THE APPLICANT HAS BEEN CAUTIONED AS TO THE FOLLOWING:

15.21 INFORMATION TO USER.

The users manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) SPECIAL ACCESSORIES.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Aironet™

User's Guide and Technical Reference Manual
Aironet 3500 Series ™
MI3100 Wireless LAN Adapter

DOC-710-004019 Rev. A0

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Aironet Wireless Communications, Inc.

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Department of Communications - Canada

Canadian Compliance Statement

This Class B Digital apparatus meets all the requirements of the Canadian Interference - Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte les exigences du Reglement sur le material broilleur du Canada.

This device complies with RSS-210 of Industry of Canada. Operation is subject to the following two conditions: 1) this device may cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.

European Telecommunication Standards Institute
Statement of Compliance
Information to User

This equipment has been tested and found to comply with the European Telecommunications Standard ETS 300.328. This standard covers Wideband Data Transmission Systems referred in CEPT recommendation T/R 10.01.

This type accepted equipment is designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

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Section 1

About the User's Guide

This guide covers the installation, configuration, control and maintenance of your Aironet MI3100 Wireless LAN Adapter.

Please read Sections 2 and 3 before attempting to install or use the hardware and software described in this guide.

This Guide is arranged as follows:

Section 1 – *Welcome to the MI3100* – provides you with a general introduction to the MI3100, frequency hopping radio technology, and the various configurations you can use when operating the MI3100 in your infrastructure.

Section 2 – *Installing the MI3100 Hardware* – describes the physical installation of the MI3100 and the standard antenna.

Section 3 – *Installing the MI3100 Software* – describes installation and configuration of the various network drivers.

Section 4 – *Performing Diagnostics* – provides you with detailed procedures for restarting your MI3100, returning to your default configuration, and loading new firmware versions.

Section 5 – *Error Messages and Troubleshooting* – provides you with detailed descriptions of the LED messages and error codes, as well as general procedures for correcting common problems.

Appendix A – *MI3100 Specifications* – provides MI3100 radio and physical specifications.

Appendix B – *MI3100 PC Card CIS Description* – explains the PC Card configuration required by the MI3100.

Typographical Conventions

When reading the User's Guide and Technical Reference Manual, it is important to understand the symbol and formatting conventions used in the documentation. The following symbols are used in this guide.

Convention	Type of Information
I	Indicates a note which contains important information.
!	A caution message that appears before procedures which if not observed could result in loss of data or damage to the equipment.
Bold type	An action you must perform such as type or select.
`Monospaced font`	Information and menus that are visible on the Configuration Software screens.

Welcome to the Aironet MI3100

The Aironet MI3100 is a PC Card radio module that provides transparent wireless data communications between fixed, portable, or mobile devices and other wireless devices or a wired network infrastructure (Ethernet or Token Ring). Host devices can be any device equipped with a Micro ISA connector. These devices include:

The MI3100 is fully compatible when used in a device supporting Plug-and-Play technology.

The MI3100 can also be built into peripheral devices such as printers to provide them with a transparent wireless connection to a wired network. The MI3100 can be installed to operate as either a PC Card device, a serial communications (UART) device, or an ISA device. (For more information on how to embed the MI3100 in OEM devices, refer to the Aironet LM3500 Developer's Guide document number 710-xxxxxx.)

Frequency Hopping Radio Technology

The MI3100 uses Frequency Hopping Spread Spectrum transmission (FHSS) previously developed for military "anti-jamming" and "low probability of intercept" radio systems. Interference is reduced because the radio signal is constantly moving (changing frequency) during the transmission of data.

If a particular frequency encounters a level of noise and/or interference, the MI3100 will rebroadcast part of the transmission where interference occurred on another frequency channel. The amount of time the radio is transmitting is measured in millaseconds, making the signal very difficult to block, jam, or clone.

Data Transparency and Protocols

The MI3100 transports data packets transparently as they move through the wireless infrastructure. The MI3100 operates similarly to a standard network product except the wire is replaced with a radio connection. All existing applications, which operate over a network, will operate using the MI3100 without any special wireless networking functions.

Protocols Supported

The MI3100 can be used in a variety of infrastructure configurations. Aironet Access Points (AP3500-E, AP3500-T, AP3000-E and AP3000-T) provide connections to Ethernet or Tolken Ring Networks. When using the Aironet standard device drivers, the MI3100 is fully compliant with the following protocols and wired networks.

Protocols Supported

- TCP/IP based protocol products
- SNMP Protocol - The resident agent is compliant with the MIB-I and MIB-II Standards, TCP/IP based internets, as well as a custom MIB for specialized control of the system.

Radio Characteristics

The MI3100 uses a radio modulation technique known as Frequency Hopping Spread Spectrum transmission (FHSS). It combines high data throughput with excellent immunity to interference. The MI3100 operates in the 2.4 GHz license-free Industrial Scientific and Medical (ISM) band. Data is transmitted over a half-duplex radio channel operating up to 2 Megabits per second (Mbps).

Radio Ranges

The MI3100 is typically used with indoor wireless networks and limited distance outdoor applications. The following Section outlines the factors and conditions needed to achieve maximum radio range for both indoor and outdoor wireless infrastructure environments.

Indoor Environment

The radio ranges achieved in a given indoor environment depend on the following factors:

- **Data Rates:** Better sensitivity and range at lower data bit rates. The maximum radio range is achieved at the lowest workable data rate. There is a decrease in receiver threshold as the radio data rate increases.

- **Antenna Type and Placement:** The key to maximizing range indoors is to choose the best antenna configuration for the environment (range increases with antenna height). To maximize indoor range, place the unit and antenna close to the Aironet Access Points.

