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# **AR5001 User Guide**

PRELIMINARY Revision July 2002



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# **Document Conventions**

### **Text Conventions**

bold	Bold type within paragraph text indicates commands, file names, directory names, paths, output, or returned values.
	Example: The DK_Client package will not function unless you use the <b>wdreg_install</b> batchfile.
italic	Within commands, italics indicate a variable that the user must specify.
	Example: <b>mem_alloc</b> <i>size_in_bytes</i>
	Titles of manuals or other published documents are also set in italics.
Courier	The Courier font indicates output or display.
	Example:
	Error:Unable to allocate memory for transfer!
Menu	The Menu character tag is used for menu items.
	Example: Choose Edit > Copy.
[]	Within commands, items enclosed in square brackets are optional parameters or values that the user can choose to specify or omit.
{ }	Within commands, items enclosed in braces are options from which the user must choose.
	Within commands, the vertical bar separates options.
	An ellipsis indicates a repetition of the preceding parameter.
>	The right angle bracket separates successive menu selections.
	Example: Start > Programs > DK > wdreg_install.

## Notices

**NOTE:** This message denotes neutral or positive information that calls out important points to the text. A note provides information that may apply only in special cases.

# **Revision History**

Revision	Description of Changes
June 2002	Initial release.

# 

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# Preface

This user's guide provides the necessary information for first-time users to successfully install the Atheros Network Driver Interface Specification (NDIS) driver, for the purpose of evaluating and/or operating the Atheros AR5001 Station Reference Design in a Microsoft Windows environment. This guide also provides information for users who wish to upgrade the Atheros NDIS driver from previous releases.

This guide describes the steps required to install NDIS drivers for the Atheros AR5001 Wireless Network Adapter in Windows 2000, Windows Millennium Edition, Windows 98 Second Edition, Windows XP, and Windows NT 4.0. This guide also includes detailed instructions for configuring the PC Card device, or IEEE 802.11a station (STA), to interact with an access point (AP) in infrastructure mode and with other STAs in ad hoc mode. Instructions for installing or upgrading the diagnostic utility LinkMon are also included. You should also read this before proceeding to install the Atheros AR5001 Wireless Network Adapter and NDIS driver in the targeted operating system (OS) environment.

# About this Document

The document consists of the following chapters and appendix:

Chapter 1	Introduction—Hardware, Software, and System Requirements needed to setup Atheros AR5001 Station Reference Design.
Chapter 2	Windows 2000—Installation/Uninstallation Procedures and Device/Network Configurations for Windows 2000.
Chapter 3	Windows 98 Second Edition—Installation/Uninstallation Procedures and Device/Network Configurations for Windows 98 Second Edition.

Chapter 4 Windows XP—Installation/Uninstallation Procedures and Device/Network Configurations for Windows XP.

# Audience

This document is intended for Atheros customers who wish to install and evaluate the Atheros AR5001 Station Reference Design in the supported Microsoft Windows environments.

# **Additional Resources**

Atheros Reference Design hardware, software, and documentation contain proprietary information of Atheros Communications, Inc., and are provided under a license agreement containing restrictions on use and disclosure, and are also protected by copyright law. Reverse engineering of this hardware, software, or documentation is prohibited.

# **1** Introduction

The Atheros AR5001 Wireless Network Adapter is an IEEE 802.11a two-chip solution reference design based on the Atheros AR5111 and AR5311 chipset. This reference design implements a half-duplex, Orthogonal Frequency Division Multiplexing (OFDM) baseband processor supporting all IEEE 802.11a data rates (6 to 54 Mbps). It also supports the Atheros Turbo Mode<sup>TM</sup> supporting data rates up to 108 Mbps. The host interface is compatible with the PC Card 7.1 standard. You can find information regarding the Atheros Station Reference Designs in the detailed *AR5001 STA 802.11a Solution Description Reference Guide*.

# **Package Contents**

Make sure the following materials are available before you begin:

- Atheros AR5001 Release V2.0 CD, or electronic equivalent
- Atheros AR5001 Wireless Network Adapter, AR5BCB-00012A, AR5BCB-00013A, or Atheros customer station designs using AR5110A-ES/ AR5210A-ES or later

# **System Requirements**

- Laptop PC containing:
  - 32-bit CardBus slot (or Desktop PC with PC Card-PCI adapter)
  - 32 MB memory or greater
  - 300 MHz processor or higher
- Microsoft Windows 2000/Windows Millennium Edition/Windows 98 Second Edition/Windows XP/Windows NT 4.0 (with Service Pack 6)

# 2 Windows 2000

This chapter describes the Windows 2000 driver installation.

# **Driver Installation (First-Time Install)**

This section describes the first-time installation for the driver for Windows 2000. If you have a previously installed driver, refer to the section "Driver Installation (Previous Driver Installed)" on page 2-6.

Atheros recommends that you remove any existing Atheros drivers (NDIS, DK, or TDI) on the PC system before installing the Version 1.0 release of the NDIS driver. See Section "Driver Uninstallation" for the instructions on how to remove previous driver releases.



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Insert the Atheros AR5001 Wireless Network Adapter into a 32-bit CardBus slot and follow these steps to install the NDIS driver:

1. Wait for the following dialog box to display.

Found New Hardware Wizard				
	Welcome to the Found New Hardware Wizard This wizard helps you install a device driver for a hardware device.			
	< <u>B</u> ack <u>Next</u> Cancel			

- 2. Click Next to continue.
- 3. Choose "Search for a suitable driver for my device (recommended)."

	Found New Hardware Wizard
	Install Hardware Device Drivers A device driver is a software program that enables a hardware device to work with an operating system.
00	This wizard will complete the installation for this device:
	A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.
	What do you want the wizard to do?      Search for a suitable driver for my device (recommended)
	Display a list of the known drivers for this device so that I can choose a specific driver
	< <u>B</u> ack <u>N</u> ext > Cancel

4. Click Next.

5. Insert the Release CD in your CD-ROM drive.

Found New Hardware Wizard				
Locate Driver Files Where do you want Windows to search for t	driver files?			
Search for driver files for the following hardw	are device:			
The wizard searches for suitable drivers in its any of the following optional search location:	s driver database on your computer and in s that you specify.			
To start the search, click Next. If you are se- insert the floppy disk or CD before clicking N	arching on a floppy disk or CD-ROM drive, ext.			
Optional search locations:				
Floppy disk drives				
I <u>S</u> pecity a location				
	< <u>B</u> ack <u>N</u> ext > Cancel			

- 6. Choose Specify a location under "Optional search locations."
- 7. Click Next to continue.
- 8. Browse to the location where the NDIS driver is located (assuming D is the CD-ROM drive), the default folder is D:\ndis\bin\production\ndis5.

	Found New Hardware Wizard			
0	Ţ	Insert the manufacturer's installation disk into the drive selected, and then click OK.	OK Cancel	
		Copy manufacturer's files from: D:\ndis\bin\production\ndis5	Browse	<u>[</u> ]]

9. Click OK to continue.

10. When you find the Atheros driver installation file (net5211.inf), click Next to continue.

Upgrade Device Driver Wizard	
Start Device Driver Installation The device driver will be installed with the o	default settings.
The wizard is ready to install the driver for th	ne following hardware device: k Adapter
Windows will use default settings to install the install the software for your new hardware, o	ne software for this hardware device. To slick Next.
	Cancel

11. The Atheros NDIS evaluation driver currently does not have a digital signature from Microsoft. Therefore, Windows 2000 shows a warning message. Click Yes to proceed with driver installation.

Digital Signature Not Found	
	The Microsoft digital signature affirms that software has been tested with Windows and that the software has not been altered since it was tested. The software you are about to install does not contain a Microsoft digital signature. Therefore, there is no guarantee that this software works correctly with Windows. Atheros AR5001 Wireless Network Adapter If you want to search for Microsoft digitally signed software, visit the Windows Update Web site at http://windowsupdate.microsoft.com to see if one is available. Do you want to continue the installation?
	Yes No More Info

12. Click Finish to complete the driver installation. See "Device Configuration" on page 2-17 for the device configuration information.

Found New Hardware Wizard	Completing the Found New Hardware Wizard Matheros AR5001 Wireless Network Adapter Windows has finished installing the software for this device.
	To close this wizard, click Finish.

# **Driver Installation (Previous Driver Installed)**

If the system already has a previous release of the Atheros NDIS installed, Windows does not prompt for the device driver when the WLAN Card is inserted.

Follow the steps below to update the NDIS driver:

1. Start System Properties from Control Panel. Under Hardware tab, click Device Manager.

System Properti	ies		<u>? ×</u>
General Netwo Hardware Wi	ork Identification Hardware zard e Hardware wizard helps yo plug, eject, and configure yo	User Profiles Advanced	
Device Mana Th on pro- Hardware Pro-	ager e Device Manager lists all th your computer. Use the De perties of any device. Driver <u>Sig</u> ning	ne hardware devices installed vice Manager to change the Device Manager	
Ha diff	rdware profiles provide a wa erent hardware configuratio	y for you to set up and store ns. Hardware <u>P</u> rofiles	

2. Within Device Manager, right-click "Atheros AR5001 Wireless Network Adapter" under "Network adapters" device node, and click Properties.

