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Infrared Wireless LAN Adapter

Installation and User's Guide

Product Warranties and Notices: Before using this information and the product it supports, be sure to read the general information on page 81.

Second Edition (December 1994)

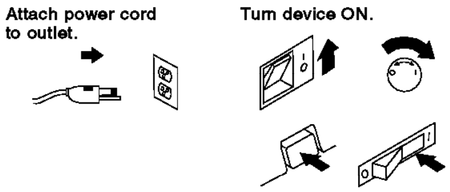
Requests for technical information about IBM products should be made to your IBM Authorized Dealer or your IBM Marketing Representative.

Contents

Safety Information

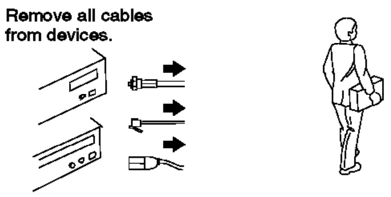
DANGER:

To Connect



[1] In the U.K., by law, the telephone cable must be connected after the power cord.

To Disconnect



[2] In the U.K., by law, the power cord must be disconnected after the telephone line cable.

Introducing the Infrared Wireless LAN Adapter

Important:

1. The illustrations in this publication may be slightly different from your hardware.
2. Be sure to retain your proof of purchase because it might be required to receive warranty service. You can find information on how to get help, technical support. and warranty service in "Help and Service Information" on page 44.

The Infrared Wireless LAN Adapter provides you with the flexibility, productivity, and ease of use features of a wireless local area network (LAN). The adapter is designed to implement stand-alone wireless LANs or may be used in a new or existing wired LAN running the Open Data-Link Interface (ODI) protocol, or the Network Driver Interface Specification (NDIS).

In addition, you can set up an Ethernet or Token-Ring Access Point (AP) to provide a connection between your wireless and wired LANs.

Now you can have the flexibility of a portable computer without sacrificing the power of shared resources. After spending the day in the field collecting data or sales orders, you can return to the office with your portable computer and immediately print your orders, add your data to the shared database, and catch up on your electronic mail. Multiple mobile users can even share the same desktop printers and LAN access point.

Just as importantly, the Infrared Wireless LAN Adapter allows you to create spontaneous networks wherever you go. You can have the convenience of a wireless connection between your portable computer and your desktop computer. Two or more portable computers equipped with the Infrared Wireless LAN Adapter can exchange information anywhere: in a conference room, a bank, a classroom, even an airplane.

The Infrared Wireless LAN Adapter uses diffuse infrared technology for maximum flexibility. You can place your equipment where it is needed because the infrared transceivers do not need to be aimed. You do not have to worry about your computer's batteries because the Infrared Wireless LAN Adapter does not use much power. There are not any environmental or regulatory issues to consider because infrared is the same safe, unregulated technology used in remote controls for home electronics, such as VCRs and televisions.

What is Included With the Infrared Wireless LAN Adapter

The Infrared Wireless LAN Adapter package contains the following:

- One of the following adapters:
  - A Personal Computer Memory Card International Association (PCMCIA) Type II adapter. This adapter comes in one of two configurations:
    - An integrated adapter/transceiver, or
    - An adapter which connects to a separate transceiver via the transceiver tether. The transceiver transmits and receives the infrared signals.
  - An industry standard architecture (ISA) PC adapter
  - A Micro Channel* architecture adapter.
- The *Infrared Wireless LAN Program Diskette*, containing the following:
  - Device drivers supporting:
    - Artisoft's LANtastic/AI** for DOS and Windows
    - IBM's DOS LAN Support Program
    - IBM's LAN Server/Requester
    - TCP/IP (Transmission Control Protocol/Internet Protocol) for DOS or OS/2
    - Microsoft's Windows for Workgroups**

* *Trademark of the IBM Corporation.*

- Novell NetWare** (Versions 3.11, 3.12, and 4.0) NetWare Lite** (Version 1.1), and Personal NetWare**.
– A setup (.ADF) file for Micro Channel computers.
– Two diagnostic utilities: one for use with the Micro Channel adapter, the other for all versions of the adapter.
– A sample NET.CFG file for NetWare installation
– Network information (.NIF) files to support the DOS NDIS device drivers.
– Installation utilities to perform the following:
  - Verify that your installation of the Infrared Wireless LAN Adapter was successful
  - Install the software to create an Access Point computer
– A READ.ME file

• This User's Guide.

System Requirements

To use the Infrared Wireless LAN Adapter, you need:

1. An IBM or IBM-compatible desktop, laptop, or notebook computer with an available 16-bit ISA or Micro Channel slot, or a Type II PCMCIA slot.
2. One of:
   - PC-DOS Version 5.0 or higher
   - MS-DOS** Version 5.0 or higher
   - Windows** 3.1 running under DOS.
   - OS/2* Version 2.0.
3. A network operating system supported by one of the device drivers shipped with the Infrared Wireless LAN Adapter.

** *LANtastic/AI is a trademark of Artisoft, Inc., Windows for Workgroups is a trademark of Microsoft Corporation, and Novell, Novell NetWare, NetWare Lite, and Personal NetWare are trademarks of Novell, Inc.*

** *MS-DOS and Windows are trademarks of Microsoft Corporation.*

Installing Your PCMCIA Infrared Wireless LAN Adapter

Before You Install:

1. **Read the safety notice in "Safety Information" on page vi.**
2. Be sure to read the READ.ME file on the *Infrared Wireless LAN Program Diskette* for any updates to the product.

Installing the Hardware

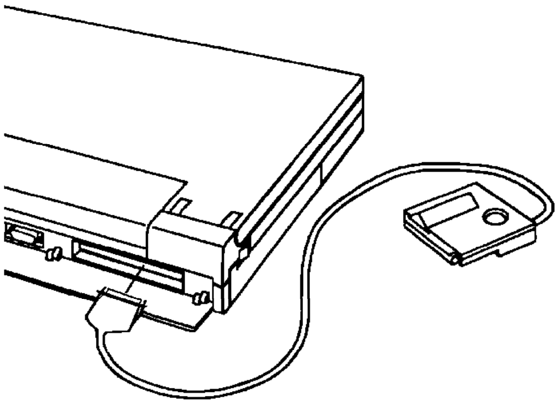
The Infrared Wireless LAN Adapter is easy to install. Just follow the step-by-step instructions in this manual. If you are not sure that you can install the adapter correctly, contact a dealer or trained service technician.

Note: These instructions assume that you have PCMCIA Card and Socket Services 2.0 or higher installed on your computer. Card and Socket Services automatically handles the setting of I/O memory addresses, interrupt request lines (IRQs), and base memory addresses. If you do not have Card Services installed, you will need to set these manually. Refer to "Operating Without Card and Socket Services" on page 6 for instructions.

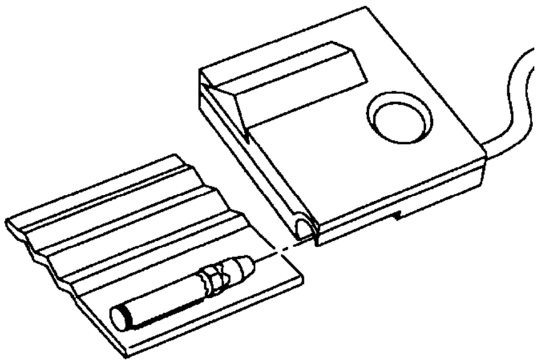
1. Insert the Infrared Wireless LAN Adapter into the PCMCIA slot of your computer. *Note that your computer does not need to be powered off.*

   If you are installing the integrated adapter/transceiver you can now go on to install the software. See "Installing the Software" on page 18 for instructions. If you have a tethered transceiver, continue on with the remainder of these instructions.

2. Connect the transceiver to the Infrared Wireless LAN Adapter by plugging it into the adapter.



3. Attach the transceiver to the mount. Slide the cylindrical part of the mount into the corresponding groove on the transceiver.



When the mount is attached, you can adjust the angle of the transceiver by tilting it up or down in the mount.

4. Adjust the angle of the transceiver in the mount to ensure that as much of the signal as possible reaches the ceiling. For information about how to place the transceiver for best results, see "Using Your Infrared Wireless LAN Adapter" on page 42.

You should now proceed to install the network operating system and device driver. See "Installing the Software" on page 18 for installation instructions.

Operating Without Card and Socket Services

If you do not have Card Services, you may need to manually update the NET.CFG file (for a Novell installation) or .NIF file (for a DOS NDIS installation) in order to specify an IRQ, I/O address, and base memory address. You may also use the sample NET.CFG or .NIF files on the *Infrared Wireless LAN Program Diskette*.

Important: The PCMCIA Infrared Wireless LAN Adapter relies on PCMCIA Card and Socket Services release 2.0 or higher to manage memory, I/O addresses, and IRQs. The use of Card and Socket Services is highly recommended and fully supported. This section is provided for your information only, and does not imply support for operation without Card and Socket Services.

The recommended settings for the adapter are:

INT (interrupt request line)
3, 4, 5, 7, 9, 10, 11, 14, or 15. We recommend that you set this to 15.

Note: Do not use IRQ 10 for the IBM ThinkPad* 750 or 750C. This IRQ is typically reserved for the ThinkPad's internal audio adapter.

PORT (I/O address)
300H - 370H. We recommend that you set this to 300. Also note that the I/O address range starts on a 10H boundary (300, 310, 320, and so on).

MEM (memory address)
C0000 - DFFFF. We recommend that you set this to D0000. These memory regions begin on 8K boundaries (C0000, C2000, C4000, and so on).

You should ensure that your choice of memory address does not conflict either with EMM386.EXE or any other PCMCIA adapter memory address. To exclude memory from use by EMM386.EXE, use the X=NNNN-NNNN parameter on the EMM386.EXE device statement in your CONFIG.SYS file. Refer to your operating system documentation for complete information on EMM386.EXE. Refer to the documentation that came with your other PCMCIA adapters for information specific to their configuration and memory address requirements.

Installing Your ISA Infrared Wireless LAN Adapter

Before You Install:

1. **Read the safety notice in "Safety Information" on page vi.**
2. Be sure to read the READ.ME file on the *Infrared Wireless LAN Program Diskette* for any updates to the product.

Installing the Hardware

The Infrared Wireless LAN Adapter is easy to install. Just follow the step-by-step instructions in this manual. If you are not sure that you can install the adapter correctly, contact a dealer or trained service technician.

Determining Your Configuration

Before you install the Infrared Wireless LAN Adapter, you need to decide which I/O address and which interrupt request (IRQ) line you want the adapter to use.

In most cases you will be able to use the adapter with the factory switch settings. If there are any conflicts with other adapters, you will need to change either the Infrared Wireless LAN Adapter's settings or the other adapter's settings. Check the documentation that came with your computer and the adapters you have installed to see which IRQs and I/O addresses are already in use. For more information, see "Reconfiguring the Adapter" on page 11.

Installation Instructions

The ISA version of the Infrared Wireless LAN Adapter fits into a 16-bit expansion slot in your computer. The illustrations in this section show a typical computer. Yours may look different, so make sure to consult its manual for instructions about adding adapters.

1. Turn off the computer and remove its power cord.

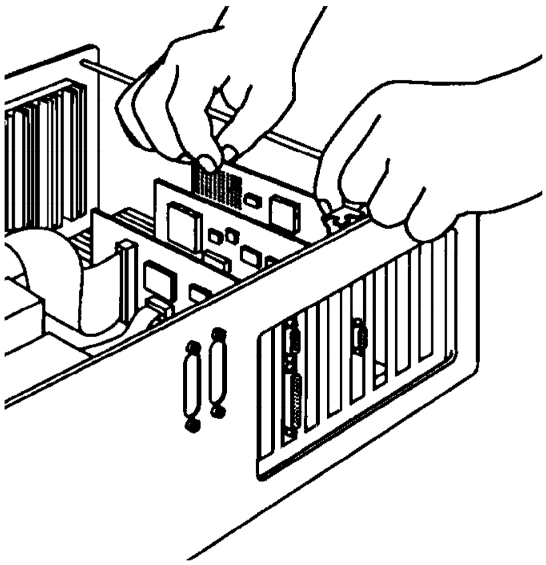
2. Turn off all external devices such as printers or displays connected to the computer.

3. Remove the cover from the computer to expose the expansion slots. The way you remove the cover depends on the kind of computer you have. On most computers, you need to remove some screws with a screwdriver. For detailed instructions, see the manual that came with your computer.

4. Locate an unused expansion slot.

5. Remove the cover from the back of the slot you have chosen. Save the screw you remove.

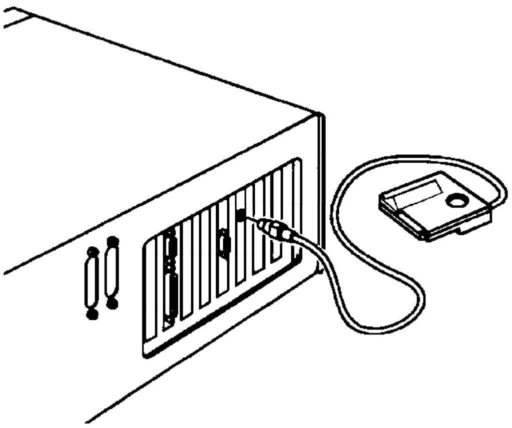
6. Carefully press the adapter into the slot. The gold plated connectors on the bottom of the adapter fit into the slot. Make sure the adapter is inserted all the way, but do not push too hard.