The MI3100 allows connection of two antennas at the same time. These antennas can be configured as a single unit diversity antenna or as two separate remote antennas. Connecting two antennas (or using the diversity antennas supplied by Aironet) allows the MI3100 to detect and use the strongest signal coming from either of the antennas. This way, the MI3100 provides you with the best communication range and reliability for your environment.

For an explanation of antenna types, configuration, and how to determine the best antenna for a your specific environment, consult the Aironet Antenna Guide document number 710-003725.

- **Openness of the Environment:** Open areas are better than closed. The less cluttered the work environment the greater the range.

  Locating the computing device and antenna (particularly when the small snap-on antenna is used) behind or in close proximity to an obstruction (shelving, a pillar, items on the desktop, etc.), creates a barrier between the sending and receiving antennas will hinder the performance of the MI3100.

- **Building Materials:** Drywall vs. Concrete. Floor-to-floor radio penetration depends on the building materials used between floors. For example, the range will be greater if the radio signal is passing through drywall rather than concrete blocks.

Table 1.1 – Typical Indoor Radio Range

Indoor Range		Snap-on Diversity Antenna
All antennas at desktop height	Open Office	100 feet 30.4 meters
	Cluttered Office	75 feet 22.8 meters
AP antenna at ceiling height 8 feet (2.4384 mm) client antenna at desktop height 3 feet (.9144 mm)	Open Office	200 feet 60.9 meters
	Cluttered Office	125 feet 38.1 meters

Outdoor Environment

The maximum radio range achieved outdoors is primarily determined by line of sight considerations: antenna elevations and path clearances.

Line of Sight: A dipole antenna and an omni-directional antenna will have a range of 470 meters (1550 feet) with both antennas at an elevation of 1.5 meters (5 feet). A maximum range of 8.7 kilometers (5.4 miles) with 10dB link margin [up to a theoretical 27.5 kilometers (17 miles)] can be achieved using directional Yagi antennas at both ends and appropriate elevation and maximum path clearance. These range measurements are derived using packets with a 512 byte data payload and a retry rate of less than 5 percent. In contrast, a connection using two dipoles (both at 5 foot elevation) can be maintained up to 2100 feet with a retry rate of 60 percent.

NOTE: Please contact Aironet Wireless Communications for more detailed information on point-to-point configurations.

Radio Antenna

The Snap-On Diversity antenna comes standard with the MI3100 and provides omni-directional coverage.

A benefit of diversity system is improved coverage. At the edges of the RF coverage or fringe areas, there are very often multiple signals reaching the receiver, all from the same transmitter. These signals travel in different paths (multipath) and are caused by reflection and shadows of the RF signals. When the signals combine, the receiver may have trouble decoding the data. The Aironet radio's ability to switch and sample between these antennas allows it to select the optimum antenna for receiving the packet.

Various optional antennas are offered for the MI3100. Consult the Aironet Antenna Guide document number 710-003725 for more information.

Security Features

The Aironet MI3100 employs Spread Spectrum Technology, previously developed for military "anti-jamming" and "low probability of intercept" radio systems.

The Aironet Access Point must be set to the same System Identifier (SID) as all other Aironet devices on the wireless infrastructure. Units with different SID will not be able to communicate with other nodes on the network.

Terminology

When configuring your system and your MI3100, keep in mind the following terminology:

Root Unit – The root unit (Aironet Access Point) is located at the top or starting point of a wireless infrastructure. The root unit provides the physical connection to the wired LAN and contains configuration information in its association table that covers all stations in the infrastructure.

Repeater – A repeater is an Aironet Access Point that extends the radio range of the infrastructure. A single Aironet Access Point transmits and receives data within an area called a cell. The size of a single cell depends upon the nature of the wireless medium within the cell. If your system configuration requires a wider communication range than allowed by the cell limit, you will need to add an Access Point configured as a repeater.

Radio Node – A PC, file server, notebook computer containing a radio card, LAN Adapter, or MI3100 PC Card.

End Node – A radio node that is located at the end of a network tree.

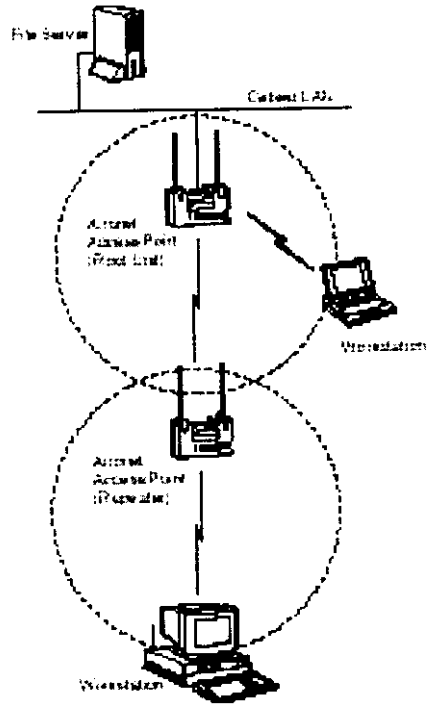
Parent/Child Station – Refers to the relationships between nodes on the network tree. For example, the Aironet Access Point (at the top of the tree) would be the parent of the end nodes. Conversely, the end nodes would be the children of the Aironet Access Point.

Association – Each root or repeater in the infrastructure contains an association table that controls the routing of packets between the LAN backbone and the wireless infrastructure. These entries contain information for all stations associated with the Aironet Access Point on the infrastructure.

Power Saving Protocol (PSP) and Non-Power Saving Protocol – The Power Saving Protocol allows computers (usually portable computers) to power up only part of the time to conserve energy. If a radio node is using the Power Saving Protocol to communicate with the infrastructure, the Aironet Access Point must be aware of this mode and implement additional features such as message store and forward.