🚇 Device Manager		
File Action View Help		
← → 🖪 🖆 🖨 😫 🗮 🗶 😹		
		^
🕀 🔩 Batteries		
Him Sick drives		
Display adapters		
DVD/CD-ROM anves		
Eleppy disk controllers		
E Controllers		
Infrared devices		
The second secon		
🕂 💆 Monitors		
🖃 🏢 Network adapters		
Intel(R) PRO/100 VE Network Connection	Update Driver	
🕀 🧾 PCMCIA adapters	Disable	
🕀 🝠 Ports (COM & LPT)	Uninstall	
Processors	Scan for hardware changes	
Sound, video and game controllers		×
Opens property sheet for the current selection.	Properties	

3. Click Update Driver... from the Driver tab. Note the Driver Version that you are updating from. You may need to verify this field again after driver update completes to make sure the driver has been updated correctly.

Atheros Al	R5001 Wireless N	etwork A	lapter Prop	erties	? ×	
General	Advanced Setting	gs Driver	Resources			
	Atheros AR5001 W	/ireless Net	work Adapter			
	Driver Provider:	Atheros				
	Driver Date:	Not availa	ble			
	Driver Version:	2.0.0.0				
	Digital Signer:	Not digital	ly signed			
To view Details. the drive	) view details about the driver files loaded for this device, click Driver etails. To uninstall the driver files for this device, click Uninstall. To update e driver files for this device, click Update Driver.					
L	Driver Details	Un	install	Update	e Driver	
			0	ĸ	Cancel	



4. Click Next to continue.



5. Choose "Display a list of the known drivers for this device so that I can choose a specific driver."

	Upgrade Device Driver Wizard					
	Install Hardware Device Drivers A device driver is a software program that enables a hardware device to work with an operating system.					
00	This wizard upgrades drivers for the following hardware device: Atheros AR5001 Wireless Network Adapter Upgrading to a newer version of a device driver may add functionality to or improve the performance of this device. What do you want the wizard to do? Search for a suitable driver for my device (recommended)					
	Display a list of the known drivers for this device so that I can choose a specific driver        < Back     Next >					

6. Click Next to continue.

2

7. Insert the Release CD into your CD-ROM drive. Click Have Disk... to continue.

Upgrade De	evice Driver Wizard			
<b>Select</b> I Whi	Network Adapter ch network adapter do you want to install?	?		
E C in	lick the Network Adapter that matches you stallation disk for this component, click Ha	ur hardware, then o ave Disk.	oliek OK. If you	ı have an
Network Ad	dapter: R5001 Wireless Network Adapter			
<ul> <li>Show of C</li> <li>Show a</li> </ul>	compatible hardware all hardware of this device class		H	lave Disk
		< Back	Next >	Cancel

8. Click Browse to specify the location where the NDIS driver is located (assuming D is the CD-ROM drive), the default folder is "D:\ndis\bin\production\ndis5".

	Install Fro	m Disk	×
0	_	Insert the manufacturer's installation disk into the drive selected, and then click OK.	OK Cancel
		Copy manufacturer's files from:	
		D:\ndis\bin\production\ndis5	Browse

9. Click OK to continue.

10. Select "Atheros AR5001 Wireless Network Adapter" from the list.

Upgrade Device Driver Wizard	
Select Network Adapter Which network adapter do you want to instal	
Click the Network Adapter that matches you installation disk for this component, click H	your hardware, then click OK. If you have an Have Disk.
Network Adapter: Atheros AR5001 Wireless Network Adapter	
<ul> <li>Show compatible hardware</li> <li>Show all hardware of this device class</li> </ul>	Have Disk
	< Back Next > Cancel

- 11. Click Next to continue.
- 12. Click Yes to continue when Windows displays the warning message.

	Update D	river Warning
	!	Installing this device driver is not recommended because Windows cannot verify that it is compatible with your hardware. If the driver is not compatible, your hardware will not work correctly and your computer might become unstable or stop working completely. Do you want to continue installing this driver?
		Yes No
$\sim 0$		

13. Click Next to proceed with the installation.



14. The Atheros NDIS evaluation driver currently does not have a digital signature from Microsoft. Therefore, Windows 2000 shows a warning message. Click Yes to proceed with driver installation.



### 15. Click Finish.



16. Note that Driver Version should display 2.0 as the major revision number. Click OK to continue.

Atheros Al	R5001 Wireless N	etwork Adapter Properties	? ×
General	Advanced Setting	gs Driver Resources	
<b>H</b> H	Atheros AR5001 V	/ireless Network Adapter	
	Driver Provider:	Atheros	
	Driver Date:	Not available	
	Driver Version:	2.0.0.0	
	Digital Signer:	Not digitally signed	
To view Details. the drive	details about the dri To uninstall the drive er files for this device	ver files loaded for this device, click Dr er files for this device, click Uninstall. To e, click Update Driver.	ver o update
	Driver Details	Uninstall Update Dr	iver
		ок	Cancel

17. Click Yes to restart system.



18. After the system restarts, the "Atheros AR5001 Wireless Network Adapter" will display under "Network adapters" in the Device Manager. Proceed to Section "Device Configuration" on page 2-17 for device configuration information.

🚇 Device Manager	
$]$ Action View $] \leftarrow \rightarrow   \cong \square   \cong   \boxtimes   \boxed{2}   \boxed{2}   \boxed{2} $	
🖃 🔜 JOHNTEST	
🗄 🧤 Batteries	
E 📃 Computer	
🗄 🖅 🖅 Disk drives	
🗈 🖳 Display adapters	
📄 🕀 🎒 DVD/CD-ROM drives	
🗄 🖶 🚭 Floppy disk controllers	
🔁 🖅 🖅 Floppy disk drives	
🗄 🕮 Human Interface Devices	
E 🚭 IDE ATA/ATAPI controllers	
E M Infrared devices	
E with the second	
Image: Image	
Atheros ARSUUT wireless Network Adapter	
English Sound video and game controllers	
E System devices	
The Holiversal Serial Bus controllers	

# **Driver Uninstallation**

This section provides information about uninstallation procedures required for upgrading the NDIS driver from previous Atheros software releases. If the system does not have previously installed versions of the NDIS driver and you wish to remove the newly installed driver from the system, proceed to Step 4.

The NDIS driver since Release 1.0 no longer leverages the Transport Driver Interface (TDI) protocol to provide the LinkMon programming interface. The TDI protocol should be uninstalled.

Follow these steps to uninstall the TDI protocol:

1. To remove the NDIS driver from the OS, go to Device Manager, right-click "Atheros AR5001 Wireless Network Adapter," and choose Uninstall.



2. Click OK to uninstall the device.



- 3. When the device is uninstalled from Device Manager, search for and delete the driver files that reside in the system.
  - a. Go to the Start menu and choose Search For Files or Folders...
  - b. Enter "oem\*.inf" in the "Search for files or folders named "field", and enter *Atheros* in the "Containing text:" field.
  - c. Click Search Now.

A few files matching these criteria are possible, if previous drivers have not been removed properly.

d. Choose the files that have been found and delete them from the system.



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4. To complete the uninstallation, remove the file "ar5211.sys" from the "\WINNT\system32\drivers" folder.

🔁 drivers					
File Edit View Favorites	Tools Help				
] ← Back → → → 🔁 🔍 Se	arch 🔁 Folders 🎯	History 🛛 🍄 🥵 🔅	X 10 🔲 🕶		
Address 🗋 drivers				•	∂G0
drivers	disdn etc acpi.sys acpiec.sys	diskdump.sys     diskperf.sys     diskperf.sys     dkkernel.sys_c     DLC.SYS	<ul> <li>i8042prt.sys</li> <li>ipfltdrv.sys</li> <li>ipinip.sys</li> <li>ipnat.sys</li> </ul>	) msgpc.sys ) MSK5SRV.sys ) MSPCLOCK.sys ) MSPQM.sys	) nwro para parp parp
<b>ar5211.sys</b> System file	জ AFU.SYS জ ar5211.sys জ asyncmac.sys	i dmboot.sys dmio.sys dmload.sys	irda.sys irda.sys irsir.sys	Indis.sys	<ul> <li>parv</li> <li>pci.s</li> <li>pciid</li> </ul>
Modified: 4/30/2002 4:58 AM Size: 199 KB Attributes: (normal)	Confirm File Delete	you want to send 'ar	5211.sys' to the Re	cycle Bin?	<ul> <li>pciid</li> <li>pcm</li> <li>port</li> <li>proc</li> <li>proc</li> <li>prok</li> <li>psct</li> </ul>
		<ul> <li>fs_rec.sys</li> <li>fsvga.sys</li> <li>ftdisk.sys</li> <li>gm.dls</li> <li>gmreadme.txt</li> <li>hidclass.sys</li> <li>hidparse.sys</li> <li>hidparse.sys</li> </ul>	Yes mf.sys mmdd.sys modem.sys mouclass.sys mouhid.sys mouhid.sys mountmgr.sys mrxsmb.sys mrxsmb.sys	No npfs.sys ntfs.sys null.sys nwinkfit.sys NWLIKIPX.SYS nwinkfb.sys nwinkrb.sys	e ptilir rasa rasir rasp rasp rasp rasp rasp rasp rasp ras
		Tilddsb.sys	<u>▼</u> 115157575		
upor Sustem file Sizer 100 KP			100 KB	Mu Computer	

2

# **Device Configuration**

Configuration of the Atheros AR5001 Wireless Network Adapter can be done through the Network Control Panel (NCP) in adapter properties. You can set the Wireless Network Adapter to work in one of two modes, either infrastructure mode (which leverages an AP) or ad hoc mode (which consists of a group of stations participating in the WLAN).