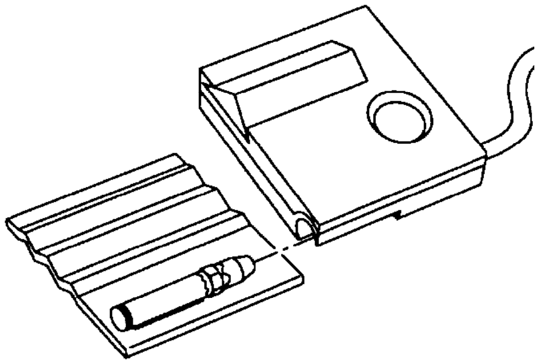
7. Secure the adapter's bracket to the computer's frame. Fasten the bracket with the screw you removed in step 5.

8. Replace the computer's cover.

9. Connect the transceiver to the Infrared Wireless LAN Adapter by plugging it into the socket on the back of the adapter.



10. Attach the transceiver to the mount. Slide the cylindrical part of the mount into the corresponding groove on the transceiver.



When the mount is attached, you can adjust the angle of the transceiver by tilting it up or down in the mount.

11. Adjust the angle of the transceiver in the mount to ensure that as much of the signal as possible reaches the ceiling. For information about how to place the transceiver for best results, see "Using Your Infrared Wireless LAN Adapter" on page 42.

12. Reconnect the power cord to the computer and turn it on.

You should now proceed to install the network operating system and device driver. See "Installing the Software" on page 18 for installation instructions.

Reconfiguring the Adapter

Depending on how your system is set up, you may need to change the default I/O address (sometimes called port address) and the interrupt request (IRQ) line used by the Infrared Wireless LAN Adapter.

To see which interrupt lines and I/O addresses are already in use, refer to the documentation that came with your computer and the expansion adapters you have already installed. You can also check which addresses and IRQs are in use with various software tools, such as the Control Panel in Windows.

Changing the I/O Address

To change the default I/O address, you need to change the settings of the DIP switches on the adapter. Look for a bank of eight small switches on the Infrared Wireless LAN Adapter. Each switch is numbered and marked ON on one side and OFF on the other. To set the I/O address, change the positions of the switches with the point of a ballpoint pen or a similar tool.

Note that switches one through three are reserved and should be set OFF.

Here are the sixteen possible memory/I/O address combinations and the switch settings for each one:

Figure 1 (Page 1 of 2). DIP Switch Settings (also see the notes following this table).

Memory address	I/O address	Switch 5	Switch 6	Switch 7	Switch 8
C0000H[1]	300H	on	on	on	on

Figure 1 (Page 2 of 2). DIP Switch Settings (also see the notes following this table).

Memory address	I/O address	Switch 5	Switch 6	Switch 7	Switch 8
C2000H[1]	310H	off	on	on	on
C4000H[1]	320H	on	off	on	on
C6000H	330H	off	off	on	on
C8000H	340H	on	on	off	on
CA000H	350H	off	on	off	on
CC000H	360H	on	off	off	on
CE000H	370H[2]	off	off	off	on
D0000H	300H	on	on	on	off
D2000H	310H	off	on	on	off
D4000H	320H	on	off	on	off
D6000H	330H	off	off	on	off
D8000H	340H	on	on	off	off
DA000H	350H	off	on	off	off
DC000H	360H	on	off	off	off
DE000H	370H[2]	off	off	off	off

DIP Switch Setting Notes:

1. Do not use the C0000-C4000 memory range when configuring PS/1* computers. Using this memory range causes memory problems with the PS/1 and can cause unpredictable results.
2. Do not use I/O address 370H for industry standard architecture (ISA) computers. For some of these machines, the BIOS checks this I/O space for a secondary parallel port when the computer is switched on. This checking can cause the Infrared Wireless LAN Adapter to not function properly.

Changing the Interrupt Request (IRQ) Line

You need to select an IRQ line in order to allow the adapter to communicate with the system. You select the IRQ using DIP switch four. Set the switch ON to select an IRQ of 10. Set the switch OFF to select an IRQ of 15. If you find that there is a conflict with another I/O device try changing the IRQ. If you find that changing the IRQ of the LAN adapter does not fix the conflict, try changing the IRQ of the other device.

Installing Your Micro Channel Infrared Wireless LAN Adapter

Before You Install:

1. **Read the safety notice in "Safety Information" on page vi.**
2. Be sure to read the READ.ME file on the *Infrared Wireless LAN Program Diskette* for any updates to the product.

Installing the Hardware

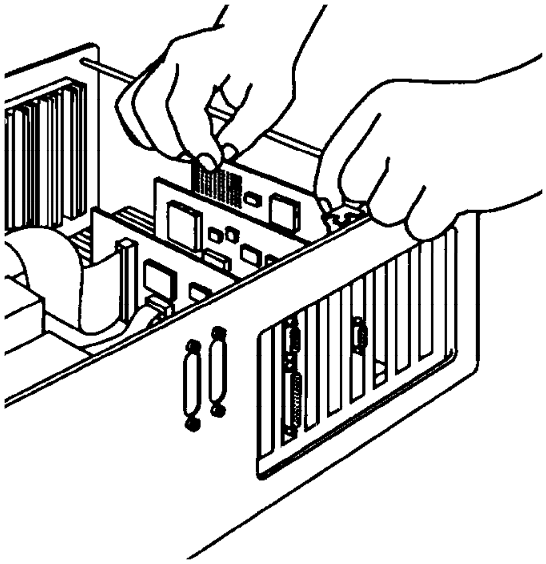
The Infrared Wireless LAN Adapter is easy to install. Just follow the step-by-step instructions in this manual. If you are not sure that you can install the adapter correctly, contact a dealer or trained service technician.

The Infrared Wireless LAN Adapter fits into a 16-bit expansion slot in your computer. The illustrations in this section show a typical computer. Yours may look different, so make sure to consult its manual for instructions about adding adapters.

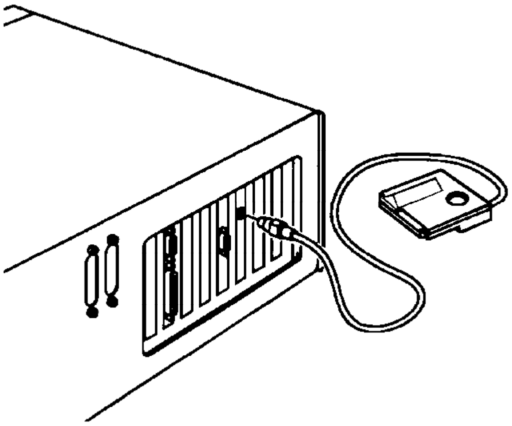
1. Boot up your computer using your backup copy of your Quick Reference diskette.
2. Select the option to copy an option diskette.
3. Follow the online directions and insert the *Infrared Wireless LAN Program Diskette* when you are prompted to do so.
4. When your Quick Reference diskette is updated, run automatic configuration. This sets your I/O address, the adapter memory address, and the interrupt request (IRQ) level.

   If any conflicts are detected during automatic configuration, follow the online instructions to resolve them.
5. Turn off the computer and remove its power cord.
6. Turn off all external devices such as printers or displays connected to the computer.

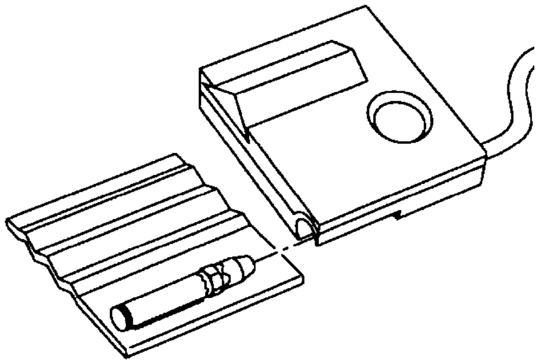
7. Remove the cover from the computer to expose the expansion slots. The way you remove the cover depends on the kind of computer you have.
8. Locate an unused expansion slot.
9. Remove the cover from the back of the slot you have chosen.
10. Carefully press the adapter into the slot. The gold plated connectors on the bottom of the adapter fit into the slot. Make sure the adapter is inserted all the way, but do not push too hard.



11. Secure the adapter′s bracket to the computer′s frame.
12. Replace the computer′s cover.
13. Connect the transceiver to the Infrared Wireless LAN Adapter by plugging it into the socket on the back of the adapter.



14. Attach the transceiver to the mount. Slide the cylindrical part of the mount into the corresponding groove on the transceiver.



When the mount is attached, you can adjust the angle of the transceiver by tilting it up or down in the mount.

15. Adjust the angle of the transceiver in the mount to ensure that as much of the signal as possible reaches the ceiling. For information about how to place the transceiver for best results, see "Using Your Infrared Wireless LAN Adapter" on page 42.

16. Reconnect the power cord to the computer and turn it on.

You should now proceed to install the network operating system and device driver. See "Installing the Software" on page 18 for installation instructions.

Installing the Software

The Infrared Wireless LAN Adapter comes with device drivers that allow you to use it with the following products:

Artisoft's LANtastic/AI (DOS)
: Instructions for installing the adapter support for the DOS version of LANtastic/AI start on page 19.

Artisoft's LANtastic/AI (Windows)
: Instructions for installing the adapter support for the Windows version of LANtastic/AI start on page 21.

IBM's LAN Support Program (DOS)
: Instructions for installing the adapter support start on page 24.

IBM's LAN Server/Requester (OS/2)
: Instructions for installing the adapter support start on page 25.

IBM's TCP/IP for DOS
: Instructions for installing the adapter support start on page 28.

IBM's TCP/IP for OS/2
: Instructions for installing the adapter support start on page 30.

Microsoft's Windows for Workgroups
: Instructions for installing the adapter support start on page 33.

Novell's Netware and NetWare Lite
: Instructions for installing the adapter support start on page 34.

Novell's Personal NetWare
: Instructions for installing the adapter support start on page 37.

The device drivers (sometimes called LAN drivers) are located on the *Infrared Wireless LAN Program Diskette*.

Before you install the software, you should make a backup copy of the diskette. Use your copy for the installation and keep the original in a safe place. Refer to the READ.ME file for information on any updates made to this product since this manual was printed.

Installation Utilities

Many of the installation procedures require some manual editing of various configuration files. To determine whether you have made all the necessary changes successfully, you can run the Verify program from the *Infrared Wireless LAN Program Diskette*. For information on the installation utilities, refer to "Installation Utilities" on page 40.

Installing Device Drivers for LANtastic/AI (DOS)

This section provides you with the information you require in order to install the device drivers for the Infrared Wireless LAN Adapter if you are using it with the DOS version of LANtastic/AI. For instructions on how to use LANtastic/AI, you should refer to the documentation that came with it.

Before You Install: Please note that this installation procedure requires that you have a diskette containing LANtastic/AI NDIS Support files. This diskette is available both from Artisoft and from the Artisoft Forum on CompuServe.

To install the device drivers for the Infrared Wireless LAN Adapter, do the following:

1. Follow the instructions for installing LANtastic/AI. At the point where you are prompted to enter the **Network Adapter Installed**, press the Enter key to display the list of supported adapters and move the cursor down to **Other NETBIOS Compatible Adapter**. Press the Enter key to select this option.
2. Move the cursor down to **Perform Installation** and press the Enter key. Press Enter again to confirm that you wish to proceed with the installation. Files are copied to your workstation.
3. When the installation procedure stops and the command prompt appears, insert the diskette

containing the LANtastic AI NDIS Support files. Type `install` and press Enter.

4. On the **AI-NDIS Installation Program** screen, select **LANtastic NDIS for Other Network Adapters** and press Enter.
5. Follow the instructions that appear on the screen until you are prompted to enter the installation directory. If you used the default directory (\LANTASTI), then accept the path and press Enter. If you chose a different installation path, then enter that path name and press Enter. Files are copied to your hard drive.
6. When you are prompted to insert the **manufacturer's driver diskette**, insert the *Infrared Wireless LAN Program Diskette* and press Enter. Files are copied to your hard drive.
7. You will receive a warning message stating that you need to edit your PROTOCOL.INI file. This is normal, and the instructions for how to do this are contained later on in this installation procedure.
8. Press Enter to continue the installation process and note the message that tells you that a file called STRTNDIS.BAT has been created in your target installation directory. You will need to edit this file later on in the installation procedure.
9. Allow the program to modify your CONFIG.SYS file when it prompts you. Press the Enter key and read the message screens as they are displayed.
10. Read the screen titled **NDIS Support for LANtastic is now installed**. It mentions the STARTNET.BAT file. You will need to edit this file as well. Press Enter to remove the screen.
11. You are now reminded that you need to reboot your computer to have the changes take effect. Before you reboot however, you need to edit the STARTNET.BAT, STRTNDIS.BAT, and PROTOCOL.INI files as shown in the remaining steps. All of these files should be in your target installation directory (\LANTASTI is the default directory).
12. Edit the STARTNET.BAT file as follows:
    a. Find the statement starting with the text: REDIR...

b. Add the following line *just before* the REDIR statement:

```
CALL C:\LANTASTI\STRTNDIS.BAT
```

assuming that C:\LANTASTI is the directory you installed to.

c. Save the file.