Infrastructure – The wireless infrastructure is the communications system that combines Aironet Access Points, mobile stations and fixed stations. Aironet Access Points within the infrastructure can be either root units, which are physically wired to the LAN backbone, or can act as wireless repeaters. The RF enabled devices serve as fixed stations or mobile stations. (See **Figure 1.1**).

Figure 1.1 - Viewing the Infrastructure

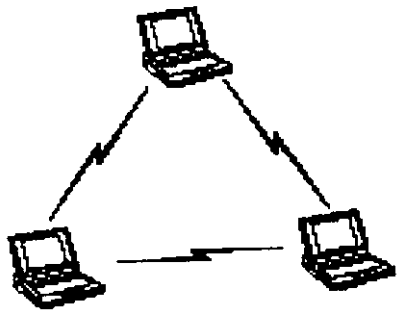


System Configurations

The MI3100 can be used in a variety of network system configurations. Aironet Access Points (AP3500-E or AP3500-T) provide connections to your Ethernet or Token Ring networks or act as repeaters increasing wireless communication range. The maximum communication range is based on how you configure your wireless infrastructure.

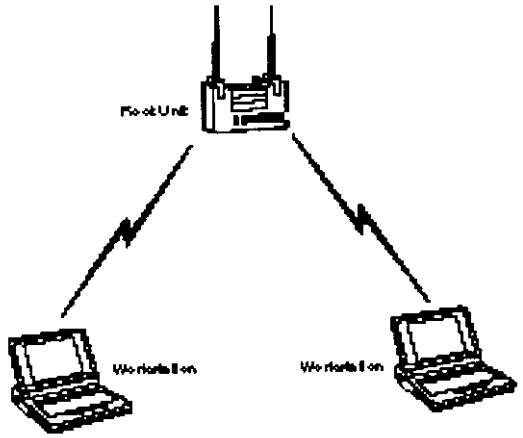
Examples of some common system configurations are shown on the pages that follow, along with a description of each.

Figure 1.2
2.4 GHz Ad Hoc Wireless LAN



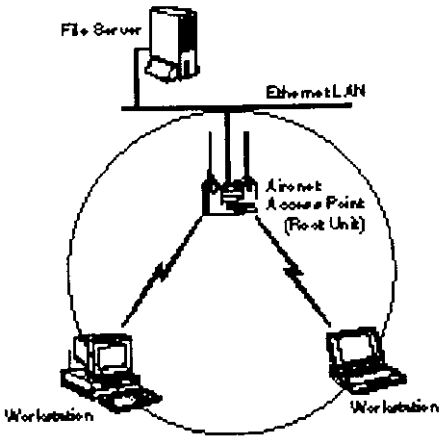
An ad hoc wireless LAN is the simplest wireless LAN configuration. In a wireless LAN, using an ad hoc network operating system (such as Windows for Workgroups or Windows 95), all devices equipped with the MI3100 can be linked together and communicate directly with each other.

Figure 1.3
2.4 GHz Wireless Infrastructure



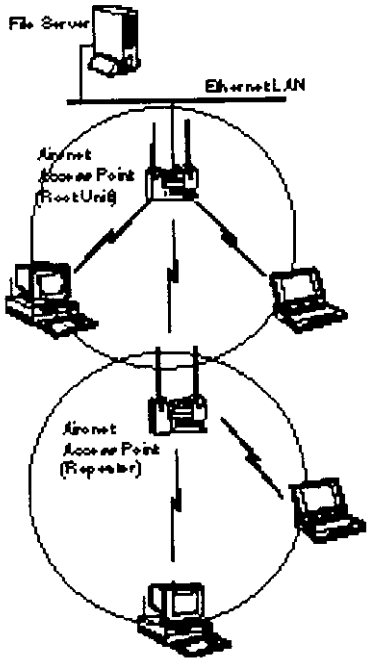
In a wireless infrastructure, an Aironet Access Point is used as a stand-alone root unit. The root unit is not attached to any backbone LAN (such as an Ethernet or Token Ring LAN), but functions as a hub linking all stations together. This configuration is similar to the ad hoc network, except the Aironet Access Point serves as the focal point for communications. This increases the effective communication since both MI3100 stations are not required to be in direct communication range of each other.

Figure 1.4
2.4 GHz Wireless Infrastructure with Workstations Accessing an Ethernet LAN



A Micro-Cellular Network can be created by placing two or more Aironet Access Points on an Ethernet LAN. The Micro-Cellular Architecture (TMA) protocols allow remote workstations to move from of one microcell domain to another. The process is seamless and transparent. The connection to the file server or host is maintained without disruption. This configuration is useful with portable or mobile stations allowing them to be directly connected to the wired network, even while moving about (roaming). When an infrastructure is configured using multiple Aironet Access Points and/or repeaters, a mobile station is automatically associated and re-associated to the Aironet Access Point which provides the best performance. This is referred to as seamless roaming.

Figure 1.5 - Extended 2.4 GHz Infrastructure Using Repeaters

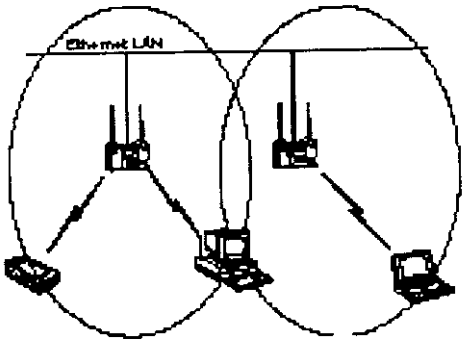


An Aironet Access Point can be configured as a stand-alone repeater to extend the range of your infrastructure, or to overcome an RF blocking obstacle. The repeater forwards traffic between the MI3100 equipped workstations and devices and the LAN backbone by sending packets to either another repeater or to another Aironet Access Point attached to the backbone. The data is sent through whichever route provides the greatest performance for the MI3100 client. Multiple repeater hops can be supported in the path to the wired LAN.

