP) Controller. The AP Controller must be installed on the network before the Access Point can be installed and configured. See the User's Guide that came with your Harmony AP Controller for instructions on how to install and configure Access Points.

**Note:**     The AP Controller must have firmware version 2.0 or greater installed to support the Harmony 802.11a Access Point. Confirm that the AP Controller has the latest firmware version before installing the 802.11a Access Point.

## Pre-installation Considerations

### Regulatory Warnings

#### FCC Guidelines

It is the responsibility of the installer and users of the Harmony 802.11a Access Point to guarantee that the antenna is 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 Access Point Models 8569 and 8570 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 for harmful interference to co-channel Mobile Satellite systems. Therefore the devices should be used indoor only for channels 36, 40, 44 and 48 and when 2X mode is enabled, channels 42 and 50. The Harmony 802.11a Access Point Model 8571 operates in the frequency range of 5.25 to 5.35 GHz and is not subject to the above restriction.

**Note:**     High power radars are allocated as primary users of the 5.25 to 5.35 GHz and 5.65 to 5.85 GHz band.  These radar stations can cause interference with and/or damage the Harmony 802.11a Access Point (Models 8569, 8570, and 8571).

### Industry Canada Guidelines

Models 8569 and 8570 have been designed to operate with antennas having a maximum gain of 6 dBi.  Model 8571 has been designed to operate with an antenna having a maximum gain of 12 dBi.  Antennas having higher gains are 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 antennas are located or pointed such that they do 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**.

# Installation

Determine the best location for the Harmony 802.11a Access Point using the following considerations:

- The length of the Ethernet cable that connects the Access Point to the network must not exceed 100 meters.
- Place the Access Point indoors, on a flat, sturdy surface as far from the ground as possible, such as on top of a desk or bookcase, keeping clear of metal obstructions and away from direct sunlight.
- Try to centrally locate the Access Point so that it will provide coverage to all of the wireless devices in the area.
- If using Model 8571 with external antennas:
  - Place the Access Point and antennas so that the antennas can be easily connected to the Access Point.
  - Use the shortest antenna cable possible; use a longer Ethernet cable if necessary.

1. Place the Access Point in the desired location.  If you want to mount the Access Point to a wall or ceiling, see "Mounting Instructions" on page 14 for instructions.

**Note:**     If using Model 8571 with external antennas, install the antennas and cabling before proceeding to Step #2.

2. Connect the Ethernet port on the rear panel of the Access Point to a 10/100Base-T network hub, switch, router, patch panel, or Harmony Power System using a straight-through Category 5 Ethernet cable.

3. If you are not using the Harmony Power System to supply power to the Model 8570/8571 Access Point or if you want to connect the Access Point to both the Power System and an AC power source, use the AC power adapter included in the product package to connect the power port on the Access Point to a working power outlet.  Use only the power adapter supplied by Proxim in the product package.  Using another power supply may damage the Access Point.

4. The Link LED on the rear panel will light to indicate that the Access Point has a network connection. The LED is lit green if connected to a 100Base-TX network and lit amber if connected to a 10Base-T network.

5. By default, the Harmony 802.11a Access Point will attempt to find an AP Controller to partner with. If you have one or more AP Controllers on the network, an AP Controller will automatically detect and configure the Access Point over the network (assuming you have not disabled the Harmony System's ability to automatically detect new Access Points).  Refer to the *Harmony Access Point Controller User's Guide* for more information on how to configure an Access Point.

## Mounting Instructions

The Harmony 802.11a Access Point ships with a wall mounting kit so that the unit can be mounted to a wall or ceiling.

The wall mounting kit contains the following parts:

• One AP Mounting Disk

• Two Plastic Wall Mount Anchors

• Two #6x0.75" Wood Screws

In addition, you will also need the following tools to wall mount the Access Point:

• 3/16" Drill (for installations using wall mount anchors)

• Marking Pen

• Phillips Screwdriver

### Ceiling Mount

Follow these steps to mount the Harmony 802.11a Access Point on the T-bar that separates office ceiling tiles:

1. Slide the AP Mounting Disk over a ceiling tile's T-bar so the bar rests between the two clips on the mounting disk, as shown in the illustrations below.
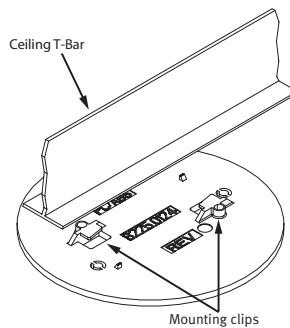