13. Edit the STRTNDIS.BAT file as follows:

a. Change the line reading:

```
AILANBIO
```

to

```
AILANBIO IPX_ROUTING
```

b. Save the file.

14. Edit the PROTOCOL.INI file as follows:

a. Find the *first occurrence* of the line

```
[IRMAC_NIF]
```

and either delete it, or comment it out by inserting a semi-colon (;) in the first column:

```
;[IRMAC_NIF]
```

b. Save the file.

15. Reboot your machine. Note that if you have installed the ISA version of the Infrared Wireless LAN Adapter, you will need to turn your computer off and then on again.

16. The adapter is now installed and you can start up the LAN support following the instructions provided with LANtastic/AI.

Installing Device Drivers for LANtastic/AI (Windows)

This section provides you with the information you require in order to install the device drivers for the Infrared Wireless LAN Adapter if you are using it with the Windows version of LANtastic/AI. For instructions on how to use LANtastic/AI, you should refer to the documentation that came with it.

Before You Install: Please note that this installation procedure requires that you have a diskette containing LANtastic/AI NDIS Support files. This diskette is available both from Artisoft and from the Artisoft Forum on CompuServe.

To install the device drivers for the Infrared Wireless LAN Adapter, do the following:

1. Start Windows.
2. Insert the *LANtastic/AI Network Operating System with Windows Interface* diskette 1 into your drive.
3. In **Program Manager** select **File** and then **Run**. Type `a:\install` and click on **OK**.
4. After reading the introductory installation screen, click on **Continue**. Files are copied to your hard drive.
5. After the files have been copied, choose the installation procedure you wish to follow, **Quick** or **Custom**.
6. When you are prompted to enter the machine information, enter a name for your machine, select whether you are installing Workstation or Server support and, under **Network Adapter**, choose **Other NETBIOS Compatible Network Adapter**. You may also proceed to do other configuration activities at this point (setting up printer support, for instance).
7. When you are ready, click on **Go**. Files are copied to your hard drive.
8. When prompted, insert the second *LANtastic/AI Network Operating System with Windows Interface* diskette into your drive. Click on **Continue**. Files are copied to your hard drive.
9. When installation of the LANtastic support is complete, click on **Exit**.
10. Insert the diskette containing the LANtastic AI NDIS Support files into your drive. Click on **File** and then **Run**. Type `a:\install` and click on **OK**.
11. On the **AI-NDIS Installation Program** screen, select **LANtastic NDIS for Other Network Adapters** and press Enter.

12. Follow the instructions that appear on the screen until you are prompted to enter the installation directory. If you used the default directory (\LANTASTI), then accept the path and press Enter. If you chose a different installation path, then enter that path name and then press Enter. Files are copied to your hard drive.
13. When you are prompted to insert the **manufacturer's driver diskette**, insert the *Infrared Wireless LAN Program Diskette* and press Enter. Files are copied to your hard drive.
14. You will receive a warning message stating that you need to edit your PROTOCOL.INI file. This is normal, and the instructions for how to do this are contained later on in this installation procedure.
15. Press Enter to continue the installation process and note the message that tells you that a file called STRTNDIS.BAT has been created in your target installation directory. You will need to edit this file later on in the installation procedure.
16. Allow the program to modify your CONFIG.SYS file when it prompts you. Press the Enter key and read the message screens as they are displayed.
17. Read the screen titled **NDIS Support for LANtastic is now installed**. It mentions the STARTNET.BAT file. You will need to edit this file as well. Press Enter to remove the screen.
18. You are now reminded that you need to reboot your computer to have the changes take effect. Before you reboot however, you need to edit the STARTNET.BAT, STRTNDIS.BAT, and PROTOCOL.INI files as shown in the remaining steps. All of these files should be in your target installation directory (\LANTASTI is the default directory).
19. Edit the STRTNDIS.BAT file as follows:
    a. Change the line reading:
    ```
    AILANBIO
    ```
    to
    ```
    AILANBIO IPX_ROUTING
    ```

b. Save the file.

20. Edit the PROTOCOL.INI file as follows:

    a. Find the *first occurrence* of the line

    ```
    [IRMAC_NIF]
    ```

    and delete it, or comment it out by inserting a semi-colon (;) in the first column:

    ```
    ;[IRMAC_NIF]
    ```

    b. Save the file.

21. Exit Windows and reboot your machine. Note that if you have installed the ISA version of the Infrared Wireless LAN Adapter, you will need to turn your computer off and then on again.

22. The adapter is now installed and you can start up the LAN support following the instructions provided with LANtastic/AI.

Installing Device Drivers for the LAN Support Program (DOS)

This section provides you with the information you require in order to install the device drivers for the Infrared Wireless LAN Adapter if you are using it with the LAN Support Program. Note that the LAN Support Program by itself does not provide you with a complete networking system. You need to run a network application, such as LANtastic/AI, on top of it. For instructions on how to use the LAN Support Program, you should refer to the documentation that came with it.

To install the device drivers for the Infrared Wireless LAN Adapter, do the following:

1. Insert the *LAN Support Program Installation Aid* diskette into your drive.
2. At the DOS command prompt, type:

    ```
    A:\DXMAID
    ```

3. Proceed through the introductory screens until you reach the screen **Environmental Information**. Accept

all the default settings on this screen and enter the directory name you wish to use for the installation path.

4. Insert the *Infrared Wireless LAN Program Diskette*.
5. On the **Process Adapter Option Diskette** screen, type A:\DOS. This is the directory where the DOS drivers reside. Press Enter to install the drivers.
6. If you need to install support for additional adapters, repeat the process for each adapter type. When you are finished, insert the *LAN Support Program Installation Aid* diskette again and press F5 to change parameters.
7. If you are using locally administered addresses, enter the unique 12 character network address for the adapter.
8. Press F4 to save the information.
9. In order for your system to recognize the adapter, you should now restart your computer by pressing Ctrl+Alt+Del. Note that if you have installed the ISA version of the Infrared Wireless LAN Adapter, you will need to turn your computer off and then on again.

Installing Device Drivers for LAN Server/Requester (OS/2)

This section provides you with the information you require in order to install the device drivers for the Infrared Wireless LAN Adapter if you are using it with LAN Server/Requester under OS/2. For instructions on how to use LAN Server/Requester, you should refer to the documentation that came with it.

To install LAN Server/Requester, you must first install or reinstall Lan Adapter and Protocol Support (LAPS) using the LAPS diskette that came with LAN Server/Requester. If you reinstall LAPS, you may receive messages informing you that you are installing an older version of the drivers than is currently on your system, and asking you whether you wish to proceed. You *should* proceed in order to ensure that the appropriate adapter support is installed to work properly with LAN Server/Requester.

This procedure will simply update the adapter support and will not disturb any adapter or protocol configurations you may have already set up.

To install the device drivers for the Infrared Wireless LAN Adapter, do the following:

1. Click on **Install** from the LAPS main screen. When you are prompted for the drive to install from, insert the *Infrared Wireless LAN Program Diskette*, type A:\OS2, and then click on **OK**.
2. Click on **OK** as each driver is loaded.
3. When the drivers have finished loading, click on **Configure** from the main menu.
4. Click on **Configure LAN transports** and then **Continue**.
5. Under **Network Adapters** select the appropriate Infrared Wireless LAN Adapter. Then click on the **Add** button.
6. Choose **IBM OS/2 NetBIOS** from the list of protocols and click on the **Add** button.
7. Click on **OK** on the main menu, and then **Exit**.
8. Click on **Continue** when you are asked whether to update your CONFIG.SYS file.
9. If you are installing support for either of the PCMCIA versions of the Infrared Wireless LAN Adapter, you should run IRCFGCHK. This program will ensure that the order of the Card and Socket Services statements in your CONFIG.SYS file is correct. To run this program, insert the *Infrared Wireless LAN Program Diskette* and type A:\OS2\IRCFGCHK. Follow the online instructions.
10. Reboot your computer.

PCMCIA and the CONFIG.SYS File

If you have installed support for the PCMCIA version of the Infrared Wireless LAN Adapter, please ensure that the order of the Card and Socket Services driver statements and the adapter driver statements is correct in your CONFIG.SYS file (see below for an example). If the statements are not in the correct sequence, the adapter will not function properly. You can ensure that the statements are in the correct order by running the IRCFGCHK program. This program is documented in the device driver installation procedure, above.

Here is an example of the correct order of statements in your CONFIG.SYS file:

```
DEVICE=C:\OS2\PCMCIA.SYS
DEVICE=C:\OS2\VPCMCIA.SYS

⋮
DEVICE=C:\IBMCOM\MACS\IRMAC.OS2

⋮
rem ** Socket Services statement **
DEVICE=C:\IBM2SS02.SYS
rem ** Resource Map Utility statement **
DEVICE=C:\ICRMU02.SYS
```

While the Socket Services and Resource Map Utility statements do not need to be the last statements in your CONFIG.SYS file, they must follow the *last* instance of any PCMCIA client driver in your CONFIG.SYS file. You may wish, therefore, to make them the last statements in your CONFIG.SYS file to ensure that this is the case.

About the PROTOCOL.INI File

The PROTOCOL.INI file is used to pass parameters to the adapter driver. The following parameters are added to the PROTOCOL.INI file as part of the adapter driver installation process:

NETADDRESS (all adapters)
: When set to anything other than FFFFFFFFFFFF, will override the adapter's internal (factory-set) network address.

IOADDRESS (PCMCIA adapter only)
: Specifies the I/O address that will be used by the device driver to access the adapter's registers. The value for this parameter is a hexadecimal number between 300 and 370 and must be a multiple of 10. The default value is 300.

INTERRUPT (PCMCIA adapter only)
: Specifies the interrupt level used by the adapter. The valid values are 3, 4, 5, 7, 9, 10, 11, 14, and 15. The default is 10.

RAMADDRESS (PCMCIA adapter only)

Specifies the base memory address for adapter memory. The valid range is between C0000 and DFFFF. We recommend that you set this to D0000. These memory regions begin on 8K boundaries (C0000, C2000, C4000, and so on).

Note that, with the exception of NETADDRESS, the settings for the PCMCIA versions of the Infrared Wireless LAN Adapter may be overridden by Card and Socket Services. Refer to the documentation that came with your Card and Socket Services for additional information.

If you decide to modify any of the settings in the PROTOCOL.INI file, you should do so using the LAPS Installation and Configuration utility. You should not modify the entries directly.

Installing Device Drivers for TCP/IP (DOS)

This section provides you with the information you require in order to install the device drivers for the Infrared Wireless LAN Adapter if you are using it with TCP/IP Version 2.2.1 or higher. For instructions on how to use TCP/IP, you should refer to the documentation that came with it.

To install the device drivers for the Infrared Wireless LAN Adapter, do the following:

1. Install *TCP/IP Version 2.1.1 for DOS* following the instructions that came with it. Once installation is complete you need to configure TCP/IP using the CUSTOM program.
2. Switch to the directory you selected as your target installation directory and type:

   ```
   CUSTOM
   ```

   Note that you need to run CUSTOM twice: once to set up your PROTOCOL.INI file, and secondly to bind the adapter.

3. Select **Configure**.

4. Select **NDIS Protocol Manager** and then **Add**.

5. You are presented with a template for your PROTOCOL.INI file that looks similar to this:

```
[stanza_name]
;descriptive comment line

  parm1=value1
  parm2=value2
  parmN=valueN
```

   Edit the file so that it looks like this:

```
[IRMAC_NIF]
;Infrared Wireless LAN Adapter (for example)

  Drivername=IRMAC$
  IOaddress=0x340
  Interrupt=10
```

   where the value for IOaddress matches the base memory address you selected for the adapter and Interrupt matches the IRQ you selected.

6. Click on **OK** and then **Exit-Save Changes**.

7. Answer and acknowledge the various input and message screens as they appear on your screen until you have returned to the DOS prompt.

8. At the DOS command prompt, type:

```
CUSTOM
```

9. Select **NDIS Interfaces** and then click on **Bound Adapter**.

10. Double-click on **IRMAC_NIF**, which should be at the top of the listbox.

11. Type in the **IP address** of your workstation as provided to you by your network administrator.

12. Type in the **Subnet mask** as provided to you by your network administrator.

13. Click on **Enable interface** and then on **OK**.

14. Complete any additional configuration activities you require (refer to your TCP/IP documentation for instructions).

15. When you are ready, select **Exit-Save Changes**.

16. Answer and acknowledge the various input and message screens as they appear on your screen until you have returned to the DOS prompt.

17. You now need to copy the Infrared Wireless LAN Adapter device driver to your hard disk and then edit your CONFIG.SYS file to add the device driver statement.