In infrastructure mode, the Wireless Network Adapter participates in a basic service set (BSS) as a station, and communicates with the other stations through an AP, as illustrated in Figure 2-1.



Figure 2-1. Infrastructure Mode

In ad hoc mode, a Wireless Network Adapter works within an independent basic service set (IBSS), as illustrated in Figure 2-2. All stations communicate directly with other stations without an AP.



To configure the AR5001 Wireless Network Adapter:

1. In the Device Manager, right-click "Atheros AR5001 Wireless Network Adapter," and click Properties to access the properties of the adapter.

🚇 Device Manager		
File Action View Help		
DUNTEST		~
🕀 🝓 Batteries		
🕀 😼 Computer		
🗄 🐲 Disk drives		
🕀 💆 Display adapters		
E 😃 DVD/CD-ROM drives		
Floppy disk controllers		
Floppy disk drives		
IDE ATA/ATAPI controllers		
🛨 🧼 Keyboards		
Milce and other pointing devices		
Monicors     Monicors     Metwork adapters		
Atheros AR5001 Wireless Network Adapter:		
Intel(R) PRO(100 VE Network Connection	Update Driver	
The PCMCIA adapters	Disable	
+ Ports (COM & LPT)	Uninstall	
	Coop for bardware char	
	ocan for naroware changes	~
Opens property sheet for the current selection.	Properties	

2. Configuration additions, modifications, and deletions are made under the "Settings" tab of the "Atheros AR5001 Wireless Network Adapter" properties.

Atheros AR5001 11a/b Cardbus Wireless Network Ad ? 💈	K
General Advanced Settings Driver Resources	_
Selected Configuration: Work	
Configuration List	
Work New	
<u>M</u> odify	
Delete	
Selected Configuration Details Network Name (SSID): SPE_ALPHA Network Connection: AP (Infrastructure) Power Saving: Normal Locally Admin. Address: 00037F0013EB Data Security: Enabled Default Encryption Key: Unique Key	
OK Cancel	

2

3. Select one of the configurations under the configuration list, and click Modify to show the "Network Configuration Settings" screen. This property sheet has two pages: General and Security. Table 2-1 provides descriptions for the fields on the General page.

Field Name	Description
Configuration Name	This field identifies the configuration. This name must be unique. Configuration names are case insensitive.
Network Name (SSID)	This is the name of the IEEE 802.11a wireless network, for example, "Atheros 802.11a Wireless Network." This field has a maximum limit of 32 characters.
Network Connection	This field defines whether the STA is configured for an ad hoc or infrastructure network.
Power Savings	This field allows the configuration of power management options. The options are Off, Normal, and Maximum. Power management is disabled when ad hoc mode is selected in the Network Connection field. When the Power Saving setting is Off, the adapter receives full power from the PC. When the Power Saving setting is Normal, the driver turns off power to the adapter for brief periods over briefly-spaced time intervals. When the Power Saving setting is Maximum, the driver turns off power to the adapter for longer periods over more widely-spaced time intervals.
Locally Administered Address (LAA)	This field defines the locally administered MAC address.

Table 2-1. General Dialog Field Descriptions

4. To enter a value in the address field, the check box needs to be selected. Typically, an LAA is not required, because the driver automatically loads a unique, globally administered address from the EEPROM.

Network Configuration Settings	;		? 🗙
General Security Advanced			
Configuration Name:	Work	_	
Network Name (SSID):	SPE_ALPHA		
Network Connection:	AP (Infrastructure)	•	
Power Saving:	Normal	•	
<ul> <li>Locally Administered Address: (Hex 0-9 A-F)</li> </ul>	00037F0013EB		
		ОК	Cancel

5. Use the Security tab on the Network Configuration Settings dialog to select security features.

	Network Configuration Settings	? 🗙
	General Security Advanced	
	Enable Security     Default Encryption Key: Unique	•
$\bigcirc \checkmark$	Unique Key: Key Length (bits): 152 (128+24) 32 hex digits	<b>-</b>
	Shared Keys:	
	First:         152 (128+24) 32 hex digits           Second:         ************************************	• •
	Third: 64 (40+24) 10 hex digits	▪
	Fourth: 64 (40+24) 10 hex digits	┚│
	OK Ca	ncel

Chapter 2

Table 2-2 provides descriptions for the fields on the Security dialog.

Field Name	Description	
Enable Security	Completely enables or disables the IEEE 802.11 wired equivalent privacy (WEP) security feature.	
Default Encryption Key	Defines the type of encryption key to use (either Unique Key or Shared Keys). This field allows you to select only a key (Unique, First, Second, Third, or Fourth) whose corresponding field has been completed.	
Unique Key	Defines the unique encryption key for security for the current network configuration. In ad hoc mode, this encryption key type is not used. To enable security using a Unique Key, this field must be populated.	
Shared Keys	These fields define a set of shared encryption keys. To enable security using Shared Keys, at least one Shared Key field must be populated.	
Key Length	Defines the length for each encryption key. As the Key Length is changed, the number of available characters in the field is changed automatically. If after a key is entered the length is adjusted to a smaller number, the key is automatically truncated to fit. If the length is increased again, the field is not automatically updated to its previous value.	

Table 2-2. Security Dialog Field Descriptions

All encryption key fields are displayed only when initially entered. On subsequent entry into the security property page, the fields are masked. The keys must be entered as hexadecimal digits.

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# **Selecting Encryption Types**

Atheros supports two encryption types; Wired Equivalent Privacy (WEP) and Advanced Encryption Security (AES). While WEP is universally supported and commonly used, AES provides a much higher level of security, that is, frames encrypted with AES are more difficult to decipher without knowing the key. To use AES, you must specify a unique key (refer to Table 2-2 on page 2-22).

**NOTE:** AES is not supported in ad hoc mode, since ad hoc mode does not support unique keys.

Select the encryption type automatically (auto) or manually at both the STA and AP. See the **set cipher** command in the *AR5001 AP User's Guide* for information on configuring the encryption type on the AP. By specifying auto, the STA and AP will negotiate and attempt to use AES before exchanging data packets. If AES is not supported by the STA or AP, WEP is used. Manual selection allows you to specify the encryption type. By default, the STA is set to auto and will first attempt to use AES, and will only use WEP if the AP supports, or is configured for, WEP only.

Use the Advanced tab on the "Atheros AR5001 Wireless Network Adapter" dialog to change the encryption type.

Network Configuration Settings	? 🛛
General Security Advanced	
Wireless Mode: Auto	
Ad Hoc Mode: 802.11b 💌 Scan Mode: Auto 💌	
802.11a Turbo: Disabled 💌 Transmit Power: Full Power 💌	
802.11g( Pure g): Disabled 🔹 Qos: Disabled 💌	
802.11b range: Normal Range 💌	
ОК	Cancel

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Table 2-3 provides descriptions for the fields on the Network Configuration Setting, Advanced tab dialog.

Field Name	Description		
Wireless Mode	Specifies 802.11a operation.		
Ad Hoc Mode	Specifies a band to establish an ad hoc network if no matching SSID is found after scanning all available modes.		
802.11a Turbo	Enables or disables Atheros turbo mode for 802.11a radio space. Once enabled, both 802.11a and 802.11a turbo modes are scanned.		
Encryption Type	Specifies the encryption type:s		
	WEP - use only WEP encryption.		
	■ AES - only associate with Access Points that can successfully negotiate AES encryption.		
	Auto - Allow the STA and AP to negotiate the encryption type.		
Scan Mode	Specifies passive, or auto scannings (use country code to select the type of scan, active or passive).		
Transmit Power	Selects full, half, quarter, eighth, or minimum transmit power.		
QoS	Disables or enables the station to cooperate in a network using Quality of Service.		

Table 2-3.	Advanced	Dialog F	ield	Descriptions
------------	----------	----------	------	--------------

To change the encryption type, take the following steps:

- 1. From the Network Configuration Settings dialog Advanced tab, use the Encryption Type drop-down menu to specify the encryption type.
- 2. Click OK to enable your change.

**CAUTION:** To successfully transmit data frames, specify a unique key.

**NOTE:** If AES and ad hoc are both specified, the STA will use WEP.

**NOTE:** Fragmentation is currently not supported using AES.



### **Infrastructure Mode**

To configure an Atheros AR5001 Wireless Network Adapter in infrastructure mode:

1. Ensure that the "Locally Administered Address" checkbox is unchecked.

Network Configuration Settings	;		? 🗙
General Security Advanced			1
Configuration Name:	Work		
Network Name (SSID):	SPE_ALPHA		
Network Connection:	AP (Infrastructure)	•	
Power Saving:	Normal	•	
Locally Administered Address: (Hex 0-9 A-F)	00037F0013EB		
		ОК	Cancel

2. Enter information in the General dialog as summarized in Table 2-4.

Table 2-4. Infrastructure Mode General Dialog Field Descriptions

Field Name	Description
Configuration Name	This field identifies the configuration. This name must be unique. Configuration names are case insensitive.
Network Name (SSID)	This is the name of the IEEE 802.11a wireless network, for example, "Atheros 802.11a Wireless Network." This field has a maximum limit of 32 characters. If the field is left blank, the STA connects to the AP with the best signal strength.
Network Connection	AP (infrastructure).
Power Savings	This field allows the configuration of power management options. The options are Off, Normal, and Maximum.
Locally Administered Address (LAA)	This field defines the locally administered MAC address. To enter a value in the address field, the check box needs to be selected.
Usually infrastructure mode is used in an enterprise environment where APs are installed and maintained by corporate IT staff. Much of the data in the enterprise network is confidential. It is important to configure security to make sure only stations with appropriate keys can receive sensitive data. The Atheros AR5001 Wireless Network Adapter and NDIS driver support key lengths of 40 bits, 104 bits, and 128 bits. Typically, the appropriate encryption and decryption keys are supplied by the corporate IT staff.