Ceiling T-Bar

Mounting clips

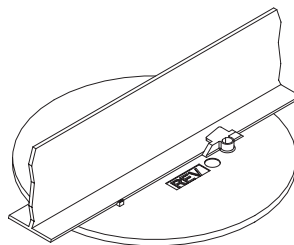*Figure 3: Attaching the AP Mounting Disk to a Ceiling T-Bar*



*Figure 4: AP Mounting Disk Secured to Ceiling T-Bar*

2.  Attach the Access Point to the mounting disk by aligning the Access Point's mounting holes (located on the underside of the unit) over the mounting disk's raised notches (shown below).
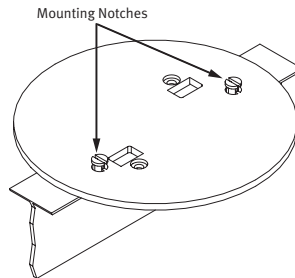
Mounting Notches

*Figure 5: AP Mounting Disk Notches*

3.  Slide the Access Point over the mounting disk until it locks into place.

4.  Ceiling mounting is now complete.  Return the instructions on page 13 to install the Access Point cabling.

**Note:**    All cable runs to a ceiling-mounted Access Point must comply with the National Electrical Code (NEC).

## Wall Mount

Follow these steps to wall mount the Harmony 802.11a Access Point:

1.  Determine the optimum location and orientation for the Access Point.

2.  Place the AP Mounting Disk on the mounting location so that the side of the disk that contains text is against the wall.

3.  If wall anchors are required for your installation, mark the centers of the two mounting holes (see Figure 6), remove the mounting disk from the wall, and drill a 3/16"-diameter hole at each mark.  Return the mounting disk to the wall and align it with the holes you drilled.

**Note:**    Use only the two mounting holes shown in Figure 6 to secure the mounting disk to a wall.
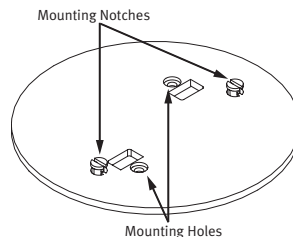
Mounting Notches

Mounting Holes

*Figure 6: AP Mounting Disk*

4.  Align one of the #6 wood screws with one of the mounting holes (see Figure 6) and screw it into one of the wall anchors or directly into the wall.  Do not tighten.

5.  Insert the second screw into the remaining mounting hole and screw it into the remaining wall anchor or directly into the wall.

6.  Tighten the two screws to secure the mounting disk to the wall.

7.  Attach the Access Point to the mounting disk by aligning the Access Point's mounting holes (located on the underside of the unit) over the mounting disk's raised notches (see Figure 6).

8.  Slide the Access Point over the mounting disk until it locks into place.

9.  Wall mounting is now complete.  Return the instructions on page 13 to install the Access Point cabling.

# Chapter 3

## Configuration

The Harmony 802.11a Access Point must be used in conjunction with a Harmony AP Controller. A Harmony System that supports 802.11a generally consists of one or more Harmony AP Controllers, one or more Harmony Access Points, and one or more mobile clients that have an 802.11a adapter installed. Each Access Point acts as an intermediary between its mobile clients and the AP Controller, converting radio signals into Ethernet packets and vice versa. The Harmony AP Controller handles all of the configuration and management of the Access Points on the network and centralizes the management and security features of a wireless LAN.

The Harmony 802.11a Access Point supports two modes of operation: Tunneled and Managed. In Tunneled mode, the Harmony 802.11a Access Point communicates exclusively with the AP Controller using a technique known as IP Tunneling. An Access Point in Tunneled mode can be installed on a remote subnet to support roaming across a router. In Managed mode, the Harmony 802.11a Access Point communicates directly with the Ethernet network but is still managed by the AP Controller. An Access Point in Managed mode must be installed on the same IP subnet as the System's AP Controllers.

The number of Access Points per AP Controller varies based on the type of Access Points installed and the operating mode of those Access Points. An AP Controller has a finite capacity to forward and filter packets on the network. Too many Access Points communicating with a single AP Controller may reduce system performance, which depends on the amount of traffic that is generated by the Ethernet network and the Access Points. For example, an AP Controller can support more 802.11a Access Points in Managed mode than in Tunneled mode because, unlike Access Points in Tunneled mode, Access Points in Managed mode communicate directly with the Ethernet network and packets do not need to be processed by the AP Controller first.