Coverage Options

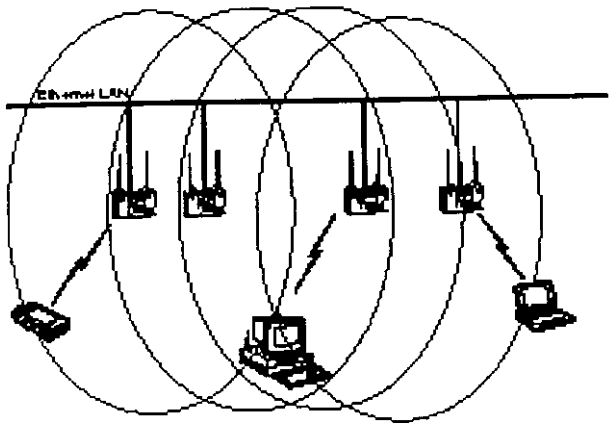
The system architecture options of the MI3100 station and Aironet Access Points provide for a variety of coverage alternatives and flexibility. The system can be designed to provide a wide coverage area with minimal overlap (Figure 1.6) or coverage with heavy overlap (Figure 1.7). This improves system performance and protection against downtime in the event of a component failure.

Figure 1.6 - Minimal Overlap Coverage Option



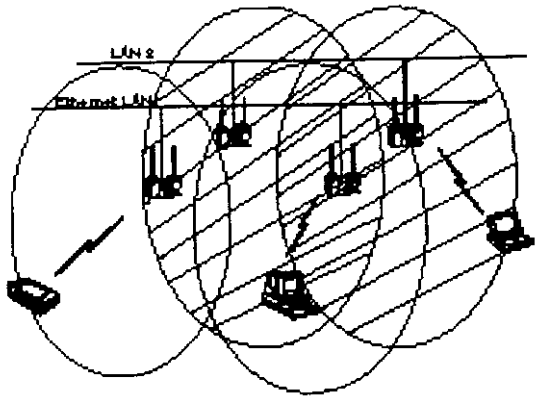
By arranging the Aironet Access Points so the overlap in coverage area is minimized, a large area can be covered with minimal system cost. The total bandwidth available to each mobile station will depend on the amount of data each mobile station desires to transfer and the number of stations located in each cell. Seamless roaming is supported as a mobile station moves in and out of range of each Aironet Access Point, thereby maintaining a constant connection to the LAN backbone. Each Aironet Access Point (and MI3100) must be configured with the same system identifier (SID) in order to provide the roaming capability.

Figure 1.7 - Heavy Overlap Coverage Option



By arranging the Aironet Access Points so the overlap in coverage area is nearly maximized, a large number of mobile stations can be supported in the same wireless infrastructure without degradation in system performance or connect time. Due to the redundancy in coverage overlap, system performance is not hampered in the event of an Aironet Access Point failure. Upon failure of the Aironet Access Point, the station will automatically roam to an operational Aironet Access Point. With this architecture, all Aironet Access Points and MI3100 units must be configured with the same system identifier (SID).

Figure 1.8 - Multiple Overlapping Systems Coverage Option



Multiple systems can operate in the same vicinity by arranging the Aironet Access Points so there is overlap in coverage area. The architecture provides multiple channels, which can exist in the same area with virtually no interference to each other. In this mode, each system must be configured with different system identifiers, which prevent MI3100 clients from roaming to the Aironet Access Points of a different wireless infrastructure.

Section 2

Installing the MI3100 Hardware

This Section describes the procedures for installing the Aironet MI3100 PC Card Wireless LAN Adapter.

Here's what you'll find in this Section:

- Before You Start
- Attaching the Antenna
- Connecting the MI3100

Before You Start

For the MI3100 to be used with a computing device (desktop personal computer, notebook, laptop computer, or point-of-sale terminal), the device must be equipped with an internal or external PC Card Type II or Type III slot. All drivers and supporting software (card and socket services) for the PC Card slot must be loaded and configured. Please follow the manufacturer's guidelines for installing the software as well as installing the MI3100.

After unpacking the MI3100, make sure the following items are present and in good condition:

- MI3100 PC Card Wireless LAN Adapter
- Standard Snap-On Antenna
- Configuration Software Diskette

If any item is damaged or missing, contact your Aironet supplier. Save all shipping and packing material in order to repack the unit should service be required.

> ***NOTE:*** Any remote antenna and its associated wiring are ordered and packed separately.

Standard Antennas

The Snap-On Diversity antenna comes with the MI3100.

The Snap-On Diversity antenna is attached directly to the MI3100. Its small size allows mobile communication in a small area where a larger antenna would be awkward or interfere with the use of the PC or terminal. For example, laptop computers connected together in an ad hoc network or mobile point-of-sale terminals connected to an Ethernet network via a fixed Aironet Access Point.

The design of the Snap-On and Remote Diversity antennas take full advantage of the MI3100's ability to detect and use the strongest signal.

The MI3100 can also be used with a variety of optional external antennas. Consult the Aironet Antenna Guide (document number 710-003725) for antenna descriptions and configuration information.

i **NOTE:** Only use antennas and cables supplied by Aironet Wireless Communications.

Attaching the Antenna

> ***CAUTION:*** The Snap-On Antenna should never be placed in contact with metal surfaces.

To attach the Snap-On antenna:

> ***NOTE***: MI3100 Adapter Card comes with the antenna attached. If you need to change the antenna, the MI3100 Adapter should be removed from the PC Card slot before removing or attaching an antenna.