An ad hoc network usually is a short-lived network with a small number of stations. The network is usually created for a special purpose such as exchanging data between friends, or between customer and client. Because the duration of the ad hoc network tends to be limited, Power Saving and Security features are not typically a requirement. For ad hoc network activity, the Power Saving and Security features can be disabled. Currently, shared key security is supported in ad hoc mode. Future Atheros software implementations will provide unique key support.

In ad hoc mode, a station scans the air for an existing BSS. If no BSS is found, the station establishes a BSS for other stations to join. When other stations scan the air and find an established BSS in place, they join that BSS to form an ad hoc network. If a specific set of stations requires ad hoc network connectivity, it is recommended to have one station establish a BSS first before configuring the remaining stations. This prevents the scenario of several stations trying to form a BSS at the same time, which can result in multiple singular BSSs being established, rather than a single BSS with multiple stations.

Network Configuration Settings			? 🗙
General Security Advanced			
Configuration Name:	Ad Hoc		
Network Name (SSID):	SPE_ALPHA		
Network Connection:	Ad Hoc	•	
Power Saving:	Normal	•	
Locally Administered Address: (Hex 0-9 A-F)	100037F0013EB		
		ОК	Cancel

Ad Hoc Mode

Table 2-5 summarizes the field description for the General dialog in ad hoc mode.

Field Name	Description
Configuration Name	This field identifies the configuration. This name must be unique. Configuration names are case insensitive.
Network Name (SSID)	A network name is mandatory for ad hoc mode. The SSID for all stations in a single ad hoc network must be the same.
Network Connection	Ad Hoc.
Power Savings	Power saving mode is currently not supported in ad hoc mode.
Locally Administered Address (LAA)	This field defines the locally administered MAC address. To enter a value in the address field, the check box needs to be selected.

Table 2-5. Ad Hoc Mode General Dialog Field Descriptions

#### TCP/IP Setup

After configuring the Atheros AR5001 Wireless Network Adapter through the Network Control Panel, the TCP/IP address for the network device must be configured.

- 1. Open the "Control Panel" and click "Network and Dial-up Connections."
- 2. Find the "Local Area Connection" that is associated with the Atheros AR5001 Wireless Network Adapter. Right-click that connection, and click Properties.





3. Select "Internet Protocol (TCP/IP)" and click **Properties**.

	ocal Area Connection Properties	? ×	
	General Sharing		
	Connect using:		
	Atheros AR5001 Wireless Network Adapter		
	Configu	re	
	Components checked are used by this connection:		
	<ul> <li>✓ ■ Client for Microsoft Networks</li> <li>✓ ■ File and Printer Sharing for Microsoft Networks</li> <li>✓ ■ Internet Protocol (TCP/IP)</li> </ul>		
	Install Uninstall Properties	=	
	Tescription Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.		
	Show icon in taskbar when connected		
	OK Car	ncel	
_	N		
0			
V			

5. After obtaining IP configuration information from the appropriate IT staff, click OK in both "Internet Protocol (TCP/IP) Properties" and "Local Area Connection Properties" to complete the IP configuration.

Ir	ternet Protocol (TCP/IP) Prop	erties	? ×	
	General			
	You can get IP settings assigned a this capability. Otherwise, you nee the appropriate IP settings.	automatically if your network support d to ask your network administrator f	s or	
	○ <u>O</u> btain an IP address automa	atically		
	• Use the following IP address	9		
	<u>I</u> P address:	192 . 168 . 1 . 21		
	S <u>u</u> bnet mask:	255 . 255 . 255 . 0		
	Default gateway:	· · ·		
	C Obtain DNS server address	automatically	_	
		er addresses:		
	Preferred DNS server:			
	Alternate DNS server:	· · ·		
		Advanced	i	
		OK Ca	ncel	
				•

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- 6. Choose Start > Programs > Accessories > Command Prompt to open the DOS command prompt window.
- 7. Type "ipconfig" at the C:\> prompt to determine if the TCP/IP configuration has taken effect. To test IP connectivity in ad hoc or infrastructure mode, use the **ping <ipaddress>** command. When a TCP/IP connection is established, the LinkMon utility (refer to "LinkMon" on page 7-1) can be used to monitor the Atheros AR5001 Wireless Network Adapter operating status.

C:\WINNT\System32\cmd.exe	
C:\>ipconfig	<b>_</b>
Windows 2000 IP Configuration	
Ethernet adapter Local Area Connection 2:	
Connection-specific DNS Suffix .: IP Address: 192.168.1.21 Subnet Mask: 255.255.255.0 Default Gateway	
C:\>ping 192.168.1.20	
Pinging 192.168.1.20 with 32 bytes of data:	
Reply from 192.168.1.20: bytes=32 time<10ms TTL=128 Reply from 192.168.1.20: bytes=32 time<10ms TTL=128 Reply from 192.168.1.20: bytes=32 time<10ms TTL=128 Reply from 192.168.1.20: bytes=32 time<10ms TTL=128	
Ping statistics for 192.168.1.20: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = Oms, Maximum = Oms, Average = Oms	
C:\>_	

50

8. To map the drive on another machine to your computer, right-click "My Computer" and click Map Network Drive...

My Docume	ents Hummingbird Microsoft Outlook Connectivity V7.0	
My Comp		
	Explore	
- 65	Search Manage	
My Netv Place	Map Network Drive Disconnect Network Drive	
	Create Shortcut	
Recycle	Properties	
Ø		
Internet Exp	olorer Adobe Photoshop a-ftp.exe 6.0	

9. After mapping the drive, you can perform file transfers, use video streaming applications, and all other network data transfers that are normally performed with wired 10/100 Ethernet connections.



## **S** Windows Millennium Edition

This chapter describes the Windows Millennium Edition network driver installation.

### **Driver Installation**

Atheros recommends that you remove any existing Atheros NDIS driver on the PC system before installing Version 1.0 release of the NDIS driver. See "Driver Uninstallation" on page 3-4 for the instructions on how to remove previous driver releases. When the system no longer has the Atheros NDIS driver installed, insert the AR5001 Wireless Network Adapter into a 32-bit CardBus slot, and follow these steps to install the NDIS driver:

1. Wait for the following dialog box to appear. Choose "Specify the location of the driver (Advanced)," and click Next to continue.



- 2. Choose "Search for the best driver for your device. (Recommended)."
  - a. Select "Specify a location."
  - b. Click Browse to locate the NDIS driver. The default folder is "E:\ndis\bin\production\ndis5" (assuming E: is the CD-ROM drive).
  - c. Click Next to continue.

Add New Hardware Wizard	
Windows will search for new drivers in its driver database on your hard drive, and in any of the following selected         Image: Search for the best driver for your device.	
< <u>B</u> ack Next > Cancel	

3. When the Atheros driver installation file (NET5210B.INF) has been found, click Next to continue.



4. Click Finish to continue, and restart the system to complete driver installation. Refer to "Device Configuration" on page 3-5 for device configuration.

_	0	
	Add New Hardware Wiz	ard
		Atheros AR5001 Wireless Network Adapter Windows has finished installing the new hardware device.
50		Cancel

## **Driver Uninstallation**

This section provides uninstallation procedures for removing the Atheros NDIS driver from the system. Uninstallation is recommended for upgrading the NDIS driver from previous Atheros driver releases.

- 1. Remove the NDIS driver from the OS:
  - a. Go to Start > Search > For Files or Folders..., and search for the INF file containing the "Atheros" text string under the \WINDOWS\INF folder. Be sure to include subfolders in the search criteria.
  - b. When "Atherosnet5211.inf" has been found, delete it by right-clicking the file and choose Delete.
- 2. From Control Panel, launch the System Properties window. Select "Atheros AR5001 Wireless Network Adapter" from Device Manager, and click Remove to uninstall the device.

System Properties	? ×
General       Device Manager       Hardware Profiles       Performance         Image: View devices by type       Image: View devices by connection	
Computer CDROM CDROM CDROM Disk drives Display adapters Floppy disk controllers Hard disk controllers Hard disk controllers Keyboard Modem Modem Monitors Mouse Mouse Network adapters Dial-Up Adapter Dial-Up Adapter SMC IrCC (Infrared Communications Controller) Properties Refresh Remove Print	
С	ancel

- 3. Click OK to confirm the removal of the device.
- 4. Restart the system to complete un-installation.

## **Device Configuration**

Configuration of the Atheros AR5001 Wireless Network Adapter can be done through the Atheros NIC Configuration utility found in the Windows Control Panel. Similar to Windows 2000, the device can be set to work in one of two modes: infrastructure mode or ad hoc mode. Please refer to "Device Configuration" on page 2-17 for more details on these network connection types.