When a Harmony 802.11a Access Point is connected to the network for the first time, the AP Controller automatically configures it with the AP AutoConfigure Default settings. See "Auto Configure Default Parameters" beginning on page 20 for details.

## 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, Proxim's Harmony 802.11a products 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 21 for details.

# 802.11a Access Point Configuration

All Harmony Access Points are configured automatically by the AP Controller or manually using the AP Controller interface. See the User's Guide that came with your Harmony AP Controller for information about configuring the Access Point.

Once an Access Point is added to a Harmony network, an AP Controller on that network will automatically configure it for operation by assigning a Channel and a value for the other networking parameters using the Access Point Defaults settings.

Once configured, the Access Point should automatically appear as an entry in the AP Controller's Web browser interface. (If not, you may need to manually add it. See the "Manually Adding a New Access Point" section in your AP Controller User's Guide.)
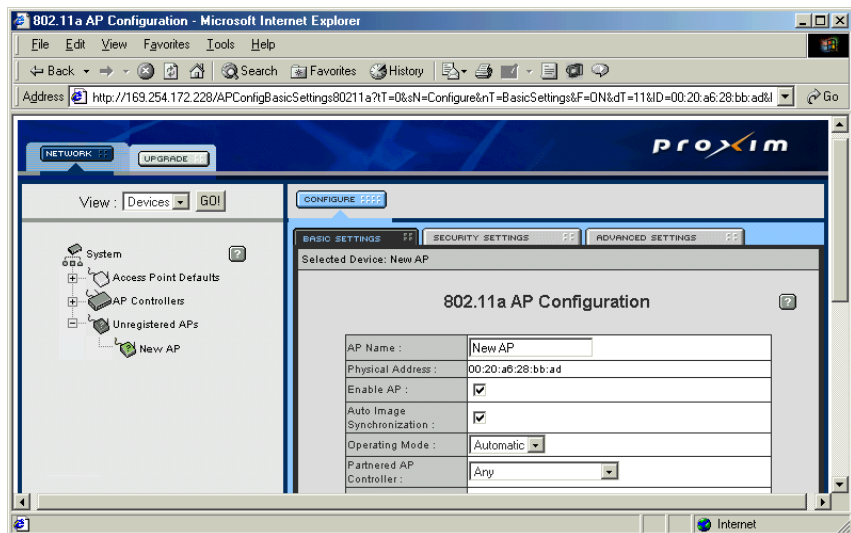


Follow these steps to configure one of the Access Point Parameters:

1. Click the plus sign to the left of an AP Controller to view the list of its partnered Access Points.

2. Click the icon that corresponds to the Access Point that you want to configure.

3. Edit one or more of the Access Point Parameters.

4. Click **SAVE**.

5. Recycle power on the Access Point if you changed any of its IP parameters.

# Auto Configure Default Parameters

The Harmony System's Web interface lists each Access Point underneath the AP Controller with which it is partnered.  (An Access Point that is not currently partnered with an AP Controller is listed as an Unregistered AP.)  The AP Controller will assign default settings to a new Access Point automatically.  These settings can be changed within the System's Web interface. See your AP Controller User's Guide for more information

The 802.11a Access Point Configuration Parameters are divided into three categories:

• Basic Settings

• Security Settings

• Advanced Settings

## Basic Settings

### AP Name

The AP Controller assigns an AP Name to each Access Point that it automatically detects and configures.  By default, the AP Name is the device's physical address, but you can assign a different 21 character name to the Harmony Access Point.

### Physical Address

A Harmony Access Point's physical address is assigned at the factory and cannot be changed by the end user.  The physical address or MAC address is a 48-bit unique identifier assigned to each networking device.

### Enable AP

An Access Point is enabled by default, which allows the unit to operate normally, providing mobile clients with access to the Ethernet network.  When disabled, the Access Point cannot partner with an AP Controller or communicate with mobile clients.