18. To copy the device driver, do the following:

    a. Switch to the \BIN subdirectory of the directory you selected as your target installation directory.
    b. Insert the *Infrared Wireless LAN Program Diskette* in your floppy drive and type:

       ```
       COPY A:\DOS\IRMAC.DOS
       ```

       (assuming that A is your floppy drive) and press the Enter key.
    c. The file is copied to the \BIN subdirectory.

19. To edit your CONFIG.SYS file, do the following:

    a. Open CONFIG.SYS with your editor.
    b. In your CONFIG.SYS you should see statements similar to the following:

       ```
       DEVICE=C:\TCPDOS\BIN\PROTMAN.DOS /I:C:\TCPDOS\ETC
       DEVICE=C:\TCPDOS\BIN\DOSTCP.SYS
       ```

       Insert the following statement so that it *follows* the PROTMAN.DOS statement:

       ```
       DEVICE=C:\TCPDOS\BIN\IRMAC.DOS
       ```

    c. Save your CONFIG.SYS file.

20. Reboot your computer for the configuration changes to take effect. Note that if you have installed the ISA version of the Infrared Wireless LAN Adapter, you will need to turn your computer off and then on again.

21. The adapter is now installed and you can start up the LAN support following the instructions provided with TCP/IP.

Installing Device Drivers for TCP/IP (OS/2)

This section provides you with the information you require in order to install the device drivers for the Infrared Wireless LAN Adapter if you are using it with TCP/IP Version 2.0 or higher. For instructions on how to use TCP/IP, you should refer to the documentation that came with it.

To install the device drivers for the Infrared Wireless LAN Adapter, do the following:

1. If you have already installed TCP/IP and are simply adding adapter support, start the LAPS program and proceed to the next step. If you have not yet installed TCP/IP, do so following the instructions that came with it. When you reach the first LAPS installation screen, proceed to the next step.
2. Click on **Install**. When you are prompted for the drive to install from, insert the *Infrared Wireless LAN Program Diskette*, type A:\OS2, and then click on **OK**.
3. Click on **OK** as each driver is loaded.
4. When the drivers have finished loading, click on **Configure** from the main menu.
5. Click on **Configure LAN transports** and then **Continue**.
6. Under **Network Adapters** select the appropriate Infrared Wireless LAN Adapter. Then click on the **Add** button.
7. Choose **IBM TCP/IP** from the list of protocols and click on the **Add** button.
8. Click on **OK** on the main menu, and then **Exit**.
9. Click on **Continue** when you are asked whether to update your CONFIG.SYS file.
10. Proceed with the installation of TCP/IP as directed by the documentation that came with the program.
11. When installation is complete, and if you are installing support for either of the PCMCIA versions of the Infrared Wireless LAN Adapter, you should run IRCFGCHK. If you installed another version of the Infrared Wireless LAN Adapter you can skip this step. The IRCFGCHK program will ensure that the order of the Card and Socket Services statements in your CONFIG.SYS file is correct. To run this program, insert the *Infrared Wireless LAN Program Diskette* and type A:\OS2\IRCFGCHK. Follow the online instructions.
12. Reboot your computer.

PCMCIA and the CONFIG.SYS File

If you have installed support for the PCMCIA version of the Infrared Wireless LAN Adapter, please ensure that the order of the Card and Socket Services driver statements and the adapter driver statements is correct in your CONFIG.SYS file (see below for an example). If the statements are not in the correct sequence, the adapter will not function properly. You can ensure that the statements are in the correct order by running the IRCFGCHK program. This program is documented in the device driver installation procedure, above.

Here is an example of the correct order of statements in your CONFIG.SYS file:

```
DEVICE=C:\OS2\PCMCIA.SYS
DEVICE=C:\OS2\VPCMCIA.SYS

⋮
DEVICE=C:\IBMCOM\MACS\IRMAC.OS2

⋮
rem ** Socket Services statement **
DEVICE=C:\IBM2SS02.SYS
rem ** Resource Map Utility statement **
DEVICE=C:\ICRMU02.SYS
```

While the Socket Services and Resource Map Utility statements do not need to be the last statements in your CONFIG.SYS file, they must follow the *last* instance of any PCMCIA client driver in your CONFIG.SYS file. You may wish, therefore, to make them the last statements in your CONFIG.SYS file to ensure that this is the case.

About the PROTOCOL.INI File

The PROTOCOL.INI file is used to pass parameters to the adapter driver. The following parameters are added to the PROTOCOL.INI file as part of the adapter driver installation process:

NETADDRESS (all adapters)
: When set to anything other than FFFFFFFFFFFF will override the adapter's internal (factory-set) network address.

IOADDRESS (PCMCIA adapter only)
: Specifies the I/O address that will be used by the device driver to access the adapter's registers. The value for this parameter is a hexadecimal number

between 300 and 370 and must be a multiple of 10. The default value is 300.

INTERRUPT (PCMCIA adapter only)
: Specifies the interrupt level used by the adapter. The valid values are 3, 4, 5, 7, 9, 10, 11, 14, and 15. The default is 10.

RAMADDRESS (PCMCIA adapter only)
: Specifies the base memory address for adapter memory. The valid range is between C0000 and DFFFF. We recommend that you set this to D0000. These memory regions begin on 8K boundaries (C0000, C2000, C4000, and so on).

Note that, with the exception of NETADDRESS, the settings for the PCMCIA versions of the Infrared Wireless LAN Adapter may be overridden by Card and Socket Services. Refer to the documentation that came with your Card and Socket Services for additional information.

If you decide to modify any of the settings in the PROTOCOL.INI file, you should do so using the LAPS Installation and Configuration utility. You should not modify the entries directly.

Installing Device Drivers for Windows for Workgroups

This section provides you with the information you require in order to install the device drivers for the Infrared Wireless LAN Adapter if you are using it with Windows for Workgroups. Note that network support must already be installed in order to do the following procedure. For instructions on how to use Windows for Workgroups you should refer to the documentation that came with it.

Before you install the software, you should already have installed the Infrared Wireless LAN Adapter.

To install the device drivers for the Infrared Wireless LAN Adapter, do the following:

1. Start Windows if you have not already done so.
2. Double-click on **Network Setup** in the **Network Group**.

3. Select the **Drivers...** button.
4. Click on **Add Adapter**.
5. Select **Unlisted or updated Network Adapter** and then click on **OK**.
6. Insert the *Infrared Wireless LAN Program Diskette* into your A: drive and select A: from the drive list.
7. Select the appropriate adapter from the adapter list. Select **NetWare version** if you are running NetWare, otherwise select **Windows version**. Click on **OK**.
8. Click on **Close** in the **Network Drivers** window.
9. When the window comes up with the Infrared Wireless LAN Adapter driver name, click on **OK**.
10. Files are copied over to your hard disk.
11. If you are using the PCMCIA or Micro Channel version of the Infrared Wireless LAN Adapter, you need to restart Windows to allow the system changes to take effect. If you are using the ISA adapter you need to shut your computer off (after closing Windows first) and then turning it on again for the changes to take effect.
12. You are now ready to use the Infrared Wireless LAN Adapter with Windows for Workgroups.

Installing Device Drivers for Novell NetWare or NetWare Lite

This section provides you with the information you require in order to install the device drivers for the Infrared Wireless LAN Adapter if you are using it with Novell's NetWare or NetWare Lite. For information on installing the device drivers for Personal NetWare, refer to "Installing Device Drivers for Novell Personal NetWare" on page 37.

There are two drivers for the Infrared Wireless LAN Adapter:

1. IRMLID.COM is the driver you use if your computer is a client workstation on a NetWare network. It is also the driver you use with NetWare Lite.
2. IRMLID.LAN is the driver you use if your computer is a file server on a NetWare network.

For detailed instructions on installing your network operating system, refer to the documentation that came with it.

The following information will help you when you reach the part of the installation in which you install the driver.

If NetWare or NetWare Lite is already installed on your computer, you need to add the appropriate driver for the Infrared Wireless LAN Adapter. Check the Novell documentation for information on changing device drivers.

NetWare Lite Driver Installation

Run the Install program as described in the Novell installation instructions. When the program asks you for the LAN driver, choose **Other Driver** from the list. Insert the *Infrared Wireless LAN Program Diskette*. When prompted by the program, choose the IRMLID.COM driver in the A:\DOS directory.

You must also manually copy over the NET.CFG file from the *Infrared Wireless LAN Program Diskette* to your workstation. See "The NET.CFG File (Novell)" on page 38 for more information.

NetWare Driver Installation

Follow the Novell installation instructions for either a client or a server installation. When the instructions refer to the LAN driver, use IRMLID.COM for a client installation and IRMLID.LAN for a file server installation. For example, in the Novell manual, *Netware, ODI Shell for DOS*, they refer to the NE2000.COM LAN driver as an example. Wherever they refer to NE2000, NE2000.COM, or NE2, substitute IRMLID, IRMLID.COM, and IRMLID, respectively.

Important: The Infrared Wireless LAN Adapter drivers conform to the Novell specification for NetWare 4.0. Therefore, for **server installations only**, when installing under NetWare 3.11 or 3.12, you will need to manually copy over the following files from the root directory of the *Infrared Wireless LAN Program Diskette* to the target NetWare installation directory:

```
MSM31X.NLM
ETHERTSM.NLM
FDDITSM.NLM
PCN2LTSM.NLM
RXNETTSM.NLM
TOKENTSM.NLM
MONITOR.NLM
LSLENH.NLM
PATCHMAN.NLM
```

The NET.CFG file you will require for the client workstation installation is contained on the *Infrared Wireless LAN Program Diskette*. Simply copy this over when you are asked to do so in the Novell installation instructions. See "The NET.CFG File (Novell)" on page 38 for additional information.

If the installation procedure asks you to add the LAN driver name to the AUTOEXEC.BAT file, make sure you use the same driver file name you specified during the main part of the installation procedure (IRMLID, for example).

A Note About AUTOEXEC.NCF

As part of the server installation process you are directed to create an AUTOEXEC.NCF file. You should edit this file so that it contains the following lines:

```
LOAD LSLENH
LOAD MSM31X
LOAD ETHERTSM
LOAD IRMLID NODE=nnnnnnnnnnnn
BIND IPX to IRMLID net=mmmmmmmm
```

where nnnnnnnnnnnn is the unique twelve-digit node address and mmmmmmmm is the eight-digit local network ID.

This example illustrates a sample AUTOEXEC.NCF file for NetWare 3.11 and 3.12. For NetWare 4.0, the first line should be changed to read: LOAD MSM

Notes on AUTOEXEC.NCF:

1. If you have installed the ISA version of the adapter, you need to add the FRAME value to the LOAD IRMLID statement:

   ```
   LOAD IRMLID FRAME=ETHERNET_802.2 NODE=nnnnnnnnnnnn
   ```

2. If you have installed the PCMCIA version of the Infrared Wireless LAN Adapter, and are operating without Card and Socket Services you will need to add the PORT and INT values to the LOAD IRMLID statement, like so:

   ```
   LOAD IRMLID NODE=nnnnnnnnnnnn PORT=300 INT=A
   ```

   See "Operating Without Card and Socket Services" on page 6 for further information.

Installing Device Drivers for Novell Personal NetWare

This section provides you with the information you require in order to install the device drivers for the Infrared Wireless LAN Adapter if you are using it with Novell's Personal NetWare. For information on installing the device drivers for NetWare or NetWare Lite, refer to "Installing Device Drivers for Novell NetWare or NetWare Lite" on page 34.

To install the device drivers for the Infrared Wireless LAN Adapter, do the following:

1. Install Personal NetWare following the instructions that came with the product.
2. On the screen where it asks you to select the **Primary Network Interface Card**, select **OEM Supplied Driver** and press Enter.
3. When prompted, insert the *Infrared Wireless LAN Program Diskette*.

4. Double-click on the displayed path name and change it to:

```
A:\DOS
```

assuming that your floppy drive is A. Click on **OK** and then **Accept the above and continue**.

5. You should now see **IBM Wireless LAN Adapter**.
6. Select **Configure Primary Interface Card...**. You can now change the MEM, PORT, and INT values to match the settings you chose for your adapter.
7. Select the appropriate **media frame type** (refer to your Personal NetWare documentation).
8. Click on **Accept the above and continue**.
9. Complete any additional configuration activities you require (refer to your Personal NetWare documentation for instructions).
10. Provide the appropriate **machine name**, if you are prompted to do so.
11. When you are ready, click on **Accept the above and continue**.
12. Remove the *Infrared Wireless LAN Program Diskette* and click on **Start Installation**.
13. Proceed with the Personal NetWare installation. When you are prompted to do so, insert the *Infrared Wireless LAN Program Diskette*. Click on **Accept the above and continue**.
14. Once installation is complete, you need to reboot your computer for the configuration changes to take effect. Note that if you have installed the ISA version of the Infrared Wireless LAN Adapter, you will need to turn your computer off and then on again.
15. The adapter is now installed and you can start up the LAN support following the instructions provided with Personal NetWare.

The NET.CFG File (Novell)

This section provides information on the NET.CFG file common to Novell's products (NetWare, NetWare Lite, and Personal Netware). The NET.CFG file for a NetWare client workstation looks similar to this:

```
LINK DRIVER IRMLID
  NODE ADDRESS nnnnnnnnnnnn
  INT 10
  PORT 300
  MEM D0000000
  FRAME ETHERNET_802.2
```

If you are using NetWare Lite, the NET.CFG file needs to be in the same directory as STARTNET.BAT, a file created during the installation process. If you are using NetWare, NET.CFG should be in the root directory.