To launch the configuration utility, go to Control Panel and double-click on the Atheros NIC Configuration icon.



The configuration utility allows addition, modification, and deletion of the configuration profiles. Select one of the existing configuration profiles under the configuration list to modify, or click New to add a new configuration profile. Refer to "Infrastructure Mode" on page 3-10 and "Ad Hoc Mode" on page 3-13 to set up the station to work in infrastructure mode and ad hoc mode.

Network Card:       [0003]Atheros AR5001 Wireless Network Adapter         Selected Configuration:       Default         Configuration List	•
Selected Configuration: Default Configuration List Default New	
Configuration List	
Default New	
<u>M</u> odify	
Delete	
Selected Configuration Details	
Network Name (SSID): <empty> Network Connection: AP (Infrastructure)</empty>	
Power Saving: Normal Locally Admin. Address: Not Used	
Data Security: Disabled	
OK Cance	1

## **Selecting Encryption Types**

Atheros supports two encryption types; Wired Equivalent Privacy (WEP) and Advanced Encryption Security (AES). While WEP is universally supported and commonly used, AES provides a much higher level of security, that is, frames encrypted with AES are more difficult to decipher without knowing the key. To use AES, you must specify a unique key.

**NOTE:** AES is not supported in ad hoc mode, since ad hoc mode does not support unique keys.

Select the encryption type automatically (auto) or manually at both the STA and AP. See the **set cipher** command in the *AR5001 AP User's Guide* for information on configuring the encryption type on the AP. By specifying auto, the STA and AP will negotiate and attempt to use AES before exchanging data packets. If AES is not supported by the STA or AP, WEP is used. Manual selection allows you to specify the encryption type. By default, the STA is set to auto and will first attempt to use AES and will only use WEP if the AP only supports, or is configured for WEP only.

50

Use the Advanced tab on the "Atheros AR5001 Wireless Network Adapter" dialog to change the encryption type.

				S	ration Setting	Network Configu
					Advanced	General Security
	•	Auto	Encryption Type:	•	Auto	Wireless Mode:
	•	Auto	Scan Mode:	•	802.11b	Ad Hoc Mode:
	•	Full Power	Transmit Power:	•	Disabled	802.11a Turbo:
	•	Disabled	Qos:	•	Disabled	802.11g( Pure g):
				•	Normal Range	802.11b range:
Cancel	OK					

Table 3-1 provides descriptions for the fields on the Network ConfigurationSetting, Advanced tab dialog.

Field Name	Description
Wireless Mode	Specifies 802.11a
Ad Hoc Mode	Specifies a band to establish an ad hoc network if no matching SSID is found after scanning all available modes.
802.11a Turbo	Enables or disables Atheros turbo mode for 802.11a radio space. Once enabled, both 802.11a and 802.11a turbo modes are scanned.
Encryption Type	Specifies the encryption type:s
	■ WEP - use only WEP encryption.
	AES - only associate with Access Points that can successfully negotiate AES encryption.
	Auto - Allow the STA and AP to negotiate the encryption type.
Scan Mode	Specifies passive, or auto scannings (use country code to select the type of scan, active or passive).
Transmit Power	Selects full, half, quarter, eighth, or minimum transmit power.
QoS	Disables or enables the station to cooperate in a net- work using Quality of Service.

Table 3-1. Advanced Dialog Field Descriptions

To change the encryption type, take the following steps:

- 1. Select Encryption Algorithm.
- 2. Select the desired setting from the Value menu.

**CAUTION:** To successfully transmit data frames, specify a unique key.

NOTE: If AES and ad hoc are both specified, the STA will use WEP.

**NOTE:** Fragmentation is currently not supported using AES.

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#### **Infrastructure Mode**

This section defines the process of configuring an Atheros AR5001 Wireless Network Adapter in infrastructure mode. Refer to "Device Configuration" on page 2-17 for detailed descriptions of each option in the Network Configuration Settings.

1. Under the "General" tab, make sure the "Locally Administered Address" checkbox is unchecked.

Ne	twork Configuration Settings		<u>? ×</u>
	General Security Advanced		
	Configuration Name:	OFFICE	
	Network Name (SSID):	NET1	
	Network Connection:	AP (Infrastructure)	
	Power Saving:	Normal	
	Locally Administered Address: (Hex 0-9 A-F)		
		OK Can	cel

Use Table 3-2 as a guideline to choose the values of each field in the configuration window.

Field Name	Description
Configuration Name	This field identifies the configuration. This name must be unique. Configuration names are case insensitive.
Network Name (SSID)	This is the name of the IEEE 802.11a wireless network, for example, "Atheros 802.11a Wireless Network." This field has a maximum limit of 32 characters. If the field is left blank, the STA connects to the AP with the best signal strength.
Network Connection	AP (infrastructure).
Power Savings	This field allows the configuration of power management options. The options are Off, Normal, and Maximum

#### Table 3-2. Infrastructure Mode General Dialog Field Descriptions

2. Usually, infrastructure mode is used in an enterprise environment where APs are installed and maintained by corporate IT staff. Much of the data in the enterprise network is confidential. It is important to configure security to make sure only stations with appropriate keys can receive sensitive data. The Atheros AR5001 Wireless Network Adapter and NDIS driver support key lengths of 40 bits, 104 bits and 128 bits. Typically, the appropriate encryption and decryption keys are supplied by the corporate IT staff.

twork Configu	ration Settings	<u>?</u>
General Securi	V Advanced	
🔽 Enable Secu	rity Default Encryption Key:	First 💌
– Encryption Kej	vs (Hex 0-9 A-F)	Key Length (bits):
Unique Key:	444444444	64 (40+24) 10 hex digits 💌
Shared Keys:		
First:	111111111	64 (40+24) 10 hex digits 💌
Second:	222222222222222222222222222222222222222	152 (128+24) 32 hex digits 💌
Third:	3333333333333333333333333333	128 (104+24) 26 hex digits 💌
Fourth:		64 (40+24) 10 hex digits 💌
	,	

#### Ad Hoc Mode

This section defines the process of configuring an Atheros AR5001 Wireless Network Adapter in ad hoc or IBSS mode. Refer to "Ad Hoc Mode" on page 2-28 for descriptions of ad hoc operation.

Similar to the set-up of AP Infrastructure mode described in the previous section, ad hoc mode is also configured by changing the options in the Network Configuration Settings of the Atheros NIC Configuration utility.

Network Configuration Settings	;		? 🗙
General Security Advanced			
Configuration Name:	Ad Hoc		
Network Name (SSID):	SPE_ALPHA		
Network Connection:	Ad Hoc	•	
Power Saving:	Normal	•	
Locally Administered Address: (Hex 0-9 A-F)	00037F0013EB		
		ОК	Cancel

Use Table 3-3 as a guideline to choose the values of each field in the configuration window.

Table 3-3. Ad Hoc Mode General Dialog Field Descriptions

Field Name	Description
Configuration Name	This field identifies the configuration. This name must be unique. Configuration names are case insensitive.
Network Name (SSID)	A network name is mandatory for ad hoc mode. The SSID for all stations in a single ad hoc network must be the same.
Network Connection	Ad Hoc.

Field Name	Description
Power Savings	Power saving mode is currently not supported in ad hoc mode.
Locally Administered Address (LAA)	This field defines the locally administered MAC address. To enter a value in the address field, the check box needs to be selected.

Table 3-3. Ad Hoc Mode General Dialog Field Descriptions

- 3. You can optionally set up other properties, but because the duration of the ad hoc network tends to be limited, Power Saving and Security features are not typically a requirement. For ad hoc network activity, the Power Saving and Security features can be disabled. Currently, shared key security is supported in ad hoc mode. Future Atheros software implementations will provide unique key support.
- 4. Click OK when the properties are set correctly. The system needs to reboot in order for the changes to take effect.

Note that in ad hoc mode, a station scans the air for an existing BSS. If no BSS is found, the station establishes a BSS for other stations to join. When other stations scan the air and find an established BSS in place, they join that BSS to form an ad hoc network. If a specific set of stations requires ad hoc network connectivity, it is recommended to have one station establish a BSS first before configuring the remaining stations. This prevents the scenario of several stations trying to form a BSS at the same time, which can result in multiple singular BSSs being established, rather than a single BSS with multiple stations.

#### **TCP/IP Configuration**

After configuring the Atheros AR5001 Wireless Network Adapter network adapter properties, the TCP/IP address for the network device needs to be configured.