### Auto Image Synchronization

When this option is enabled, the Harmony System automatically updates the Access Point's Flash Code when a new version is uploaded to the System's AP Controllers. Also, the Harmony System will compare an Access Point's Flash Code version with the version stored on the AP Controllers each time the Access Point is turned on or rebooted.  If the Access Point's Flash Code version is older than the version stored on the AP Controllers, the Harmony System will automatically upgrade the Access Point. This feature automatically upgrades new Access Points as they are added to the Harmony System (if necessary) and any Access Points that were unregistered or turned off when a new Flash Code version was uploaded to the AP Controllers.

### Operating Mode

The Operating Mode determines how the Access Point communicates with its partnered AP Controller. There are three options: Tunneled, Managed and Automatic.

When set to Tunneled, the Access Point does not communicate with the Ethernet network directly; all traffic is sent to or received from the AP Controller using an encapsulation technique known as IP Tunneling. In Tunneled mode, an Access Point receives its configuration settings from the AP Controller. If you have installed an Access Point on a remote IP subnet, the Access Point must be in Tunneled mode to support roaming across a router.

When set to Managed, the Access Point acts as a networking bridge; it communicates with Ethernet nodes directly (traffic does not go through the AP Controller first). However, an Access Point in Managed mode still obtains its configuration settings from the AP Controller. Note that an Access Point in Managed mode must be installed on the same IP subnet as the Harmony System's AP Controllers.

When set to Automatic, the AP Controller automatically determines if the Access Point should be in Tunneled or Managed mode. If the Access Point is located on a remote IP subnet, the AP Controller configures the Access Point to use Tunneled mode; otherwise the AP Controller configures the Access Point to use Managed mode.

### Partnered AP Controller

By default, an Access Point can partner with any AP Controller on the Harmony System. You can change this setting to force new Access Points to partner with a specific AP Controller. If you do not wish to specify which AP Controller on the Harmony System the Access Point should partner with, then leave the default Any option selected.

### 2X Mode

2X mode is a high-speed mode that provides data rates of up to 108 Mbps, twice the speed of standard 802.11a devices. When 2X Mode is disabled, Harmony 802.11a devices comply with the IEEE 802.11a standard and can achieve speeds of up to 54 Mbps. When 2X Mode is enabled, Harmony 802.11a devices do not comply with the IEEE 802.11a standard but they can achieve speeds of up to 108 Mbps. 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. By default, 2X mode is disabled.

**Note:**    Enabling 2X mode will limit the number of independent Channels that the Access Point can use. See "Channel" below for details.

### Channel

The number of available Channels for a Harmony 802.11a Access Point varies by model number and country.

In the United States, the Harmony 802.11a Access Point Models 8569 and 8570 can use one of eight Channels when 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).  These Access Point models can use one of three Channels when in 2X mode: Channel 42 (5.21 GHz), Channel 50 (5.25 GHz), and Channel 58 (5.29 GHz).

In the United States, the Harmony 802.11a Access Point Model 8571 can use one of three Channels when in 802.11a-compliant mode: Channel 56 (5.28 GHz), Channel 60 (5.30 GHz), and Channel 64 (5.32 GHz).  This Access Point model can use only one Channel in 2X mode: Channel 58 (5.29 GHz).

**Note:**   See "Radio Frequency Interference Requirements" on page 11 for important regulatory information concerning Channel selection.  A 2X Channel requires twice the bandwidth of a standard 802.11a Channel.

The Harmony System automatically assigns a Channel to each new Harmony 802.11a Access Point added to the network.  However, you should manually configure each Access Point's Channel after it has been added to the Harmony System once the number of Access Points on your network exceeds the number of available Channels.  (The number of available Channels will vary based on the model number of your Access Points and their 2X mode setting.)  Access Points that share the same Channel should be installed as far away from each other as possible to reduce potential interference.

**Note:**   If Access Points in 802.11a mode are co-located with Access Points in 2X mode, you must manually configure the Channel assignments to minimize potential interference.  For example, if a Model 8570 Access Point in 2X mode is using Channel 50, do not configure nearby Model 8570 Access Points in 802.11a mode for Channel 42, 48, 52, or 56.

### SSID

By default, the Harmony System configures new Access Points with the default Service Set ID ("proxim").  The SSID is a string of up to 32 ASCII characters that must match on all communicating 802.11a devices within the same network.  All Harmony Access Points and Harmony clients must use the same SSID to allow roaming between Access Points.

### Group Membership

Each Access Point can belong to one Access Point Group for management and configuration purposes.  Use the drop-down list to select the 802.11a Group to which you want the Access Point to belong.