Notes on INT, PORT, and MEM

While NET.CFG contains values for the configuration parameters INT, PORT, and MEM, the values for these settings are ignored for the ISA and Micro Channel adapters. The actual values for these parameters are derived from:

ISA
The DIP switch settings of the adapter.

Micro Channel
The system configuration file on your computer.

For the PCMCIA adapter, Card and Socket Services will attempt to use the values set in NET.CFG for the configuration parameters INT, PORT, and MEM. If Card and Socket Services detects that a conflict with another adapter will occur if the NET.CFG values are used, it will override the settings in order to resolve the conflict. If you are operating without Card and Socket Services (see “Operating Without Card and Socket Services” on page 6), the values set in NET.CFG will be used. If this results in a conflict with another adapter you will need to resolve the conflict by changing the values in NET.CFG, or changing the settings on the other adapter.

Installation Utilities

The *Infrared Wireless LAN Program Diskette* provides a number of utilities that perform the following operations:

Verify
This utility determines whether the installation of an Infrared Wireless LAN Adapter has been successful and that all the necessary changes to the various files, such as PROTOCOL.INI and CONFIG.SYS, have been made. In many instances it can make the necessary file changes for you, should you wish it to. In those cases where it cannot automatically make the changes, or should you wish to make the changes manually, it will tell you which changes you need to make.

Install Access Point
This utility automatically installs the access point software. You can use this utility if you are setting up:

- an Ethernet Access Point (AP) using the *ISA* version of the Infrared Wireless LAN Adapter and one of the supported Ethernet adapters, or
- a Token-Ring AP using any model of the Infrared Wireless LAN Adapter and one of IBM′s 16/4 Shared RAM Token-Ring Adapters (part numbers 73G2032, 74F9410, or 933931).

Detailed information on the installation and operation of an Ethernet AP is in Appendix A, "Creating an Ethernet Access Point" on page 46. If you are setting up a Token-Ring AP, refer to Appendix B, "Creating a Token-Ring Access Point" on page 55.

Help
The installation utilities come with online help. If you encounter any difficulties, or wish to learn more about the utilities, refer to this help. As well, you can browse through the README file for the Infrared Wireless LAN Adapter to learn of any changes to the product that may have occurred after this book was printed, and also read additional information that

may help you in the installation and use of the Infrared Wireless LAN Adapter.

In order to use the utilities, insert the *Infrared Wireless LAN Program Diskette* in your floppy drive and type:

```
A:\IRUTILS
```

Follow the online directions. Remember to refer to the online help if you run into any problems.

Using Your Infrared Wireless LAN Adapter

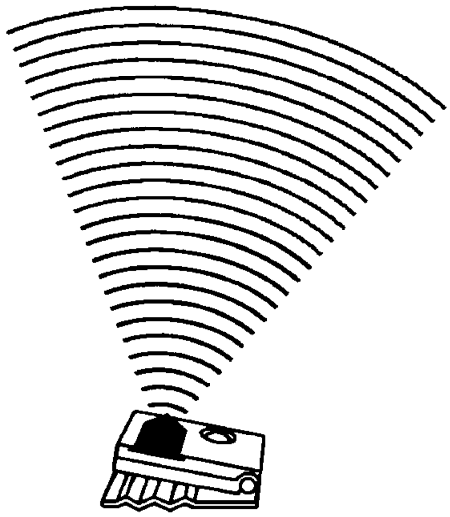
To use your Infrared Wireless LAN Adapter you should already have:

- Installed the Infrared Wireless LAN Adapter
- Attached the transceiver to the adapter (if applicable)
- Assembled the mount (if applicable)
- Started your LAN network software.

Operating the Transceiver

While you are using the transceiver, you do not need to follow any special procedures. From your point of view, it works just like normal network cabling: it transmits and receives data. The only difference is that it uses infrared signals instead of wires.

The transceiver sends out infrared signals in a diffuse pattern that reflects off the ceiling and walls; you do not need to aim it. While you do not need to aim the transceiver, it works better in some places than in others. Positioning it properly helps ensure reliable communications.



It is important to keep the transceiver clear of any obstructions. If something briefly blocks the infrared signal (if your hand passes close over the transceiver, for example), the Infrared Wireless LAN Adapter driver automatically retransmits the data it couldn't send out. If the blockage lasts longer however, it is possible that the system will become disabled and stop functioning.

Follow these guidelines for the best results:

1. Make sure the transceiver can send out its signal clearly. The infrared signal radiates in a cone-shaped pattern from the prism on the transceiver. When you position the transceiver, try not to block any part of the signal. For instance, do not place the transceiver very close to a wall. Never cover the transceiver with anything.

2. Position the transceiver so that as much of the signal as possible reaches the ceiling. When the entire signal reaches the ceiling, the signal is dispersed through the largest possible area. This means that you should try to aim the transceiver at a flat surface along the ceiling, avoiding recessed light fixtures and air vents.

3. Don't place the tethered transceiver near a window. Its infrared signals may pass through glass and not be reflected back into the room.

4. Don't place the tethered transceiver in an area that receives direct sunlight or near a bright incandescent light source. Sunlight and bright incandescent light can interfere with the infrared signal. Fluorescent light does not cause problems.

Help and Service Information

During the warranty period, you can get toll-free technical support 24 hours a day, 7 days a week, to answer any questions about your new IBM option. If you need warranty service, return or exchange is available. In addition, if your IBM option is installed in an IBM computer, you might be entitled to service at your location. Your technical support representative can help you determine the best alternative.

Before calling, please prepare for your call by following these steps.

CAUTION: To avoid electrical shock, unplug your computer and all attached devices from electrical outlets before performing any troubleshooting procedure.

Step 1: Troubleshooting

You might be able to solve the problem yourself. Before calling IBM, you might want to try some or all of the following troubleshooting procedures.

1. Remove and reattach all option cables.
2. Remove and reseat the option.
3. Place the option in a different slot, if one is available.
4. If your option contains jumpers or switches, check that they are set as specified.
5. Reread any software instructions; be sure software settings are correct.
6. Inspect the option for damage, such as bent pins.
7. Check the computer manual for instructions about the installation of upgrades. Look for a section about system setup or system configuration. Follow all procedures.
8. After completing these steps, reassemble the computer and connect the power cord.

Step 2: Preparing for the Call

To assist the technical support representative, have available as much of the following information as possible:

1. Option name, description, and serial number (if any)
2. Proof of purchase
3. Computer manufacturer, model, serial number (if IBM), and manual
4. Exact wording of the error message (if any)
5. Description of the problem
6. Hardware and software configuration information for your system

If possible, be at your computer. Your technical support representative might want to walk you through the problem during the call.

Step 3: Placing the Call to IBM

Use one of the following numbers:

- Within the United States, call the Options by IBM HelpCenter* at 1-800-426-7299.
- Within Canada
  - For support, call HelpPC at 1-800-565-3344.
  - For more information or to place an order, call 1-800-465-7999.
- Outside the United States and Canada, contact your IBM HelpWare* number, your place of purchase, or your local branch office.

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Appendix A. Creating an Ethernet Access Point

In order to connect an infrared wireless LAN to an existing Ethernet wired LAN, you need to set up an *Access Point* (AP). An AP consists of a computer with an Ethernet adapter and an Infrared Wireless LAN Adapter, running the access point software contained on the *Infrared Wireless LAN Program Diskette*. The AP provides the link between the wireless LAN and the wired LAN. This is known as *bridging*. The Access Point is connected to the wired LAN using the Ethernet adapter, and also connected to any mobile PCs installed with Infrared Wireless LAN Adapters that are within range of the AP.

As well as providing the link between the wired and wireless LANs, a series of APs may be used to create a zone within which a mobile user can travel without losing contact with the wired LAN. This is known as *roaming*.

The AP can also be used to extend a wireless LAN by relaying data traffic between two mobile PCs which would otherwise not be able to communicate with each other. This is known as *relaying*.

System Requirements

An AP consists of a computer with the following:

- IBM DOS 5.0 or higher, or
- MS-DOS 6.0 or higher.
- An IBM Infrared Wireless LAN Adapter.
- An Ethernet adapter connected to a wired LAN. This can be one of the following:
  - IBM ISA, PCMCIA, or MCA Ethernet adapter
  - 3Com Etherlink III ISA Network adapter
  - SMC EtherCard Elite16C Ultra ISA adapter
  - Novell NE2000plus ISA Ethernet adapter.

Installing the Access Point

There are two ways to install the access point software: automatically or manually. You can use automatic installation if your AP will use *ISA adapters* only (both for the Infrared Wireless LAN Adapter and for the other Ethernet adapter). If you are using an adapter other than those listed under "System Requirements" on page 46, or you will be using one of the non-ISA versions of the Infrared Wireless LAN Adapter, you will need to do a manual installation as described in "Manual Installation" on page 48.

Prior to installing the access point software you will need to have already installed both the Ethernet adapter using the instructions that came with it, and the Infrared Wireless LAN Adapter Infrared Wireless LAN Adapter (refer to the appropriate chapter in this book for information on how to do this).

You should take a moment to write down the interrupt (IRQ), I/O address, and memory address of both the Infrared Wireless LAN Adapter and the Ethernet adapter if you have not already done so. You will need this information to install the Access Point, whether you choose to use the automatic or manual installation procedure.

Ethernet Adapters: While the access point software has been designed to work with Ethernet adapters in general, not all Ethernet adapters are supported. The software is only supported with those adapters listed in "System Requirements" on page 46. Installing the access point software on an AP with an unsupported adapter is not recommended.

Automatic Installation

To automatically install the access point software on a computer, do the following:

1. Start your computer.
2. Insert the *Infrared Wireless LAN Program Diskette*.

3. At the DOS prompt, type:
   A:\IRUTILS
4. Follow the online directions.
5. Upon completion of the installation procedure, you need to turn your computer off and then on again in order for the system changes to take effect. When your computer is on, go to the command prompt and type:
   C:\IREAP\AP

   to start the access point software.
6. Refer to “Using the Access Point” on page 51 for information on using the Access point software.

Manual Installation

Before you proceed you should know where to find your AUTOEXEC.BAT, CONFIG.SYS, and PROTOCOL.INI files, as you will be modifying these files during the installation procedure.

If you choose to install the access point software manually, do the following:

1. Start your computer.
2. Uninstall any network operating system (NOS) on your computer. At a minimum this requires that you comment out all information relating to your Ethernet adapter or Infrared Wireless LAN Adapter in your CONFIG.SYS and PROTOCOL.INI files. You may wish to actually delete the NOS directories and files in order to free up disk space, but this is not a prerequisite to installing the access point software.
3. Install and configure both the Infrared Wireless LAN Adapter and the Ethernet adapter using the instructions that came with each adapter. Write down the IRQ, I/O address, and memory address of each of the adapters when you configure them, as you will need this information for this installation procedure.
4. Insert the *Infrared Wireless LAN Program Diskette*.
5. At the DOS prompt, type:
   MD C:\IREAP

   in order to create an installation subdirectory. You may choose to name the subdirectory anything you wish. For the purposes of illustration, we will refer to the installation subdirectory as \IREAP for the remainder of this document.

6. Copy all the files from the \ROAM subdirectory on the *Infrared Wireless LAN Program Diskette* to the \IREAP subdirectory using the DOS COPY command:

   ```
   COPY A:\ROAM\*.* C:\IREAP
   ```

   The following files will be copied to the \IREAP subdirectory:

   ```
   PROTMAN.DOS
   PROTMAN.EXE
   NETBIND.COM
   AP_PROT.SYS
   AP_PROT.MSG
   AP.BAT
   IREAP.COM
   IRGAPDD.COM
   IREAP.MSG
   PROTOCOL.INI
   STACK.COM
   STACK.MSG
   ```

7. Remove the *Infrared Wireless LAN Program Diskette* and insert the Ethernet adapter driver diskette that came with the Ethernet adapter you installed on the AP.

8. Copy the Ethernet device driver file from the diskette to the \IREAP subdirectory. Refer to the documentation that came with your Ethernet adapter to determine what the appropriate file is.

9. Edit the PROTOCOL.INI file in the \IREAP subdirectory in order to add the appropriate Ethernet card configuration statement. If you are not sure what the statement is, consult the documentation that came with your Ethernet adapter. Here is an example of what the configuration should look similar to:

   ```
   [XXXXXX_MOD]
       DRIVERNAME = YYYYYY$
       IOBASE = 0x300
       INTERRUPT = 3
       RAMADDRESS = 0xD0000
   ```

   where XXXXXX is a label you give the driver (the name of the driver without the .DOS extension, for example), and YYYYYY is the internal name of the driver (refer to your Ethernet adapter documentation to determine what this is). IOBASE, INTERRUPT, and RAMADDRESS are the configuration parameters you selected when you configured the adapter. If you didn't use one or more of these values, omit the statement containing the parameter name from the block. If the Ethernet adapter is a PCMCIA adapter, add the line:

```
PCMCIA
```

as the last line in the block.