1. From Control Panel, launch the Network properties window.

Network	? ×
Configuration Identification Access Control	
The following network components are installed:	
FIDA Protocol -> SMC IrCC (Infrared Communications Con	
TCP/IP -> Atheros AR5001 Wireless Network Adapter TCP/IP -> Dial-Up Adapter	
TCP/IP -> Intel(R) PR0/100 VE Network Connection	
File and printer sharing for Microsoft Networks	<b>2</b>
Add Remove Properties	
Primary Metwork Logon:	- 11
Client for Microsoft Networks	<b>च</b>
	- 11
<u>File and Print Sharing</u>	
Description	
TCP/IP is the protocol you use to connect to the Internet ar wide-area networks.	nd

3

2. Select "TCP/IP<sup>®</sup>Atheros AR5001 Wireless Network Adapter" and click Properties.

Bindings	Adv	anced	N	etBIOS
Configuration	Gateway	WINS Con	iguration	IP Address
IP address can your network doe ur network admir s space below.	be automal is not autor istrator for	ically assigne natically assig an address, a	ed to this c in IP addre and then ty	omputer. ssses, ask speitin
Obtain an IP	address aut	tomatically		
Specify an IP	address:			
IP Address:	192	.168. 1	. 22	
Sybnet Mask	c <b>255</b>	.255.25	5.0	
Detect conne	ction to ne	twork media		
-				
				- I

Depending on the type of network the station connects to, Gateway and DNS Configuration information can also be required. IP configuration information (DHCP or assigned IP address, Gateway and DNS server IP addresses) is usually obtained from the corporate IT staff. For a simple demonstration, the station is assigned a static IP address. 3. From "TCP/IP Properties," choose "IP Address" and select "Specify an IP address." Input an IP address and subnet mask.

Assigning an IP address and subnet mask allows the station to interact with the AP or other stations in the same IP subnet.

- 4. Click OK to complete the TCP/IP configuration, and restart the system for the changes to take effect.
- 5. Choose Start > Programs > Accessories > Command Prompt to open the DOS command prompt window. Type "ipconfig" to determine if the TCP/IP configuration has taken effect. To test IP connectivity in ad hoc or infrastructure mode, use the **ping <ipaddress**> command. When a TCP/IP connection is established, the LinkMon utility (see "LinkMon" on page 7-1) can be used to monitor the Atheros AR5001 Wireless Network Adapter operating status.

	KS-DOS Prompt	
	8 x 12 🗸 🛄 🖻 🔂 🔂 🚰 🗛	
	C:\WINDOWS\Desktop>ipconfig	
	Windows IP Configuration	
	Ø Ethernet adapter :	
	IP Address	
	C:\WINDOWS\Desktop>ping 192.168.1.21	
	Pinging 192.168.1.21 with 32 bytes of data:	
	Reply from 192.168.1.21: bytes=32 time<10ms TTL=128 Reply from 192.168.1.21: bytes=32 time<10ms TTL=128 Reply from 192.168.1.21: bytes=32 time<10ms TTL=128 Reply from 192.168.1.21: bytes=32 time<10ms TTL=128	
04	Ping statistics for 192.168.1.21: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss) Approximate round trip times in milli-seconds: Minimum = Oms, Maximum = Oms, Average = Oms	
	C:\WINDOWS\Desktop>	-
		• //

6. To map the drive on another machine to your computer, right-click "My Computer" and click "Map Network Drive...." Specify the path of a network-shared folder.

	¥.			
iny compare	<u>O</u> pen			
	Explore			
	S <u>e</u> arch			
	Map Network Drive			
	Disconnect Network Drive			
	Create <u>S</u> hortcut			
	Rena <u>m</u> e			
Map Netw	P <u>r</u> operties		? ×	
<u>D</u> rive:	🖃 F:	-	OK	
Datta	10100 100 1 01VC#		Canada	
Path:	11132.100.1.2110\$	<u> </u>	Lancei	
	Beconnect at logon			

7. After mapping the drive, you can perform file transfers, video streaming, and all other network data transfers that are normally performed with wired 10/100 Ethernet connections.

C

# **4** Windows XP

This chapter describes the Windows XP driver installation.

## **Driver Installation (First-time Install)**

Atheros recommends that you remove any existing Atheros drivers on the PC system before installing Version 1.0 release of the NDIS driver. Refer to "Driver Uninstallation" on page 4-4 for the instructions on how to remove previous driver releases.

With no existing Atheros NDIS driver installed, insert the Atheros AR5001 Wireless Network Adapter into a 32-bit CardBus slot, and follow these steps to install the NDIS driver:

1. Wait for the following dialog box to appear. Choose "Install from a list or specific location (Advanced)," and click Next to continue.



2. Under "Search for the best driver in these locations," choose "Include this location in the search" and click Browse to find the location of the NDIS driver. When the driver location has been identified, click Next to continue.

Found New Hardware Wizard
Please choose your search and installation options.
$\odot$ Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM)
Include this location in the search:
D:\ndis\bin\production\ndis5
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< <u>B</u> ack <u>N</u> ext > Cancel

3. The Atheros NDIS evaluation driver currently does not have a digital signature from Microsoft. Therefore, Windows XP shows a warning message. Click Continue Anyway to proceed with driver installation.

Hardware	Installation
1	The software you are installing for this hardware: Atheros AR5001 Wireless Network Adapter has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.) Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
	Continue Anyway STOP Installation

4. Click Finish to complete driver installation, and refer to "Device Configuration" on page 4-7 for device configuration.

	Found New Hardware Wize	ard		
	Completing the Found New Hardware Wizard			
		The wizard has finished installing the software for:		
		Atheros AR5001 Wireless Network Adapter		
		Click Finish to close the wizard.		
		< Back Finish Cancel		
0				

## **Driver Uninstallation**

This section provides uninstallation procedures for removing the Atheros NDIS driver from the system. Uninstallation is recommended for upgrading the NDIS driver from previous Atheros driver releases.

1. To remove the NDIS driver from the OS, go to Device Manager, right click "Atheros AR5001 Wireless Network Adapter," and choose Uninstall.



2. Click OK to uninstall the device.



4

3. When the device is uninstalled from Device Manager, search for and delete the driver installation file that resides in the system.



- a. Go to Start and choose Search > All files and folder, enter "oem\*.inf" in the "All or part of the file name" field
- b. Enter "Atheros" in the "A word or phrase in the file" field.
- c. Enter "C:\WINNT\INF" in the "Look in" field, where C: is the drive letter of where Windows XP is installed.
- d. Click Search to find the driver installation file.



4. A file matching the search criteria is displayed. Choose this file and delete it from the system.



## **Device Configuration**

Windows XP zero-configuration functionality allows you to select and join a wireless network without having to configure the device separately. You can decide to choose the default parameters and directly proceed to zero-configuration in "Windows XP Wireless Network Configuration" on page 4-18.

Similar to Windows 2000, configuration of the Atheros AR5001 Wireless Network Adapter can be done through the Network Control Panel (NCP) in adapter properties. You can set the Wireless Network Adapter to work in one of two modes: infrastructure mode or ad hoc mode. Refer to "Device Configuration" on page 2-17 for more details on these network connection types.

To launch NCP go to Device Manager, right-click "Atheros AR5001 Wireless Network Adapter," and select Properties to access to the properties of the adapter.



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Configuration additions, modifications, and deletions are made under the "Settings" tab of "Atheros AR5001 Wireless Network Adapter Properties." Select one of the configurations under the configuration, click Modify or New and complete the steps in "Infrastructure Mode" on page 4-11 or "Ad Hoc Mode" on page 4-13 to set up the station to work in infrastructure mode or ad hoc mode, respectively.

	Properties ? 🔀
General Advanced Settings Driver Resources	
Selected Configuration: Default	
Configuration List	
Default	New
	Modify
	Delete
Selected Configuration Details Network Name (SSID): <empty> Network Connection: AP (Infrastructure) Power Saving: Normal Locally Admin. Address: Not Used Data Security: Disabled</empty>	
	OK Cancel

## **Selecting Encryption Types**

Atheros supports two encryption types; Wired Equivalent Privacy (WEP) and Advanced Encryption Security (AES). While WEP is universally supported and commonly used, AES provides a much higher level of security, that is, frames encrypted with AES are more difficult to decipher without knowing the key. To use AES, you must specify a unique key.

**NOTE:** AES is not supported in ad hoc mode, since ad hoc mode does not support unique keys.

Select the encryption type automatically (auto) or manually at both the STA and AP. See the **set cipher** command in the *AR5001 AP User's Guide* for information on configuring the encryption type on the AP. By specifying auto, the STA and AP will negotiate and attempt to use AES before exchanging data packets. If AES is not supported by the STA or AP, WEP is used. Manual selection allows you to specify the encryption type. By default, the STA is set to auto and will first attempt to use AES and will only use WEP if the AP only supports, or is configured for WEP only.

Use the Advanced tab on the "Atheros AR5001 Wireless Network Adapter" dialog to change the encryption type.

Network Configuration Settings		? 🗙
General Security Advanced		
Wireless Mode: Auto	Encryption Type: Auto	
Ad Hoc Mode: 802.11b	Scan Mode: 🛛 🗹	
802.11a Turbo: Disabled 💌	Transmit Power: Full Power	
802.11g(Pure g): Disabled	Qos: Disabled	
802.11b range: Normal Range 💌		
	OK C	ancel

Chapter

Table 4-1 provides descriptions for the fields on the Network ConfigurationSetting, Advanced tab dialog.

Field Name	Description
Wireless Mode	Specifies 802.11a
Ad Hoc Mode	Specifies a band to establish an ad hoc network if no matching SSID is found after scanning all available modes.
802.11a Turbo	Enables or disables Atheros turbo mode for 802.11a radio space. Once enabled, both 802.11a and 802.11a turbo modes are scanned.
Encryption Type	Specifies the encryption type:s
	<ul> <li>WEP - use only WEP encryption.</li> <li>AES - only associate with Access Points that can successfully negotiate AES encryption.</li> </ul>
	Auto - Allow the SIA and AP to negotiate the encryption type.
Scan Mode	Specifies passive, or auto scannings (use country code to select the type of scan, active or passive).
Transmit Power	Selects full, half, quarter, eighth, or minimum transmit power.
QoS	Disables or enables the station to cooperate in a network using Quality of Service.