1. Hold the antenna so the connector and guide pin leads line up with the connector and slots on the MI3100.
2. Slide the leads on the antenna into the connectors until they snap into place.

To attach a remote antenna:

1. Line up the antenna cable leads with the connectors on the MI3100.
2. Slide the leads cable into the connectors until they snap into place.

Detaching the Antenna

To detach the Snap-On Antenna:

1. Remove the MI3100 from the PC Card slot.
2. Grasp the center of the antenna with the thumb and forefinger.
3. Gently pull the antenna away from the MI3100 until it comes free.

CAUTION: Do Not bend or twist the antenna away from the PC Card body. Do not pry or use tools to remove the antenna.

To detach a remote antenna:

1. Remove the MI3100 from the PC Card slot.
2. Grasp the end of the antenna cable lead by the connector.
3. Gently pull the connector away from the MI3100 until it comes free.

Installing the MI3100 into the PC Card Slot

Before you begin, examine the MI3100. One end is a dual row 68-pin PC Card connector. This side will be inserted into the PC Card slot with the Aironet logo facing up. The MI3100 card is keyed so it can be inserted only one way into the PC Card slot.

The MI3100 can be connected to a PC Card Type II slot. This includes slots that support both Type II and Type III cards.

CAUTION: Do not force the MI3100 into the PC Card slot. Forcing it will damage both the MI3100 and the slot. If the MI3100 does not go in easily, remove the card and re-insert.

To connect the MI3100:

1. Hold the MI3100 so the Aironet logo is facing up.
2. Slide the MI3100 female end into the slot until its connector is firmly seated and the slot's eject button pops out.

To remove the MI3100:

1. Make sure the MI3100 is not transmitting or receiving.
2. Press the PC Card slot's eject button until the MI3100 is free.
3. Grasp the MI3100 and pull it out of the slot.

Section 3

Installing the MI3100 Software

The MI3100 card is supplied with PACKET, NDIS2, NDIS3 and NDIS3.1 drivers allowing operation under DOS, Windows for Workgroups 3.1x, Windows 95, and Windows NT. The MI3100 is fully IEEE 802.11 compliant with the Ethernet standard for frame types and addressing allowing it to function as a standard network interface card.

Driver Overview

The MI3100 is shipped with a utility disk containing drivers and diagnostic tools. The diagnostic tools are discussed in Section 4.

The DOS and Windows for Workgroups based drivers require a configuration file be created (or edited) with an ASCII text editor. Installation of each driver is discussed in the following Tables.

The driver disk shipped with the MI3100 is organized as follows:

Table 3.1 - Driver Disk Structure

README.TXT	contains latest information about the disk contents
DIAG	directory containing utilities
MICRO ISA.EXE	PC Card socket controller utility
TARG.EXE	MI3100 flash ROM programming utility
LOAD.BAT	batch file for executing test routines using direct communication with the 82365 socket controller
LOADBAT.BAT	batch file for executing test routines using card and socket services
LM3KCS.COM	utility file for TARG when using card and socket services
3KV????.HEX	latest firmware release
NDIS2	directory containing NDIS2 drivers
AWC2N3K.DOS	MI3100 NDIS2.1 driver
AWC2N3K.INF	NDIS2.1 install file
OEMSETUP.INF	NDIS2.1 compatible install file for Microsoft Windows for Workgroups
PROTOCOL.INI	Sample configuration file for infrastructure mode.
PROTOCOL.AHC	sample configuration file for ad hoc mode
PKT	directory containing DOS packet drivers
AWCP3K.COM	MI3100 DOS based packet driver
AWCP3K.INI	Sample configuration file for infrastructure mode
AWCP3K.AHC	sample configuration file for ad hoc mode
WIN95_NT	directory containing NDIS3 drivers
LM3500.INF	WIN95 install file
LM3500.SYS	NDIS3 driver
LM3500.DLL	NDIS3 library
OEMSETUP.INF	WIN NT install file

Windows 95 NDIS3 Installation

To complete the installation of the MI3100 under Windows 95, ensure that the Windows 95 PC Card driver is installed and PC Card 32-bit support is enabled.

> ***NOTE:*** To find out more about PC Card and PC Card 32-bit support follow the instructions found in the Section labeled "Enabling 32-bit PC card support", under "MICRO ISA" from the Windows 95 Help menu.

1. Power on your computer and boot Windows 95.
2. Insert the adapter in one of the PC Card slots.
3. Windows 95 will display the "New Hardware Found" dialog box.
4. Select the "Driver from disk provided by hardware manufacturer" option and select the "OK" button.
5. Insert the floppy disk provided with the adapter into the appropriate drive and press "Enter".
6. Select the MI3100 LAN Adapter and press "Enter".
7. Select the appropriate Infrastructure Mode and enter the System ID.
8. Press "Enter".

Choosing the adapter from the Network Icon and selecting Properties will allow the setting of additional parameters. Refer to the section on Driver Keywords and Settings in this section for information on these settings.

Windows NT NDIS3 Installation

1. Shutdown the Windows NT workstation.
2. Insert the MI3100 adapter in one of the PC Card slots.
3. Power up the Windows NT workstation.
4. From the control panel, select the Network icon.

	For Windows NT 4.xx	For Windows NT 3.51
5.	Select "Adapters".	Select "Add Adapters".
6.	Select "Add".	Select "<Other> Require disk from manufacturer" from the list of adapters.
7.	Select "Have Disk"	Select "Continue".