10. Under the heading [AP_MOD] in the PROTOCOL.INI file, change

```
BINDINGS = ZZZZZZ$
```

to

```
BINDINGS = YYYYYY$
```

where YYYYYY is the label you gave to the driver in the previous step.

11. If you chose a subdirectory other than \IREAP to install the access point software to, you will need to change all references to the \IREAP subdirectory in the AP.BAT file to be the name of the directory you chose. Also, change the line:

```
IRGAPDD X Y Z
```

to reflect the configuration of the Infrared Wireless LAN Adapter, where X is the interrupt (IRQ), Y is the I/O address, and Z is the memory address of the Infrared Wireless LAN Adapter. So, for instance, to specify an IRQ of 15, an I/O address of 300, and a memory address of C2000, you would type:

```
IRGAPDD 15 300 C20000
```

and press the Enter key.

12. Edit your CONFIG.SYS file in order to add the following statements at the bottom of the file:

```
DEVICE=\IREAP\PROTMAN.DOS /I:C:\IREAP;
DEVICE=\IREAP\ETHERNET.DOS;
DEVICE=\IREAP\AP_PROT.SYS;
```

where ETHERNET.DOS is the name of the Ethernet adapter device driver, and C:\IREAP is your installation subdirectory.

13. Remove any diskettes from your floppy drive and turn your computer off and then on again in order for all the changes to take effect.

14. The installation is complete. To run the access point software return to the \IREAP subdirectory and type:

```
AP
```

This will start the access point software in the background. To bring the program into the foreground and see a visual display of the status of the Access Point, type:

```
IREAP V
```

15. Refer to “Using the Access Point” for information on using the access point software.

Using the Access Point

The access point software acts as a terminate-and-stay-resident (TSR) program. It can either run in the foreground, taking control of the display, or in the background of the DOS or Windows environment. You can switch between these two modes using the IREAP program, described a little later in this section.

Note that if you are running the Access Point under Windows 3.11, you must start the AP *before* you start Windows. You also cannot have any networking features of Windows 3.11 active and still run the AP in the background.

To start the access point software, go to the \IREAP subdirectory (if you chose to install to a different subdirectory go to that one instead), and type:

```
AP
```

The AP.BAT batch file does the following:

1. Loads the infrared device driver (IRGAPDD.COM).
2. Initiates binding between the access point protocol stack and the Ethernet device driver (NETBIND.COM).
3. Starts the access point software (IREAP.COM).

IREAP.COM

The IREAP program starts up the access point software, and is invoked automatically when you run AP.BAT. This program also allows you to switch between having the access point software run in the foreground or background. To use this program, type:

```
IREAP parameter
```

where parameter is one of the following:

I Starts the access point program. This is the default action.

U Uninstalls the access point program (removes the TSR from memory).

V Provides a visual display of the status of the Access Point. See "The AP Status Screen" on page 53 for further information.

T This parameter is used if you encounter problems with an MPC roaming across bridges in your wired LAN. Refer to "Problem Solving" on page 54 for further information

How the Access Point Works

The Access Point (AP) acts as a bridge between the wired LAN (via the Ethernet adapter) and the mobile PC (via the Infrared Wireless LAN adapter). The AP continuously sends out a beacon signal to inform mobile PCs when they have entered its zone. A mobile PC may also be notified that it is within the AP zone by receiving a frame from the AP. The mobile PC monitors the infrared frame traffic and detects frames sent by the AP.

Association

A mobile PC within the zone of an AP will attempt to associate with that AP. If the association is successful, the AP will relay the Ethernet data traffic that is destined for the associated mobile PC from the wired LAN to the wireless LAN, and also from the MPC to the wired LAN.

The request to associate with an AP is initiated by the mobile PC when it realizes it is within the AP's zone by receiving either a frame or a beacon from the AP.

Disassociation

Association between a mobile PC and an AP will be broken when the mobile PC moves out of the AP's zone. The AP will stop relaying the Ethernet data traffic for the disassociated mobile PC.

The AP Status Screen

To run the access point software in the foreground, use IREAP.COM with the V parameter:

IREAP V

This provides a visual display of the status of the AP. The information displayed on the screen is as follows:

BSS Table
: This table lists the Ethernet addresses of all MPCs that are currently associated with the AP. There is also an indication of the number of entries in the table. If there are more than eight entries in the table, an arrow appears at the bottom of the list. Up to 64 MPCs can be associated with an AP. If a 65th MPC tries to associate, the least recently heard MPC will be deleted from the table to make room for the new MPC.

Buffer Status
: The status of three buffers (traffic to Ethernet, traffic to infrared wireless LAN, and traffic relayed from Infrared Wireless LAN Adapter to Infrared Wireless LAN Adapter) is shown, as well as the number of packets in each buffer. The number of bytes is also shown.

  Underneath the Buffer Status is a number representing the maximum number of packets that have been in each buffer.

Ethernet Packets Filtered/Forwarded
: The number of Ethernet packets and bytes that have been filtered (*looked at*) by the Ethernet adapter and forwarded is shown.

Last Message
: If something unexpected happens, such as an MPC trying to associate twice with the same AP, the AP will add a message to the log file (IREAP.MSG), and also displays it on the screen. Only the last message added to the log file will be displayed on the screen.

Ending the Program

To end the access point program, type:

IREAP U

This removes the program from memory. If you decide to restart the program later, type:

IREAP I

or

IREAP

Problem Solving

If any errors occur during the installation procedure, they will be displayed on the screen and also written to the IREAP.LOG file in the \IREAP subdirectory.

If any errors occur while the access point software is running, they are also written to the IREAP.LOG file. If the access point software is running in the foreground, messages will also be written to the screen.

The IREAP.LOG file is erased whenever the IREAP program is run, so if you wish to keep a copy of the file for diagnostic purposes, you should rename it to another file name or copy the file to another directory before rerunning the access point software.

Error messages recorded in the IREAP.LOG file are of two types - Warning and Error. Warning messages start with the character ″W″ and error messages start with the character ″E″. Warning messages indicates an usual condition which does not affect the operation of the Access Point. Error messages indicate an error condition which may or may not be recoverable.

Roaming Across LAN Bridges

If you find that a mobile PC is having problems maintaining a connection when it moves between APs, use the IREAP.COM program with the T parameter to send a topology notification Ethernet bridge frame to the Ethernet LAN. This informs any bridges in the network to reset their filtering databases to account for the new association. To run the program, switch to the \IREAP subdirectory and type:

IREAP T

Appendix B. Creating a Token-Ring Access Point

In order to connect an infrared wireless LAN to an existing Token-Ring wired LAN, you need to set up an *Access Point* (AP). An AP consists of a computer with a Token-Ring adapter and an Infrared Wireless LAN Adapter, running the access point software contained on the *Infrared Wireless LAN Program Diskette*. The AP provides the link between the wireless LAN and the wired LAN. This is known as *bridging*. The Access Point is connected to the wired LAN using the Token-Ring adapter, and also connected to any mobile PCs installed with Infrared Wireless LAN Adapters that are within range of the AP.

As well as providing the link between the wired and wireless LANs, a series of APs may be used to create a zone within which a mobile user can travel without losing contact with the wired LAN. This is known as *roaming*.

The AP can also be used to extend a wireless LAN by relaying data traffic between two mobile PCs which would otherwise not be able to communicate with each other. This is known as *relaying*.

System Requirements

An AP consists of a desktop or notebook computer with the following:

- IBM DOS 5.0 or higher, or
- MS-DOS 5.0 or higher.
- An IBM Infrared Wireless LAN Adapter (part number 934345, 934350, 87G9740, or 87G9743)
- An IBM 16/4 Shared RAM Token-Ring Adapter (part number 73G2032, 74F9410, or 933931).

If you are installing PCMCIA versions of the Infrared Wireless LAN Adapter and Token-Ring adapters, you will need two free Type II PCMCIA slots in your computer.

Installing the Access Point

There are two ways to install the access point software: automatically or manually.

Prior to installing the access point software you will need to have already installed both the Token-Ring adapter using the instructions that came with it, and the Infrared Wireless LAN Adapter Infrared Wireless LAN Adapter (refer to the appropriate chapter in this book for information on how to do this).

Note that for the PCMCIA versions of the adapters, you should ensure that any memory manager you may have installed (EMM386.EXE, for example) excludes any memory required by Card and Socket Services. Refer to the information that came with your adapters and, if appropriate, your Card and Socket Services information, for specific memory requirements. Information on configuring your memory manager is typically discussed in your operating system documentation.

Automatic Installation

To automatically install the access point software on a computer, do the following:

1. Start your computer.
2. Insert the *Infrared Wireless LAN Program Diskette*.
3. At the DOS prompt, type:
   A:\IRUTILS
4. Follow the online directions.
5. Upon completion of the installation procedure, you need to turn your computer off and then on again in order for the system changes to take effect. When your computer is on, go to the command prompt and type:
   C:\AP\AP

   to start the access point software.
6. When the software is running, you can monitor the AP's activity using the TR_MGR program. To start this program, type:
   C:\AP\TR_MGR -V

which will display the main monitoring panel.

7. Refer to "Using the Access Point" on page 62 for information on using the Access point software and further information on monitoring the AP's activity.

Manual Installation

Before you proceed you should know where to find your AUTOEXEC.BAT, CONFIG.SYS, and PROTOCOL.INI files, as you will be modifying these files during the installation procedure.

If you choose to install the access point software manually, do the following:

1. Start your computer.
2. Uninstall any network operating system (NOS) on your computer. At a minimum this requires that you comment out all information relating to your Token-Ring adapter or Infrared Wireless LAN Adapter in your CONFIG.SYS and PROTOCOL.INI files. You may wish to actually delete the NOS directories and files in order to free up disk space, but this is not a prerequisite to installing the access point software.
3. Install and configure both the Infrared Wireless LAN Adapter and the Token-Ring adapter using the instructions that came with each adapter.
4. Insert the *Infrared Wireless LAN Program Diskette*.
5. At the DOS prompt, type:
   ```
   MD C:\AP
   ```
   in order to create an installation subdirectory. You may choose to name the subdirectory anything you wish. For the purposes of illustration, we will refer to the installation subdirectory as \AP for the remainder of this document.
6. Copy all the files from the \ROAM subdirectory on the *Infrared Wireless LAN Program Diskette* to the \AP subdirectory using the DOS COPY command:
   ```
   COPY A:\ROAM\*.* C:\AP
   ```
   The following files will be copied to the \AP subdirectory:

```
PROTMAN.DOS
PROTMAN.EXE
NETBIND.COM
AP_PROT.SYS
AP_PROT.MSG
AP.BAT
IREAP.COM
IRGAPDD.COM
IREAP.MSG
PROTOCOL.INI
STACK.COM
STACK.MSG
TR_MGR.COM
TR_MGR.INI
TR_MGR.MSG
IBMTOKCS.DOS
IBMTOKCS.NIF
LTG.MSG
```

7. Edit your CONFIG.SYS file in order to add the following statements at the bottom of the file:

```
DEVICE=\AP\PROTMAN.DOS /I:C:\AP
DEVICE=\AP\IBMTOKCS.DOS
DEVICE=\AP\AP_PROT.SYS
```

   Note: If you are installing a PCMCIA card, be sure the Card and Socket Services drivers are installed in the CONFIG.SYS file prior to adding the three lines above. Ensure that the system memory window allocated to the resource manager does not conflict with ISA adapters or the region of memory used by EMM386. Also, be sure to use the Token-Ring device driver (IBMTOKCS.DOS) included with this package instead of the version of the driver shipped with the Token-Ring adapter.

8. Go into the C:\AP directory and edit the PROTOCOL.INI file. You may need to change the following two lines in the Token-Ring section to match your particular machine's configuration:

```
PCMCIA
RingSpeed = 16
```

   If you are using an ISA or Micro Channel adapter, then place a semicolon (;) in front of the PCMCIA keyword. If you are using the PCMCIA version of the Token-Ring adapter and have installed Card and Socket Services, then leave it as it is.

   The second parameter is RingSpeed. The 16/4 Token-Ring adapter can operate at either 16 Mbps or 4 Mbps. If your LAN is a 16 Mbps LAN then leave this line the way it is. If your LAN operates at 4 Mbps then change RingSpeed to equal 4.

9. Go into the C:\AP directory and edit the TR_MGR.INI file. The parameters contained in this file may need to changed. See your LAN Administrator in order to determine what these values should be:

```
Node     = 420000000000
IR_Ring  = 0200
TR_Ring  = 0064
Bridge   = 0F
```

Note that all values in this file are hexadecimal values. The parameters and their values follow. The minimum, maximum and default values are described in the table in "TR_MGR.INI Keywords" on page 60.

Node
: The MAC address of the Token-Ring adapter. If you delete this line, the AP software will use the adapter′s default globally administered address (GAA) as the node address. You should contact your LAN Administrator to see if you need to use a locally administered address (LAA). If you do, set the node address to the LAA assigned by your LAN Administrator.

IR_Ring
: Segment number for the LAN on which IR mobile computers associated with this AP will be.