### IP Addressing

The default setting allows the Access Point to receive an IP Address from a DHCP server on the local network.  Otherwise, enter a static IP Address, Subnet Mask and Default Gateway in the fields provided.  In addition, if you use static IP addresses on your network, you can configure the AP Defaults to automatically assign a Subnet Mask and Default Gateway for each new Access Point that you add to the System.

## Security Settings

The Harmony 802.11a Access Point offers three security settings: No Security, Use WEP for Encryption and Authentication, and the Harmony Security Protocol.

### 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, the Harmony 802.11a Access Points 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.  Also, if you want to use WEP and you have multiple 802.11a Access Points installed on the Harmony System that wireless clients roam between, then you must enable WEP on all 802.11a Access Points.  A 802.11a client that is using WEP cannot communicate with an Access Point that does not have Use WEP for Encryption and Authentication enabled.

### 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.

Each Access Point can store up to four WEP Keys.  When configuring WEP Keys, enter the same WEP Keys in the same order on all of the 802.11a devices on your network. You must also select one default key that the Access Point will use to encrypt data.  As long as the WEP Keys are configured in the same order on each 802.11a device, then you do not need to configure all of your devices to use the same default key.

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).

**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 Harmony 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 names 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, a user enters his or her Harmony User Name and Password during boot up, immediately following the Windows logon prompt. This information is forwarded to an Access Point Controller which checks the User Database to confirm that an entry exists for the user, that the entry is enabled, and that the user has entered the correct password. Once the user has been authenticated, the AP Controller generates a unique 152-bit WEP Key, which it securely delivers to the Access Point and wireless client. In addition, the Access Point allows network traffic to and from the wireless client once the user has been authenticated.

The dynamic WEP Key generated by the AP Controller is valid only for the specified user and only for the period of time specified by the Dynamic Key Renewal Interval, for the duration of the user's network session, or until the wireless client roams to another Access Point (whichever is shortest). When the Dynamic Key Renewal Interval expires or when a client roams, the AP Controller automatically generates a new WEP Key for the client; this process is transparent to the end user and requires no additional user interaction.

Note that if you enable the Harmony Security Protocol, you do not need to configure WEP Keys (the Harmony System will generate keys for you). Also, if you have multiple 802.11a Access Points that wireless clients roam between, then you must enable the Harmony Security Protocol on all 802.11a Access Points. An 802.11a client that is using the Harmony Security Protocol cannot communicate with an Access Point that does not have the Harmony Security Protocol enabled.

## Advanced Settings

### Supported Rates

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 moves away from an 802.11a Access Point, the data rate automatically decreases in order to maintain a usable radio connection. Therefore, a mobile client that is close to an Access Point may operate at 54 Mbps, but a client that is far away from the Access Point may operate at 6 Mbps. Operation at 6 Mbps or 12 Mbps provides greater range than operation at 54 Mbps or 108 Mbps.

By default, the Harmony 802.11a Access Point dynamically switches between all data rates for the specified radio mode (802.11a or 2X mode). However, you can also manually configure a specific data rate that the Access Point will use. Note that the 802.11a and 2X rates are paired and the value used by the Access Point depends upon whether or not 2X mode is enabled. For example, if you select the "36 / 72 Mbps" option, the 802.11a Access Point will operate at only 36 Mbps if it is in 802.11a mode and at only 72 Mbps if it is in 2X mode.

### RTS/CTS

The 802.11a standard supports optional RTS/CTS communication.

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

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 of time. 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 can configure a Harmony 802.11a Access Point to always use RTS/CTS, never use RTS/CTS, or use RTS/CTS for packets over a certain size (RTS/CTS Threshold). By default, RTS/CTS is always off.

The RTS/CTS Threshold supports a range between 256 and 2346 Bytes. If set to 256, then a sending radio will use RTS/CTS before sending any packet that is 256 Bytes or larger. If set to 2346, then a sending radio will not use RTS/CTS for any packets except those that are 2346 Bytes or larger.

**Fragmentation**

The Harmony 802.11a Access Point supports 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, the 802.11a Access Point 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 Access Point 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 2346 Bytes. If set to 256, then a sending radio will fragment all packets 256 Bytes or larger. If set to 2346, then a sending radio will fragment only those radio packets that are 2346 Bytes or larger.

By default, Fragmentation is always off.