8. Insert the floppy disk provided with adapter in the appropriate drive and select "OK".
9. Select "OK" when the dialog box shows "Aironet MI3100 PC Card LAN Adapter".
10. Select the appropriate parameters. Verify that the Interrupt and IO Base Address do not conflict with other devices' resources.
11. Select "OK".
12. Select "Close".
13. Add all other related network information if applicable (IP address, DCHP, DNS, GATEWAY).
14. Select "Yes" to shutting down the workstation.

Windows for Workgroups NDIS2 Installation

The installation of this driver includes creating or editing a configuration file (PROTOCOL.INI). It is required that this file contain the following lines:

Table 3.2 - Minimum NDIS2 Driver Settings

INFRASTRUCTURE MODE	AD HOC MODE
[AW2N3K]	[AW2N3K]
DRIVERNAME=AWC2N3K$	DRIVERNAME=AWC2N3K$
INFRASTRUCTURE = "YES"	INFRASTRUCTURE = "NO"
SSID = "your_SSID_here"	SSID = "your_SSID_here"

Additional variables defined in the following section may also be used.

1. Power on your computer and start Windows for Workgroups.
2. Go to the Main program group and click on Windows Set-Up.
3. Choose "Change Network Settings" under the Options Menu.
4. Under Network Settings choose "Networks....".
5. Under Networks choose "Install Microsoft Windows Network". Select "OK".
6. Under Network Setup choose "Drivers...".
7. Under Network Drivers choose "Add Adapters".
8. If the drivers were already copied to the hard disk, they will be displayed in the list.
9. Under Add Adapter choose "Aironet LM3500 Adapter" If it is not on the menu list, choose "Unlisted" or "Updated Network Driver". The Install Driver pop up window will ask you for the Aironet driver disk.
10. Place Lan_Drv_3500 V1.XX in drive A:. Direct the path to A:\ndis2 and click on OK.
11. Choose the correct Aironet Adapter and click "OK".
12. If the chosen adapter is displayed in the "Network Drivers", click on "Setup".
13. Make changes to match the Aironet system.

DOS Packet Driver Installation

The installation of this driver includes creating or editing a configuration file (AWCP3K.INI). It is required that this file contain the following lines:

Table 3.3 - Minimum PKT Driver Settings

INFRASTRUCTURE MODE	AD HOC MODE
[AWCP3K]	[AWCP3K]
INFRASTRUCTURE = "YES"	INFRASTRUCTURE = "NO"
SSID = "your_SSID_here"	SSID = "your_SSID_here"

Additional variables defined in the following section may also be used.

Driver Keywords and Settings

The default MI3100 configuration:

- Non power save infrastructure mode allowing association with any Aironet Access Point matching the SSID supplied by the user
- The Factory supplied network address will be used
- Receive directed packets to this address as well as multicasts and broadcasts
- Retry data packets up to 16 times before discarding the frame
- Retry RTS sequence up to 16 times before discarding the frame
- RTS exchange will be used on all frames greater than 300 bytes
- Frames longer than 700 bytes will be fragmented
- Fragmented transmit packets will be killed if not delivered in 5 seconds
- Fragmented receive frames will be killed if not complete after
  10 seconds
- Active scanning with 3 msec energy detect time and 20 msec probe response wait timeout
- Four consecutively missed beacons will cause a re-scan
- MI3100 will send an Aironet Access Point keep-alive message every 10 seconds

The following tables contain keywords and parameter settings common to both the NDIS2 PROTOCOL.INI and the PKT AWCP3K.INI configuration files.

Basic system operation can be adjusted with the following parameters.

Table 3.4 - General Network Parameters

Parameters	Value	Description
INFRASTRUCTURE	ON/YES OFF/NO	Optional - specifies whether system operation uses an infrastructure (Aironet Access Point) or ad hoc (default is ON/YES).
SSID	0 to 32 character string	Optional - this parameter must match the SSID for proper infrastructure operation.
NETADDRESS	any IEEE MAC address except broadcast and multicast	Optional - this setting allows for locally administered MAC addresses by overriding the unique MAC ID on the MI3100.
RXMODE	NORMAL NOMULTICAST	Optional - this setting determines whether or not multicast frames are delivered to the driver from the MI3100 (default is NORMAL).
PRECONFIG	ON/YES OFF/NO	Optional - this parameter is used after a valid configuration has been saved in the flash. It specifies the saved configuration should be used (default is OFF/NO).
AUTOSAVE	ON/YES OFF/NO	Optional - specifies whether the user configuration will be saved in flash memory on the MI3100 (default is OFF/NO).

Network performance can be optimized with the following variables.

Table 3.5 - Advanced Network Parameters

Parameters	Value	Description
DATARETRYLIMIT	0 – 255	Optional - specifies the number of times a packet will be retried before the packet is dropped and a transmit error is reported to driver (default is 16).
RTSRETRYLIMIT	0-255	Optional - specifies the number of times that RTS/CTS will be retried to gain access before a packet is dropped and a transmit error is reported to the driver (default is 16).
RTSTHRESHOLD	0-2312	Optional - specifies the minimum frame size, in bytes, for which RTS/CTS delivery will be used. Packets longer than this value will be delivered using RTS/CTS handshaking (default is 300).
TXMSDULIFETIME		Optional - specifies the maximum time to attempt packet delivery (default is 5000000 usec [5 seconds]).
RXMSDULIFETIME		Optional - specifies the maximum time for receiving a fragmented packet (default is 10000000 usec [10 seconds]).
DIVERSITY	DEFAULT ON RIGHT LEFT	Optional - specifies the transmit diversity method to be used by the MI3100 (default is ON).

Additional system performance adjustments can be made with the following group of variables.

Table 3.6 - Fragmentation Parameters

Parameters	Value	Description
FRAG THRESHOLD	256-2312 (must be even)	Optional - specifies the fragmentation size in bytes. Frames longer than this value will be transmitted using multiple packets (default is 700).