Table 4-1.	Advanced	Dialog	Field	Descriptions
------------	----------	--------	-------	--------------

To change the encryption type, take the following steps:

- 1. Select Encryption Algorithm.
- 2. Select the desired setting from the Value menu.

**CAUTION:** To successfully transmit data frames, specify a unique key.

**NOTE:** If AES and ad hoc are both specified, the STA will use WEP.

**NOTE:** Fragmentation is currently not supported using AES.

#### Infrastructure Mode

This section defines the process of configuring an Atheros AR5001 Wireless Network Adapter in infrastructure mode. Refer to "Device Configuration" on page 2-17 for detailed descriptions of each option in the Network Configuration Settings.

1. Under the "General" tab, make sure the "Locally Administered Address" checkbox is unchecked.

Network Configuration Settings	\$	?×
General Security Advanced		
Configuration Name:	Infrastructure	
Network Name (SSID):	AP_Network	
Network Connection:	AP (Infrastructure)	
Power Saving:	Normal	
Locally Administered Address: (Hex 0-9 A-F)		
	ОК С	Cancel
2. Use Table 4-2 as a guideline to choose the values of each field in the configuration window.

Field Name	Description		
Configuration Name	This field identifies the configuration. This name must be unique. Configuration names are case insensitive.		
Network Name (SSID)	This is the name of the IEEE 802.11a wireless networ for example, "AP_Network." This field has a maximu limit of 32 characters. If the field is left blank, the STA connects to the AP with the best signal strength.		
Network Connection	AP (infrastructure).		
Power Savings	This field allows the configuration of power management options. The options are Off, Normal, and Maximum.		

Table 4-2. Infrastructure Mode General Dialog Field Descriptions

3. Usually, infrastructure mode is used in an enterprise environment where APs are installed and maintained by corporate IT staff. Much of the data in the enterprise network is confidential. It is important to configure security to make sure only stations with appropriate keys can receive sensitive data. The Atheros AR5001 Wireless Network Adapter and NDIS driver support key lengths of 40 bits, 104 bits and 128 bits. Typically, the appropriate encryption and decryption keys are supplied by the corporate IT staff.

Network Configu	ration Settings	? 🛛
General Security	Advanced	1
Enable Security	y Default Encryption Key:	Unique
Unique Key: 1	111111111	Key Length (bits):
Shared Keys:		
First: 2	222222222	64 (40+24) 10 hex digits
Third: 4	444444444444444444444444444444444444444	152 (128+24) 32 hex digits 128 (104+24) 26 hex digits
Fourth:		64 (40+24) 10 hex digits 💌
Third Key: Column	27, Length 26	
		OK Cancel

### Ad Hoc Mode

This section defines the process of configuring an Atheros AR5001 Wireless Network Adapter in ad hoc or IBSS mode. Refer to "Ad Hoc Mode" on page 2-28 for descriptions of ad hoc operation.

Similar to the setup of AP Infrastructure mode described in the previous section, ad hoc mode is also configured by changing the options in the "Network Configuration Settings" window.

Network Configuration Settings		? 🔀
General Security Advanced		
Configuration Name:	Ad Hoc	
Network Name (SSID):	Adhoc_Network	
Network Connection:	Ad Hoc 💌	
Power Saving:	Off 👤	
Locally Administered Address: (Hex 0·9 A-F)		
	OK Car	icel

4. Use Table 4-3 as a guideline to choose the values of each field in the configuration window.

Table 4-3.	Ad	Нос	Mode	General	Dialog	Field	Descriptions
------------	----	-----	------	---------	--------	-------	--------------

Field Name	Description
Configuration Name	This field identifies the configuration. This name must be unique. Configuration names are case insensitive, for example, "Ad Hoc.".
Network Name (SSID)	A network name is mandatory for ad hoc mode. The SSID for all stations in a single ad hoc network must be the same.
Network Connection	Ad Hoc.
Power Savings	Power saving mode is currently not supported in ad hoc mode.
Locally Administered Address (LAA)	This field defines the locally administered MAC address. To enter a value in the address field, the check box needs to be selected.

You can optionally set up security features, but it is not typically a requirement because the duration of the ad hoc network tends to be limited. Currently, shared key security is supported in ad hoc mode. Future Atheros software implementations will provide unique key support.

In ad hoc mode, a station scans the air for an existing BSS. If no BSS is found, the station establishes a BSS for other stations to join. When other stations scan the air and find an established BSS in place, they join that BSS to form an ad hoc network. If a specific set of stations requires ad hoc network connectivity, it is recommended to have one station establish a BSS first before configuring the remaining stations. This prevents the scenario of several stations trying to form a BSS at the same time, which can result in multiple singular BSSs being established, rather than a single BSS with multiple stations.

### TCP/IP Setup

After configuring the Atheros AR5001 Wireless Network Adapter through the Network Control Panel, the TCP/IP address for the network device needs to be configured.

 From the Start menu, choose Programs > Accessories > Communications > Network Connections. Find the "Local Area Connection" that is associated with the Atheros AR5001 Wireless Network Adapter. Rightclick that connection and click Properties.



Wireless Network Connection 5 Properties 👘 🕐 🔀	Internet Protocol (TCP/IP) Properties	?
General Wireless Networks Advanced	General	
Connect using:	You can get IP settings assigned automatically if your network support this capability. Otherwise, you need to ask your network administrator f the appropriate IP settings.	s for
Configure	O Dbtain an IP address automatically	
This connection uses the following items:	Use the following IP address:	
Client for Microsoft Networks	[P address: 192.168.1.20	
File and Printer Sharing for Microsoft Networks      Packet Scheduler	Sybnet mask: 255 . 255 . 255 . 0	
Internet Protocol (TCP/IP)	Default gateway:	
Install Uninstall Properties	Obtain DNS server address automatically	
Description	<ul> <li>Use the following DNS server addresses:</li> </ul>	
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication	Preferred DNS server:	
across diverse interconnected networks.	Alternate DNS server:	
Show icon in notification area when connected	Adyancec	d
OK Cancel	ОК Са	incel

2. Select "Internet Protocol (TCP/IP)" and click Properties.

3. Click "Use the following IP address" and input an IP address and Subnet mask.

Depending on the type of network the station connects to, Gateway and DNS Configuration information can also be required. IP configuration information (DHCP or assigned IP address, Gateway and DNS server IP addresses) is usually obtained from the corporate IT staff. For a simple demonstration, the station is assigned a static IP address.

4. Click OK in both "Internet Protocol (TCP/IP) Properties" and "Local Area Connection Properties" to complete the IP configuration.



5. Choose Start > Programs > Accessories > Command Prompt to open a command prompt window. Type "ipconfig" to determine if the TCP/IP configuration has taken effect. To test IP connectivity in ad hoc or infrastructure mode, use the **ping <IP address>** command.



6. When a TCP/IP connection is established, the LinkMon utility (refer to "LinkMon" on page 7-1) can be used to monitor the operating status of Atheros AR5001 Wireless Network Adapter.

7. To map the drive on another machine to your computer, from the Start menu, choose My Computer and right-click to select "Map Network Drive...."



8. Assign the drive letter that maps to the network-shared folder and specify the shared folder information. Click Finish to map the drive.

Map Network Drive		$\mathbf{X}$
	Windows and assid access th Specify t that you	s can help you connect to a shared network folder gn a drive letter to the connection so that you can he folder using My Computer. the drive letter for the connection and the folder want to connect to:
	<u>D</u> rive: F <u>o</u> lder:	Y: ▼ \\192.168.1.21\C\$ ▼ Browse Example: \\server\share
		Reconnect at logon
		Connect using a <u>different user name</u> . Sign up for online storage or connect to a <u>network server</u> .
		< Back Finish Cancel

9. After mapping the drive, you can perform file transfers, video streaming, and all other network data transfers that are normally performed with wired 10/100 Ethernet connections.

# Windows XP Wireless Network Configuration

Aside from using the Network Control Panel (NCP) to configure the Atheros AR5001 Wireless Network Adapter, Windows XP provides zero-configuration functionality that automatically tries to connect the STA to available wireless networks in the following order:

- Infrastructure mode with valid WEP keys
- Infrastructure mode with unauthenticated access for stations without WEP keys
- Ad hoc mode

To configure wireless network settings through the Windows XP user interface:

- 1. Open Network Connections from Control Panel.
- 2. Right-click the Local Area Network Connection icon (pertinent to Atheros AR5001 Wireless Network Adapter).
- 3. Click Enable to enable the device first, and then click Properties.

4. On the Wireless Networks tab, select the "Use Windows to configure my wireless network settings" check box to enable automatic wireless network configuration.

Refer to "Infrastructure Mode" on page 4-11 or "Ad Hoc Mode" on page 4-13 to set up the station to connect to an infrastructure or ad hoc network.

If you want to use non-default settings for power saving and turbo mode, you should set those parameters through the NCP method (refer to "Device Configuration" on page 4-7). Then use Wireless Networks tabs to select network name, network type, and encryption keys.

Note that you can disable automatic wireless network configuration, and revert back to using Atheros NCP configuration settings, by clearing the "Use Windows to configure my wireless network settings" check box.