**Repeating**

The Harmony 802.11a Access Point can repeat packets between 802.11a clients that are associated with it. If your network requires that 802.11a clients communicate with each other, then enable the Access Point's Repeating parameter. Otherwise, set Repeating to disabled if you want to prevent 802.11a wireless clients from communicating with each other.

# Roaming Between Access Points

If there are multiple Harmony 802.11a Access Points on the network, then a mobile client may seamlessly roam from one Access Point to another.

Each Access Point creates its own wireless cell or coverage area. This is also known as a Basic Service Set (BSS). A mobile device can communicate with a particular Access Point if it is within the Access Point's coverage area.

If the cells of multiple Access Points overlap, then the mobile client may switch from one Access Point to another as it travels throughout the facility. During the hand-off from one Access Point to another, the mobile client maintains an uninterrupted connection to the network. This is known as "roaming."

In addition, a mobile client can roam between Access Points located on different IP networks as long as the Access Points on the remote networks are partnered to an AP Controller on the local network. The client maintains an uninterrupted connection to the network and retains its assigned IP address that is valid on the AP Controller's local subnet.

This feature requires that the network administrator configure the AP Controller with a list of subnets used in the facility so the AP Controller and Access Points can communicate with each other across the router. In addition, each Harmony 802.11a Access Point that is installed on a remote subnet must be in Tunneled mode. Refer to the *Harmony Access Point Controller User's Guide* for more information.

## Roaming Guidelines

- 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.

- All Access Points in the same vicinity should use a unique, independent Channel.

- Access Points that use the same Channel should be installed as far away from each other as possible to reduce potential interference.

# Chapter 4

## Troubleshooting

The Harmony 802.11a Access Point is designed to be very easy to install and operate. However, if you experience difficulties, use the information in this chapter to help diagnose and solve problems. Also, refer to the *Harmony Access Point Controller User's Guide* for additional troubleshooting suggestions.

If you cannot resolve a problem, contact Proxim Technical Support. See "Technical Support and Training" on page 35.

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

## LED Error Codes

The Status LED on the top of the Harmony 802.11a Access Point will flash red in a repeating pattern to indicate the following errors:

1 blink .............................................Memory error

2 blinks ...........................................Flash write error

3 blinks ...........................................Ethernet initialization error

4 blinks ...........................................Radio initialization error

If you see any of the above flashing sequences, recycle power to the Access Point. If the flashing sequence persists after you have reset the unit, make a note of which of the above patterns you have and contact Proxim Technical Support.

# 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.

By default, a Harmony 802.11a Access Point will automatically adjust the data rate to maintain a usable radio connection with its clients. Therefore, 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. Note that if you specify a single data rate for the Access Point, you may reduce the effective range of the Harmony 802.11a products.

The Harmony 802.11a Access Point includes two integral antennas or two antenna connectors to support antenna diversity, which can improve system reliability. Due to the characteristics of radio waves, it is possible that one antenna may provide better performance than a second antenna installed a short distance away. Only one antenna is used at a time; they cannot be used simultaneously to increase the Access Point's coverage area.

Proper antenna placement can help improve range. Here are some guidelines:

- For best results, position the Access Point's antennas so that one antenna is vertical and one is horizontal.

- Place the Access Point as high as possible. In an office environment, try to place it above cubicle walls.

- Do not place a sheet of metal (like a filing cabinet) between two 802.11a devices.

## Common Problems and Solutions

| Symptom/Question | Possible Solution/Answer |
|---|---|
| The Harmony 802.11a Access Point does not automatically register with a Harmony AP Controller. | • Confirm that the Link LED is on. If the LED is not on, check your connection to the local Ethernet network.  Also, try another Ethernet cable.<br>• Try repowering the unit. The Access Point will try to contact an AP Controller during boot-up.  If you are using the external AC power supply, you should connect the AP to the Ethernet network before turning on the unit.<br>• Upgrade the AP Controller's firmware if it does not have version 2.0 or greater installed.<br>• Try to manually add the Access Point as described in the *Harmony Access Point Controller User's Guide.* |
| My 802.11a client adapter will not associate with the Harmony 802.11a Access Point. | • Confirm that the 802.11a client adapter is in range of the Access Point.<br>• Confirm that the client adapter is operating in Infrastructure mode.<br>• Confirm that the Access Point and client adapter have the same SSID.<br>• Confirm that the Access Point and client adapter have the same security settings.<br>• Confirm that the Access Point is partnered with an AP Controller. |
| The Status LED is amber. | • The Status LED will turn solid amber if the unit is initializing or has successfully initialized but could not find an AP Controller to partner with.<br>• The Status LED will blink amber if the Access Point requires new firmware. Try upgrading the Access Point's firmware using the Harmony System's Upgrade option. Refer to the *Harmony AP Controller User's Guide* for details. |