MI3100 power management can be adjusted with the following group of variables.

Table 3.7 - Power Management Parameters

Parameters	Value	Description
POWER SAVEMODE	CAM, PSP	Optional - specifies a particular operational mode (default is CAM). CAM = Constant Awake Mode PSP = Power Save Poll Mode Note: For ad hoc mode, ATIMDURATION must also be set.
ATIM DURATION	0 - 0x2000	Ad hoc only - specifies the length of time in Kμsec for ATIMs following a beacon (this value must be non-zero for PSP ad hoc operation. 0 is nonPSP mode (default is 0x1400). This value must be a multiple of 0x400 with a minimum of 0x1400 (5Kμsec) suggested. This value is only used when starting a new network. When joining a network, the value currently in use will be adopted.
TIMWAKE FRACTION	2	Infrastructure only - determines how often to awaken for beacons. Note that the MI3100 will always awaken to receive DTIMs.

Scanning performance adjustments can be made with the following group of variables.

Table 3.8 - Scanning Parameters

Parameters	Value	Description
SCANMODE	ACTIVE PASSIVE	Optional - parameter to determine the current scanning mode to be used by the MI3100 (default is ACTIVE).
BEACON LISTENTO		Optional - determines the number of consecutively missed beacons, which will cause re-scan (default is 84).
PROBE ENERGYTO		Optional - determines the amount of time to listen for RF energy following a probe for active scanning mode (default is 0x0bb8 [3ms]).
PROBE RESPONSETO		Optional - determines the amount of time to wait for a probe response after energy is detected on a channel for active scanning mode (default is 0x4e20 [20ms]).

Aironet Access Point alternatives can be made with the following parameters.

Table 3.9 - Infrastructure Parameters

Parameters	Value	Description
REFRESH INTERVAL		Optional - determines the amount of time, in seconds, between refresh packets to the Aironet Access Point (default is 10).
SPECIFIEDAP	any IEEE MAC address except broadcast and multicast	Optional - forces association to specified Aironet Access Point.

Ad hoc system operation is accomplished with the following group of variables.

Table 3.10 - Ad Hoc Parameters

Parameters	Value	Description
JOINNETTO		Optional - determines the amount of time that an ad hoc station will scan before starting its own net (default is 10000000 [10sec]).
BEACONPERIOD	40Kμsec - 390Kμsec	Optional - specifies the beaconing interval in Kμsec. This value must be a multiple of 0x400 (default is 0x18000 [96kusec]).
CURRENTSET	1,2,3	Optional - specifies the current IEEE 802.11 hop set. All stations in the ad hoc network must match in order to communicate (default is 1).
CURRENT PATTERN		Optional - specifies the current IEEE 802.11 hop pattern to be used. All stations in the ad hoc network must match in order to communicate.
DWELLPERIOD	40Kμsec - 400msec	Optional - specifies the current time between hops and dwell period in microseconds. This value must be a multiple of 0x400 (default is 0x30000 [192kusec]).
ATIMDURATION	2000	Ad hoc only - specifies the length of time for ATIMs following a beacon (this value must be non-zero for PSP ad hoc operation). This value is only used when starting a new network. When joining a network, the value currently in use will be adopted.

When not using card and socket services, the following variables must be initialized and direct communication with an 82365 MICRO ISA socket controller chip be used.

Table 3.11 - PC Card Parameters

Parameters	Value	Description
PORTBASE	16 bit ports (length 8 bytes)	Optional - specifies the IO base at this location. This parameter must be specified when card and socket services are not used.
SOCKET		Optional - specifies the allowed PC Card socket. This parameter must be specified when card and socket services are not used (default is 1).
IRQ		Optional - specifies the IRQ number. This parameter must be specified when card and socket services are not used.
MEMORY		Optional - specifies the CIS attribute data window. This parameter must be used when card and socket services are not used.

Section 4

Performing Diagnostic Tools

This section details procedures for running diagnostics and updating firmware.

Here's what you'll find in this section:

- Using the Diagnostic Tools
- Loading New Firmware Versions

Using the Diagnostic Tools

To ensure the quality of your wireless infrastructure, Aironet provides link quality and site survey tools. A description of the tools and their use is outlined below.

Link Quality Tool

When using infrastructure mode, Aironet Access Points provide several methods for testing the transmission quality of the RF link and its performance between the MI3100 and the Aironet Access Point. The linktest option provides an easy method for testing the performance. To perform the linktest:

1. Configure the MI3100 so it associates to the Aironet Access Point (same SSID).
2. From the Aironet Access Point console, select **Configuration** from the Main Menu then select **Radio** from the Configuration Menu. Select the **Install** option to reach the Configuration Radio Install Menu. Choose **Linktest.**
3. Set parameters (Length) to approximate typical network data.

4. Execute Multicast Test from the Configuration Radio Install Linktest Menu to determine average first time packet delivery success.
5. Execute Unicast Test from the Configuration Radio Install Linktest Menu to determine statistics about packet delivery success utilizing the Aironet RF protocol.

This will provide average one-way and round-trip response times, average collision/packet error rate, average signal strength, and signal quality.

Additional data can be gleaned from the Statistics-Radio and Statistic-Throughput Menu options.

For more information on the Aironet Access Point testing procedures, consult the AP3500 Technical Guide.

Site Survey Tool

In order to perform a meaningful site survey, it is necessary to conduct a test which will accurately model the intended use of the system. It is important to perform a site survey using equipment which is similar to that implemented. Items to be surveyed are:

- transmit power
- antenna(s) type
- antenna(s) location
- packet (fragment) size
- interference

The site survey should be conducted with all variables set to the operational values. It should be performed during the time the RF link will generally be functioning with all other systems and noise sources operational.