TR_Ring
: Segment number for the Token-Ring LAN on which the AP is being placed.

Note that in Token-Ring LANs, segment numbers must be unique over the entire LAN. Be sure that the IR_Ring numbers you use at each Access Point are also unique. Check with your LAN administrator to determine the correct values for these parameters.

Bridge
: Bridge number. The AP module acts as a bridge between the physical TR_Ring segment number and the virtual IR_Ring segment number. The bridge numbers used over a Token-Ring LAN do not have to be unique, but your LAN Administrator may wish to assign the bridge numbers for the AP′s.

There are additional *advanced* parameters that you may use to fine-tune the TR_MGR.INI file. These are discussed in "TR_MGR.INI Keywords" on page 60.

10. Upon completion of the installation procedure, you need to turn your computer off and then on again in order for the system changes to take effect. When your computer is on, at the DOS prompt type:

    ```
    C:\AP\AP
    ```

    to start the access point software.

11. When the software is running, you can monitor the AP's activity using the TR_MGR program. To start this program, type:

    ```
    C:\AP\TR_MGR -V
    ```

    which will display the main monitoring panel.

12. Refer to "Using the Access Point" on page 62 for information on using the Access point software and further information on monitoring the AP's activity.

TR_MGR.INI Keywords

TR_MGR.INI contains basic keywords that allow you to configure the AP. As well, there are *advanced* keywords which allow you to fine-tune the way in which your AP operates and also provides status information. For information on monitoring the AP status, refer to "The AP Status Screen" on page 63.

The keywords are:

Keyword	Default Value	Miminum Value	Maximum Value	Description
Node	420000000000	n/a	n/a	MAC address of the Token-Ring adapter. The address is 6 bytes (48 bits), bits 47 and 46 must be 0 and 1, respectively, and bit 31 must be 0. If you delete this line, the AP software will use the adapter′s default globally administered address (GAA) as the node address.
IR_Ring	0002	0000	0FFF	Segment number for the LAN on which IR mobile computers associated with the AP will be. This number cannot be the same as the TR_RING number.
TR_Ring	0001	0000	0FFF	Segment number for the Token-Ring LAN on which the AP is being placed. This number cannot be the same as the IR_RING number.
Bridge	0F	00	0F	Bridge number.
HANDLE	0000	0000	FFFF	Handle of Token-Ring adapter bound to AP_PROT.
GROUP	00000040	n/a	n/a	Token-Ring AP group address. Value must be 4 bytes and bit 31 (the most significant bit, MSB) must be 0. Of the remaining 31 bits, only 1 bit may be set.
IR_TABLE_SIZE	0040	0001	0800	Number of entries allowed in mobile database.
TR_TABLE_SIZE	0080	0001	0800	Number of entries allowed in routing table.
NETBIOS_TABLE_SIZE	0080	0001	0800	Number of NetBios names allowed in NetBios table.
TCPIP_TABLE_SIZE	0040	0001	0800	Number of IP addresses allowed in IP table.
TABLE_TIMEOUT	012C	0000	FFFF	Number of time intervals for which a table entry remains valid.
UPDATE_FREQUENCY	0012	0000	FFFF	Number of 18.2ms timer ticks making up a single time interval.
TRACE_BUFFER	1000	1000	FFFF	Amount of memory (in bytes) allocated for the internal trace buffer.

Keyword	Default Value	Miminum Value	Maximum Value	Description
LOG_FILE_SIZE	2000	2000	FFFF	Amount of disk space (in bytes) that the log file can grow to before being renamed and a new log file started.
MAX_REMOTE_APS	50	0001	0800	Number of remote AP′s from which status information can be received.
NOVELL	00	00	03	Level of Novell support: 00 is no Novell support, 01 is for NetWare, 02 is for newer versions of NetWare, and allows for less processing by the TR_MGR program, 03 should be used if 02 does not work.
Note: All numbers are in hexadecimal format.				

Using the Access Point

This section provides you with information on how the Access Point works, as well as how you can monitor the Access Point activity.

TR_MGR.COM

The TR_MGR.COM program starts up the access point software, and is invoked automatically when you run AP.BAT. This program also allows you to switch between having the access point software run in the foreground or background. You can also obtain operating statistics from other Token-Ring access points that are on the same Token Ring.

To use this program, type:
TR_MGR -parameter

where parameter is one of the following. Note that all parameters must be preceded by a - (hyphen) or / (slash).

I Starts the access point program. This is the default action.

U Uninstalls the access point program (removes the TSR from memory).

V Provides a visual display of the status of the Access Point. See "The AP Status Screen" on page 63 for further information.

R Provides a visual display of the status of other Access Points on the same Token Ring. See "The Remote Token-Ring AP Status Screen" on page 67 for further information.

How the Access Point Works

The Access Point (AP) acts as a bridge between the wired LAN (via the Token-Ring adapter) and the mobile PC (via the Infrared Wireless LAN adapter). The AP continuously sends out a beacon signal to inform mobile PCs when they have entered its zone. A mobile PC may also be notified that it is within the AP zone by receiving a frame from the AP. The mobile PC monitors the infrared frame traffic and detects frames sent by the AP.

Association

A mobile PC within the zone of an AP will attempt to associate with that AP. If the association is successful, the AP will relay the Token-Ring data traffic that is destined for the associated mobile PC from the wired LAN to the wireless LAN, and also from the MPC to the wired LAN.

The request to associate with an AP is initiated by the mobile PC when it realizes it is within the AP's zone by receiving either a frame or a beacon from the AP.

Disassociation

Association between a mobile PC and an AP will be broken when the mobile PC moves out of the AP's zone. The AP will stop relaying the Token-Ring data traffic for the disassociated mobile PC.

The AP Status Screen

To run the access point software in the foreground, use TR_MGR.COM with the V parameter:

TR_MGR -V

This provides a visual display of the status of the AP. The information displayed on the screen is as follows:

Local AP Node
Address of this Token-Ring AP.

Activity Monitor
Three values are shown: Timer, Display, and Transmit Buffer. Under normal operating conditions, you will see a countdown timer in the Timer and Display fields, and the Transmit Buffer field should always show 0. If it does not, you should power down and restart the AP.

Function Keys
By pressing the F1, F2, F3, F4, and F5 keys, you can change the display on the bottom of the screen. The function keys are discussed below.

To access additional information about the Access Point, use the function keys at the bottom of the main display panel. As well, you can use Alt + T to examine any trace buffer messages currently in memory. These messages are periodically written to the TR_MGR.LOG file. See "The Error Log Screen" on page 67 for further information.

The function keys take you to the following displays:

F1 (IR Node Table Entries)
Between 1 and 2048 IR nodes (mobile computers) can be shown. The number displayed is dependent on the value for IR_TABLE_SIZE in TR_MGR.INI. The default is 64. For further information on IR_TABLE_SIZE, refer to "TR_MGR.INI Keywords" on page 60. For each IR node, you will see three fields:

Node Address
The address of the node.

Expiry
A countdown timer. When the timer reaches 0, the node will be deleted from the table. Every time the listed mobile computer sends a message to, or receives a message from, another computer, the timer will be reset. This ensures that active nodes are not deleted.

Current Location

This is the address of the Token-Ring AP with which the node is currently associated.

F2 (Token-Ring Node Table Entries)

Between 1 and 2048 Token-Ring nodes can be shown. The number displayed is dependent on the value for TR_TABLE_SIZE in TR_MGR.INI. The default is 128. For further information on TR_TABLE_SIZE, refer to "TR_MGR.INI Keywords" on page 60.

These are nodes that mobile computers associated with this AP are communicating with. Normally, all nodes listed in this table exist on the wired Token-Ring LAN. For each Token-Ring node, you will see three fields:

Node ID

The MAC address of the Token-Ring node.

Expiry

A countdown timer. When the timer reaches 0, the node will be deleted from the table. Every time the listed node is sent a frame by a node in the IR Table, or sends a frame to a node listed in the IR Table, the timer will be reset. This ensures that active nodes are not deleted.

RIF

Routing Information Field. This field describes the path to reach the node address shown in the Node ID field.

F3 (NetBios Table)

Between 1 and 2048 NetBios names can be shown. The number displayed is dependent on the value for NETBIOS_TABLE_SIZE in TR_MGR.INI. The default is 128. For further information on NETBIOS_TABLE_SIZE, refer to "TR_MGR.INI Keywords" on page 60.

Every time the AP forwards a frame from an associated mobile computer to the Token Ring, the mobile's NetBios name is placed into this table, if it is not already there. For each entry, you will see three fields:

Node ID

Contains the MAC address of the IR mobile computer using the given NetBios name. This MAC address should appear in the IR Table and have the current location of this AP. Note that a single IR MAC address may have more than one NetBios name associated with it.

Expiry
A countdown timer. When the timer reaches 0, the name will be deleted from the table. Every time a mobile computer sends a NetBios frame to the Token Ring with that NetBios name, the timer will be reset. If the Node ID listed in the NetBIOS Table also exists in the IR Table when the countdown timer reaches 0, then the NetBios name is kept in the NetBios This ensures that the name of any ongoing NetBios activity will not be deleted.

NetBios Name
The NetBios name.

F4 (IP Address Table)
Between 1 and 2048 IP addresses can be shown. The number displayed is dependent on the value for TCPIP_TABLE_SIZE in TR_MGR.INI. The default is 64. For further information on TCPIP_TABLE_SIZE, refer to "TR_MGR.INI Keywords" on page 60.

Whenever a mobile computer associated with this AP sends an IP frame to the Token Ring, the mobile computer's IP address is placed into this table, unless it is already listed. For each entry, you will see three fields:

Node ID
Contains the MAC address of the IR mobile computer using the listed IP address. Normally, each Node ID will have one and only one IP address associated with it.

Expiry
A countdown timer. When the timer reaches 0, the IP address will be deleted from the table. Every time a mobile computer with the listed IP address sends an IP frame to the Token Ring, the expiry counter is reset. IP addresses are not deleted from the table if the Node ID of the IP address remains in the IR Table. This ensures that the addresses associated with an IP session will not be deleted.

IP Address field.
The IP address of the mobile computer whose MAC address is listed in the Node ID field.

F5 (Statistics)
Nine statistical counters are shown:

Encapsulated IR Frames
The number sent and received.

Relayed Frames
The number sent and received.

NetBios Frames
The number sent and received.

TR Data Frames
The number sent and received.

Undeliverable Frames
The number on the Token-Ring, and the number on Infrared.

Lost Frames
The number on the Token Ring, and the number on Infrared.

Test Frames
The number sent and received.

Location Update Frames
The number sent, received, and generated.

Route Discovery Frames
The number sent and received.

The Error Log Screen: To view the Error Log Screen at any time, press Alt + T. This screen displays the in-memory error information that will be written to the disk-based TR_MGR.LOG file. Several pages of the log may be in memory at any given time. Use the Page up and Page down keys to scroll through the information and the Escape key to return to the previous screen.

The Remote Token-Ring AP Status Screen

To run the Token-Ring Access Point in the foreground, and receive status information from remote Token-Ring Access Points, use TR_MGR.COM with the R parameter:

```
TR_MGR -R
```

All Token-Ring Access Points on the network will be shown on the screen. Note that you can also run remote status from a Token-Ring node that is not an actual AP.

This is described in “Remote Status (non-AP)” on page 68.

Use the Page up and Page down keys to scroll through the entries, and the cursor up and down keys to move the highlight bar to the appropriate MAC address. When you find the MAC address of the AP you wish to get status information for, press the Enter key.

The screen will shown a display similar to the standard Token-Ring Access Point Status screen. The F1, F2, F3, F4, and F5 keys work as described in “The AP Status Screen” on page 63 (providing information about the local AP), and the F6, F7, F8, F9, and F10 keys provide information about the remote AP you selected.

As well, you can use Alt + T to examine any trace buffer messages currently in memory. Use Alt + R to look at the error messages for the remote AP.

Here is a summary of what the function keys display:

F1 Local IR Node Table Entries

F2 Local Token-Ring Node Table Entries

F3 Local NetBios Table

F4 Local IP Address Table

F5 Local AP Statistics

F6 Remote IR Node Table Entries

F7 Remote Token-Ring Node Table Entries

F8 Remote NetBios Table

F9 Remote IP Address Table

F10 Remote AP Statistics

Remote Status (non-AP): TR_MGR -R may also be run from a Token-Ring node that is not actually an Access Point. In order to do this, the node needs to have TR_MGR.COM, .MSG, .INI, PROTMAN.DOS, PROTMAN.EXE, NETBIND.EXE, AP_PROT.SYS and AP_PROT.MSG set up to bind AP_PROT.SYS to its own Token-Ring adapter′s NDIS driver. This can be achieved by performing the manual AP installation without copying files that relate to IR, and using the Token-Ring NDIS driver that came with your Token-Ring adapter.

Ending the Program

To end the access point program, type:

TR_MGR -U

This removes the program from memory. If you decide to restart the program later, type:

TR_MGR - I

or

TR_MGR

Problem Solving

If any errors occur during the installation procedure, they will be displayed on the screen.

If any errors occur while the access point software is running, they are also written to the TR_MGR.LOG file. If the access point software is running in the foreground, messages will also be written to the screen.