	🕹 Wireless Network Connection 4 Properties 💦 🔀
	General Wireless Networks Authentication Advanced
	<ul> <li>✓ Use <u>W</u>indows to configure my wireless network settings</li> <li>Available <u>networks</u>:</li> <li>To connect to an available network, click Configure.</li> <li>▲ Test_Alpha</li> <li>▲ Adhoc_Network</li> </ul>
	Preferred networks: Automatically connect to available networks in the order listed below: Move up
$\bigcirc$	Add Remove Properties
	Configuration. Advanced



### **Infrastructure Mode**

To set up automatic wireless network configuration to connect to an existing Access Point (infrastructure network), follow these steps:

1. Click the network name under "Available networks" in the Wireless Networks tab, and click Configure. You can update the list of available networks that are within range of your computer by clicking Refresh under Available Networks.

Wireless Network Connection 4 Properties	
General Wireless Networks Authentication Advanced	
Available networks:	
I Test_Alpha <u>Configure</u> Adhoc_Network <u>Refresh</u>	2
Preferred networks:	
below:           Move up           Move down	
Add Remove Properties	
Learn about <u>setting up wireless network</u> <u>configuration</u> . Ad <u>v</u> anced	
OK Cancel	

2. If the network requires WEP, then the "Data encryption (WEP enabled)" check box is selected by default in Wireless Network Properties.

١	∦ireless Network Prop	perties	?×
	Network name (SSID):	Test_Alpha	
	Wireless network key (Wi	EP)	
	This network requires a k	ey for the following:	
	☑ Data encryption (W	EP enabled)	
	Network <u>A</u> uthentica	tion (Shared mode)	
	Network <u>k</u> ey:		
	Key <u>f</u> ormat:	ASCII characters	~
	Key length:	104 bits (13 characters	) 🔽
	Key inde <u>x</u> (advanced):	0	
	The key is provided for	r me automatically	
	This is a computer-to-co	mputer (ad hoc) network:	wireless
	access points are not us	ed	
		OK Ca	ncel

3. Select "The key is provided for me automatically" check box if the WEP key is automatically provided for you. The driver will then use the Default Encryption key from the current Atheros NCP configuration profile irrespective of the network name.

You may choose to enter the WEP key by clearing this check box and manually entering the network key and key length.

**NOTE:** The key format must be hexadecimal digits and the key length is limited to 104-bit in Windows XP, as opposed to 128-bit key supported by Atheros NDIS driver in the NCP configuration interface. If the network that you are connecting to requires 128-bit WEP key, then it is recommended that you disable Windows XP automatic wireless network configuration and use Atheros NCP configuration instead.

### Ad Hoc Mode

To connect to an existing computer-to-computer (ad hoc) network:

1. Click the ad hoc network name under "Available networks" in the Wireless Networks tab, and click Configure.

✓ Use <u>W</u> indows to configure my wireless network settings Available <u>n</u> etworks:
To connect to an available network, click Configure.  Test_Alpha Adhoc_Network Refresh
Preferred networks: Automatically connect to available networks in the order listed below: Move up
Add       Remove       Properties         Learn about setting up wireless network configuration.       Advanced
OK Cancel

2. In Wireless Network Properties, the "This is a computer-to-computer (ad hoc) network; wireless access points are not used" check box is selected by default. You may choose to enable WEP by selecting the "Data encryption (WEP enabled)" check box and the "Network Authentication (Shared mode)" check box.

letwork <u>n</u> ame (SSID):	Adhoc_Network	
Wireless network key (W	EP)	
This network requires a k	key for the following:	
Data encryption (W	(EP enabled)	
Network <u>A</u> uthentic	ation (Shared mode)	
Network <u>k</u> ey:		
Key format:	ASCII characters	
Key length:	104 bits (13 characters) 💌	
Key inde <u>x</u> (advanced):	0	
The key is provided for	or me automatically	
This is a <u>c</u> omputer-to-co access points are not u	omputer (ad hoc) network; wireless - sed	

3. Select the "The key is provided for me automatically" check box if the shared key is automatically provided for you. The driver will then use the Default Encryption key from the current Atheros NCP configuration profile irrespective of the network name.

You may choose to enter the shared key by clearing this check box and enter the key and key length manually.

**NOTE:** The key format must be hexadecimal digits and the key length is limited to 104-bit in Windows XP as opposed to 128-bit key supported by Atheros NDIS driver in the NCP configuration interface. If the network that you are connecting to requires 128-bit WEP key then it is recommended that you disable Windows XP automatic wireless network configuration and use Atheros NCP configuration instead.

4. If you want to connect to an ad hoc network, but both ad hoc and infrastructure networks are within range of your computer, then click Advanced in the Wireless Networks tab and then select "Computer-to-computer (ad hoc) networks only". Note that if you want the station to start its own ad hoc network, the "Computer-to-computer (ad hoc) networks only" option should be selected. There should be no network active from the preferred list and the "Automatically connect to non-preferred networks" check box should be cleared.



## **Connect to an Available Wireless Network**

When there is more than one available network detected by Windows XP, the OS will prompt you to select and connect to a preferred network.



To connect to an available wireless network, right-click the network connection icon in the notification area, and then click "View Available Wireless Networks".



Connect to Wireless Network
The following network(s) are available. To access a network, select it from the list, and then click Connect.
Available <u>n</u> etworks:
I Test_Alpha
This network requires the use of a network key (WEP). To access this network, type the key, and then click Connect.
Network key:
If you are having difficulty connecting to a network, click Advanced.
Advanced Connect Cancel

If you are either unable to make a connection to the wireless network that you selected or need to configure additional wireless network connection settings, click Advanced in Connect to Wireless Network, and the Wireless Networks tab will appear.

🕂 Wireless Network Connection 7 Properties 👘 ? 🔀
General Wireless Networks Authentication Advanced
✓ Use Windows to configure my wireless network settings         Available networks:         To connect to an available network, click Configure.         ▲ Test_Alpha         ◇ Adhoc_Network         Preferred networks:         Automatically connect to available networks in the order listed below:         Move up         Move gown         Add         Remove       Properties         Learn about setting up wireless network configuration.
OK Cancel

You can configure a new wireless network connection by clicking Add, and specifying the network name (SSID) in Wireless Network Properties, and the wireless network key settings, if needed.

If the network connection that you are configuring is an ad hoc network, then select "This is a computer-to-computer (ad hoc) network; wireless access points are not used" check box. The network will be added under "Preferred networks" in the Wireless Networks tab.

Wireless Network	Properties	?×		
Network <u>n</u> ame (SSID	): Test_Network			
Wireless network k	ey (WEP)			
This network requi	res a key for the following:			
Data encrypt	Data encryption (WEP enabled)			
Network <u>A</u> uth	Network Authentication (Shared mode)			
Network <u>k</u> ey:				
Key <u>f</u> ormat:	ASCII characters	~		
Key length:	104 bits (13 character	's] 💌		
Key inde <u>x</u> (advanc	ed): 0 🍣			
✓ The key is prov	ided for me automatically			
This is a <u>c</u> ompute access points are	r-to-computer (ad hoc) network not used	;; wireless		

You can change the order of the preferred networks by selecting the wireless network that you want to reposition on the list, and then clicking Move up or Move down.

🕹 Wireless Network Connection 7 Properties 👘 🛛	
General Wireless Networks Authentication Advanced	
<ul> <li>✓ Use <u>W</u>indows to configure my wireless network settings</li> <li>Available <u>networks</u>:</li> <li>To connect to an available network, click Configure.</li> <li>▲ Test_Alpha</li> <li>▲ Adhoc_Network</li> <li>■ Refresh</li> </ul>	
Automatically connect to available networks in the order listed below: Test_Network Test_Alpha Adhoc_Network <u>Add</u> <u>Bemove</u> <u>Properties</u> Learn about <u>setting up wireless network</u> <u>Adyanced</u>	
OK Cancel	

You can change the wireless network connection settings of a preferred network by selecting the wireless network, clicking Properties, and then changing the settings as needed.

To remove a wireless network from the list of preferred networks, select the wireless network that you want to remove, and then click Remove.

If a network is not defined in the preferred networks list, but you know it is available and you want to automatically connect to it, then click Advanced in the Wireless Networks tab, and select the "Automatically connect to nonpreferred networks" check box.

# Regulatory Compliance Information

## **Radio Frequency Interference Requirements**

This device is restricted to indoor use due to its operation in the 5.15 to 5.25 GHz frequency range. FCC requires this product to be used indoors for the frequency range 5.15 to 5.25 GHz to reduce the potential for harmful interference to co-channel Mobile Satellite systems.

High power radars are allocated as primary users of the 5.25 to 5.35 GHz and 5.65 to 5.85 GHz bands. These radar stations can cause interference with and / or damage this device.

# **DECLARATION OF CONFORMITY**

We Atheros Communications, Inc., 529 Almanor Ave., Sunnyvale, CA 94085

declare under our sole responsibility that the product AR5BCB-00021 Wireless LAN CardBus Card Complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## **FCC 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, with 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 methods:

- 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.

Modifications made to the product, unless expressly approved by Atheros Communications, could void the user's authority to operate the equipment.

## **RF Exposure**

This device has been tested for compliance with FCC RF Exposure (SAR) limits in typical laptop configurations.

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