The linktest tool is generally used to determine if a particular station can reliably communicate with the Aironet Access Point. However, linktest is a useful tool for determining the effective coverage range of an Aironet Access Point as well as the communication range of the stations/mobile stations.

For efficiency, the site survey application should be executed entirely from the mobile station. The linktest provides this capability when executed from a telnet session initiated from the mobile station. To perform the site survey:

1. Install the drivers.
2. Configure the drivers for network operation.
3. Ensure unique IP assignments of mobile/portable MI3100 device and Aironet Access Point.
4. Setup an Aironet Access Point for the intended operation (set fragmentation thresholds, RTS thresholds, etc.).
5. Start the operating system on the mobile station.
6. Configure the adapter.
7. Check that the mobile station is associated to the Aironet Access Point.
8. Start a telnet session on the mobile station to the Aironet Access Point. Depending upon the system in use, the telnet application may have logging and note taking capability. If so, enable these modes.
9. Navigate through the Aironet Access Point menu to the linktest option.
10. Setup the test options to accurately model the system (packet size, multicast, unicast, etc.).
11. Set the test for continuous operation with a 1 second delay.
12. Begin traversing the area around the Aironet Access Point to determine its coverage. If logging and notes are not possible with the telnet application being used, a manual log can be maintained. (The logging capability of the Aironet Access Point can also be used.)

Major Parameters

Packet Size: the shorter the packet sizes (fragment sizes), the higher the likelihood of successful delivery. The tradeoff is more overhead is incurred for the delivery of longer frames.

Unicast: this form of linktest closely resembles the normal packet delivery mechanisms. Acknowledgements are used and retries are allowed. If successful delivery before a maximum retry count is reached, it is considered a success.

Multicast: this form of linktest will more accurately depict the actual limits of the coverage area. Only packets delivered on the first attempt are counted as a success.

Issues

- The telnet session packets are interspersed with the test packets which may have the effect of increasing the roundtrip time for some frames. The linktest option will show progress changes as the test is being conducted.
- The packet first time delivery success rate may not be as important for transaction based systems and can result in a slightly larger range.
- Using longer packets can provide some degree of safety margin in the range estimate.
- Conducting the test during normal operational times will reflect the most accurate survey. A survey performed at night may not accurately reflect operation during the day when there are many more people present and equipment in operation.

Interpretation of Results

It is important to remember that the information being displayed is from the Aironet Access Point viewpoint. Therefore, packets sent are *from* the Aironet Access Point *to* the MI3100 client. Packets received, are *from* the MI3100 client *to* the Aironet Access Point.

Roundtrip time will be effected by the telnet session maintenance and the hopping overhead.
Signal quality is an estimate of the signal strength recorded at the time of packet reception by the radio.

Loading New Firmware Versions

The MI3100 firmware is contained in the card's flash memory. Flash memory allows for easy updating of the firmware as necessary.

To Download Firmware using card and socket services

1. LM3KCS 0x61
2. TARG –cs
3. Enter "L" at the * prompt to erase the flash memory.
4. Enter filename when prompted (ie., 3KV106_8.HEX).
5. Enter "q" at the * prompt to exit the utility.
6. Wait 15 seconds.
7. Reboot the host system.

To Download Firmware without using card and socket services

This option requires a host system with an 82365 (or 100% compatible) PC Card socket controller.

1. MICRO ISA ON *{-slot X}* enables power to socket # X, X=0 or 1
2. TARG
3. Enter "L" at the * prompt to erase the flash memory.
4. Enter filename when prompted (ie., 3KV106_8.HEX).
5. Enter "q" at the * prompt to exit the utility.
6. Wait for 15 seconds.
7. Reboot the host system.

Section 5

Error Messages and Trouble Shooting

The MI3100 provides LED messages and error codes. This section provides the general procedures for correcting common problems encountered when installing the MI3100 system.

Indicator LEDs

The MI3100 has two indicator LEDs (green and amber) located on the face of the card.

The green indicator is the Link Integrity/Power LED. It lights when the card is receiving power and flashes when the MI3100 is linked with the network.

The amber indicator is the Link Activity LED. It flashes when the MI3100 is receiving or transmitting data, or in a pattern to indicate an error condition.

See Tables 5.1, 5.2, and 5.3 for explanations of the LED Messages and Error Codes.

Appendix A - MI3100 Specifications

LAN Drivers Supported

Table A.1 - Supported Drivers

Protocol	Operating System
ODI	MS DOS, Windows 3.xx
NDIS 2	MS DOS, Windows 3.xx
NDIS 3 & 3.1	Windows 95, Windows NT
Packet	MS DOS, Windows 3.xx
TCP/IP	MS DOS, Windows 3.xx, Windows 95, Windows NT

Radio Specifications

Table A.2 - Radio Specifications

Item	Specification	Description
Radio Type	Frequency Hopper	2.4 GHz ISM Band
Operating Frequency	2400-2495	North American, ETSI, and Japan channel coverage, factory configurable
FCC ID	LOZ102036	FCC module approval (submission pending)
Channeling	1 MHz increments	Programmable for IEEE 802.11 or custom hop patterns
Type of Modulation	2GFSK (1 Mbit/s)	Nominal 1 MHz BW (-20 db)
Power Output (North American Configuration)	63mW	Meets FCC Part 15.247 requirements
Antenna Type		External connection one antenna jacks (primary and secondary)
Antenna Connectors	1 Amphenol MicroMate female	Unique connector per FCC Part 15.203. Snap-on with 1.5-2.5 lb disengagement force
Mating cable connectors	Huber & Suhner: Amphenol:	MMCX-50 Series MicroMate Series
PC Card Connector	Micro ISA	40 pin connector