| Symptom/Question | Possible Solution/Answer |
|---|---|
| My office has an existing 802.11b network.  Is the Harmony 802.11a Access Point 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 the Harmony 802.11a Access Point compatible with 802.11a products from other vendors? | Yes, the Harmony 802.11a product line is interoperable with 802.11a-compliant products from other vendors.  However, 2X mode, which achieves data rates up to 108 Mbps, is only available with Harmony 802.11a products from Proxim. |
| In throughput tests, the 802.11a equipment 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. |

# 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, Inc. will only ship products that are type approved in the destination country.

## Specifications

**Network Interface** ............................Ethernet 10Base-T /100Base-TX

**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

**Ethernet Compatibility** .....................IEEE 802.3, 802.3u

**Frequency Band**...............................5.15-5.35 GHz (Models 8569 & 8570) 5.25-5.35 GHz (Model 8571) (Orthogonal Frequency Division Multiplexing)

**Channels (Models 8569 & 8570)** ......8 in U.S. (802.11a mode); 3 in U.S. (2X mode)

**Channels (Model 8571)**....................3 in U.S. (802.11a mode); 1 in U.S. (2X mode)

**Operating Temperature** ....................0ºC to +50ºC

**UL Listed Power Supply** ....................The 802.11a Access Point requires power from either a Harmony Power System or from an external power supply.  The Harmony 802.11a Access Point includes a UL listed, Class 2 power supply.

## Parameters

| Parameter | Range | Default |
|---|---|---|
| AP Name | 1-21 characters | unit's physical address |
| Enable AP | Enabled, Disabled | Enabled |
| Auto Image Synchronization | Enabled, Disabled | Enabled |
| Operating Mode | Automatic, Managed, Tunneled | Automatic |
| Partnered AP Controller | N/A | Any |
| Enable 2X Mode | Enabled, Disabled | Disabled |
| Channel (Models 8569 & 8570) | In 802.11a mode: Channels 36, 40, 44, 48, 52, 56, 60, and 64; in 2X mode: Channels 42, 50, and 58 | Assigned by AP Controller |
| Channel (Model 8571) | In 802.11a mode: Channels 56, 60, and 64; in 2X mode: Channel 58 | Assigned by AP Controller |
| SSID | Up to 32 characters | proxim |
| Group Membership | N/A | Default 802.11a Group |
| IP Address | Use DHCP, Specify IP | Use DHCP |
| Security Level | No Security, Use WEP for Encryption and Authentication, Use Harmony Security Protocol | No Security |
| WEP Key Size (only valid when Use WEP for Encryption & Authentication is enabled) | 64-bit, 128-bit, 152-bit | 64-bit |
| WEP Key(s) (select one as default; only valid when Use WEP for Encryption & Authentication is enabled) | 10 hexadecimal digits for 64-bit; 26 hexadecimal digits for 128-bit; 32 hexadecimal digits for 152-bit | Blank |

| Parameter | Range | Default |
|---|---|---|
| Supported Rates | Automatic selection by Access Point, or select transmit rate from among 54, 48, 36, 24, 18, 12, 9, and 6 Mbps in 802.11a mode and from among 108, 96, 72, 48, 36, 24, 18, and 12 Mbps in 2X mode | Automatic |
| RTS/CTS | On, Off, Threshold | Off |
| RTS/CTS Threshold | 256 to 2346 | blank |
| Fragmentation | Off, Threshold | Off |
| Fragmentation Threshold | 256 to 2346 | blank |
| Repeating | Enabled, Disabled | Enabled |

# Appendix B

## Technical Support and Training

If you are having a problem using a Harmony 802.11a Access Point and cannot resolve it with the information in Chapter 4, 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?

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

| | |
|---|---|
| Tel: | 800-477-6946 or 408-731-2640 |
| Fax: | 408-731-3676 |
| Web: | **http://www.proxim.com/** |
| E-mail: | support@proxim.com |

Proxim, Inc.
Attn: Technical Support
510 DeGuigne 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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## W