The TR_MGR.LOG file is appended to every time the TR_MGR program runs. When the size of this file reaches a certain threshold (default 8K, which is configurable using the LOG_FILE_SIZE keyword in the TR_MGR.INI file) the file is renamed TR_MGR.OLD. A new TR_MGR.LOG file is then created. If there was a previous TR_MGR.OLD file on the disk when the TR_MGR.LOG file reaches the threshold size, the old file is erased.

If the TR_MGR program begins to beep at regular intervals, it is trying to reset the Token-Ring connection. This occurs most often when the Token-Ring cable is disconnected or a serious ring failure occurs. If the Token-Ring cable has become unplugged, simply reconnect the cable and let the program finish trying to reset the Token-Ring connection. If the program is unable to finish resetting, try powering the Access Point unit down and then powering it back up again. If the AP is still unable to resume normal communication, contact your local LAN administrator.

Appendix C. Problem Determination

The Infrared Wireless LAN Adapter and transceiver are designed for trouble-free operation. If you do encounter a problem, you can use the suggestions in this section to find the cause of the problem and its solution. **You should also read the READ.ME file, which contains additional useful information on installing and using the Infrared Wireless LAN Adapter.**

You may also use the diagnostics programs to perform problem determination. These programs are described in "Diagnostics" on page 72.

1. If the computer does not work or does not work properly after you install the Infrared Wireless LAN Adapter:
   - The computer might not be turned on or plugged in. Make sure that the power cord is connected and plugged in.
   - The Infrared Wireless LAN Adapter might not be securely inserted into its slot. For installation information, refer to the chapter appropriate for your Infrared Wireless LAN Adapter.
   - There might be an I/O address or interrupt request (IRQ) conflict on your system. Your computer will not work properly if two or more adapters or devices use the same IRQ and I/O address. Refer to the chapter appropriate for your Infrared Wireless LAN Adapter.
   - If you have the PCMCIA version of the Infrared Wireless LAN Adapter, ensure that the PCMCIA socket is turned *on*. This is often a configuration setting for notebook computers. Refer to your computer's operating manual for instructions.
2. If you cannot receive or send information over the network:
   - The Infrared Wireless LAN Adapter might not be securely inserted into its slot. For installation information, refer to the chapter appropriate for your Infrared Wireless LAN Adapter.

- The transceiver might not be securely connected to the socket on the Infrared Wireless LAN Adapter (if you have the tethered transceiver) or something might be blocking the transceiver signal. See whether something is covering the transceiver. For more information about positioning the transceiver, see "Using Your Infrared Wireless LAN Adapter" on page 42.
- The transceiver might be too far from another transceiver. If the ceilings in your location are higher than about 10 feet (3 meters), the infrared signal might be weaker than normal. Try moving your transceivers and other components closer together.
- The network operating system software might be installed improperly. Review the documentation that came with the software. Make sure you have installed the right driver for your Infrared Wireless LAN Adapter. For more information, refer to "Installing the Software" on page 18.
- If you are using the PCMCIA version of the Infrared Wireless LAN Adapter without Card and Socket Services, the problem may be a memory or address conflict. Either install Card and Socket Services 2.0 or higher, or edit your NET.CFG file to resolve the conflicts. See "Operating Without Card and Socket Services" on page 6 for details.

3. If you can send and receive data, but the network seems very slow:
   - The transceiver signal may be blocked. For information, see "Using Your Infrared Wireless LAN Adapter" on page 42.
   - The transceiver might be too far from another transceiver. If the ceilings in your location are higher than about 10 feet (3 meters), the infrared signal might be weaker than normal. Try moving your transceivers and other components closer together.
4. If you find that none of these solutions works, try turning your computer off and then on again.

Diagnostics

The Infrared Wireless LAN Adapter comes with two diagnostics programs:

IRLAN.DGS
: For use with the Micro Channel version of the adapter.

IRTEST.COM
: For use with all versions of the adapter.

You should use these programs if you run into problems when using the Infrared Wireless LAN Adapter. Also, you should refer to the READ.ME file for additional diagnostic and problem-solving information.

IRLAN.DGS

The IRLAN.DGS diagnostics program comes on the *Infrared Wireless LAN Program Diskette* and works with the Micro Channel version of the Infrared Wireless LAN Adapter. To use this program, do the following:

1. Start your computer with the System Reference diskette in your floppy drive.
2. Select the option to run diagnostics.
3. Select the **IRLAN Diagnostics** option.

IRLAN.DGS Error Messages: This section lists the possible error messages you may encounter with suggestions for correcting each problem.

Error 02730103: The Infrared Lan Adapter diagnostic detected an internal error

Explanation: Your card is defective.

Recovery: Refer to page 81 for warranty and service information.

Error 02730104: The memory test of the Infrared Lan Adapter failed

Explanation: There is a memory conflict between the Infrared Wireless LAN Adapter and another adapter or an application, such as a memory manager.

Recovery: Ensure that the memory regions being requested by the Infrared Wireless LAN Adapter and the other adapter do not conflict. You may either change the Infrared Wireless LAN Adapter′s settings using the adapter configuration process (refer to your computer′s documentation), or change the settings of the other adapter (refer to the other adapter′s documentation).

Alternatively, ensure that the memory regions being used by your memory manager are not conflicting with those required by the adapter. Consult your operating system documentation for information on working with memory managers.

If neither of the above solutions fix this problem, then your card is defective. Refer to page 81 for warranty and service information.

Error 02730107: The reset of the Infrared Lan Controller failed

Explanation: There is an I/O conflict between the Infrared Wireless LAN Adapter and another adapter.

Recovery: You may either change the Infrared Wireless LAN Adapter′s settings using the adapter configuration process (refer to your computer′s documentation), or change the settings of the other adapter (refer to the other adapter′s documentation).

If changing the memory region does not solve the problem, then your card is defective. Refer to page 81 for warranty and service information.

Error 02730109: The internal test of the Infrared Lan Controller failed

Explanation: See Error 02730107.

Recovery: See Error 02730107.

Error 0273010C: Configuration test of the Infrared Lan Controller failed

Explanation: Your card is defective.

Recovery: Refer to page 81 for warranty and service information.

IRTEST.COM

The IRTEST.COM program comes on the *Infrared Wireless LAN Program Diskette* and works with all versions of the Infrared Wireless LAN Adapter. To use this program, do the following:

1. Copy IRTEST.COM to your workstation hard drive.
2. Switch to the subdirectory to which you copied IRTEST.COM.
3. Type IRTEST and press Enter.

Note: IRTEST will not detect conflicts between the Infrared Wireless LAN Adapter and other adapters (sharing the same IRQ, for instance).

IRTEST Error Messages: This section lists the possible error messages you may encounter with suggestions for correcting each problem.

Error 1: Infrared Lan adapter/card not detected

Explanation: One of the following has occurred:

1. Card Services may not be configured properly for your computer. For example, the memory required by Card Services may already be in use by another application, such as a memory manager like EMM386.
2. If you have Card and Socket Services, your PCMCIA socket may be disabled or turned off.
3. If you do not have Card and Socket Services, the memory region you specified in NET.CFG may be already be being used by another application, such as a memory manager like EMM386.

Recovery: For problem:

1. Check to ensure that the memory regions being used by a memory manager are not conflicting with those required by Card Services. Consult your Card and Socket Services and operating system documentation for detailed information.
2. Refer to your computer documentation on how to enable the PCMCIA socket.
3. Check to ensure that the memory regions being used by a memory manager are not conflicting with those set in your

NET.CFG file. You will either need to modify the settings in NET.CFG, or exclude the memory from use by the memory manager. Refer to "Operating Without Card and Socket Services" on page 6 for further information.

Error 2: Could not allocate requested memory address range from Card Services

Explanation: A sufficiently large area of memory (8 kilobytes) is not available in the memory space being used by Card and Socket Services.

Recovery: Ensure that an 8 kilobyte memory region (between CFFFFH and D000H) is available and free for use by Card and Socket Services in order to map in the adapter.

Also ensure that another adapter is not using up this memory region. If it is, you should either change the other adapter's memory space so that an 8 kilobyte region becomes available, or allocate more memory space for use by Card and Socket Services so that an 8 kilobyte memory region becomes available between CFFFFH and D000H. Refer to your Card and Socket Services documentation to determine how to do this.

Error 3: Could not allocate requested I/O address range from Card Services

Explanation: A sufficiently large area of I/O (16 bytes) is not available in the I/O space being used by Card and Socket Services.

Recovery: Ensure that a 16 byte I/O region (between 300H and 370H) is available and free for use by Card and Socket Services in order to map in the adapter.

Also ensure that another adapter is not using up this memory region. If it is, you should either change the other adapter's I/O space so that a 16 byte region becomes available, or allocate more I/O space for use by Card and Socket Services so that a 16 byte I/O region becomes available between 300H and 370H. Refer to your Card and Socket Services documentation to determine how to do this.

Error 4: Could not allocate requested IRQ line from Card Services

Explanation: One of the following has occurred:

1. The requested IRQ is already in use by another adapter.
2. The IRQ requested for use by Card Services is not available (Card Services has been configured to not use the requested IRQ).

Recovery: For problem:

1. Check to ensure that the requested IRQ is not being used by another adapter. If it is, you need either to change the IRQ of the other adapter or of the Infrared Wireless LAN Adapter in order to resolve the conflict.
2. If Card Services has been configured to exclude the requested IRQ from use, you will need to reconfigure Card Services to allow the requested IRQ, or change the IRQ to one that is allowed.

Error 1103: The Infrared Lan Adapter diagnostic detected an internal error

Explanation: Your card is defective.

Recovery: Refer to page 81 for warranty and service information.

Error 1104: The memory test of the Infrared Lan Adapter failed

Explanation: There is a memory conflict between the Infrared Wireless LAN Adapter and another adapter or an application, such as a memory manager.

Recovery: Ensure that the memory regions being requested by the Infrared Wireless LAN Adapter and the other adapter do not conflict. If you have an ISA adapter refer to "Reconfiguring the Adapter" on page 11 for information on how to change the DIP Switch settings. Alternatively, you may wish to change the settings of the other adapter (refer to the other adapter's documentation).

You should also ensure that the memory addresses being used by your memory manager are not conflicting with those required by the adapter. Consult your operating system documentation for information on working with memory managers.

If neither of the above solutions fix this problem, then your card is defective. Refer to page 81 for warranty and service information.

Error 1107: The reset of the Infrared Lan Controller failed

Explanation: There is an I/O conflict between the Infrared Wireless LAN Adapter and another adapter. Refer to "Reconfiguring the Adapter" on page 11 to determine how to change the DIP switch settings of your adapter. Alternatively, you may wish to change the settings of the other adapter.

If changing the memory region does not solve the problem, then your card is defective. Refer to page 81 for warranty and service information.

Error 1109: The internal test of the Infrared Lan Controller failed

Explanation: See Error 1107.

Recovery: See Error 1107.

Error 110C: Configuration test of the Infrared Lan Controller failed

Explanation: Your card is defective.

Recovery: Refer to page 81 for warranty and service information.

OS/2 NDIS Device Driver Error Codes

The following error codes and recovery conditions are for the Infrared Wireless LAN Adapter running with the OS/2 NDIS device driver:

IR00006E
Explanation: The version of Protocol Manager you have installed is out-of-date.
Recovery: Update your version of Protocol Manager.

IR00008E
Explanation: The value specified for the parameter in the IRNDIS module in PROTOCOL.INI is not the correct type.
Recovery: Change the value in PROTOCOL.INI to the correct type for the parameter.

IR00023E
Explanation: The IBM Wireless LAN Adapter NDIS device driver timed-out waiting for a setup completion indication from the adapter.
Recovery: Run the hardware diagnostics for the IBM Wireless LAN Adapter. Contact your customer service center.

IR00025W
Explanation: Only one occurrence of the device driver statement for the IBM Wireless LAN Adapter NDIS MAC device driver is required to support multiple adapters. Additional device driver statements for the adapter in CONFIG.SYS will be ignored.
Recovery: Remove the duplicate device driver statements from CONFIG.SYS.

IR00026E
Explanation: The parameter specifying the driver name (DRIVERNAME) was not found in PROTOCOL.INI. This parameter is required.
Recovery: Change PROTOCOL.INI to specify the proper information.

IR00027E
Explanation: An unexpected error occurred when the program attempted to open the Protocol Manager. The IBM Wireless LAN Adapter NDIS MAC device driver has been removed.
Recovery: Check the drive and directory to ensure that the Protocol Manager is located in the specified path.

IR00028E
Explanation: The device driver was unable to register with the Protocol Manager.
Recovery: Reinstall the Protocol Manager and try the operation again.

IR00029E
Explanation: There was no adapter found in this system. The IBM Wireless LAN Adapter must be installed in order to run the MAC device driver.
Recovery: Install an IBM Wireless LAN Adapter in the computer, or remove the device driver statement from CONFIG.SYS.

IR00030W
Explanation: An unrecognized parameter was found while processing the IBM Wireless LAN Adapter section of PROTOCOL.INI.
Recovery: Correct the parameter or remove it from PROTOCOL.INI.

IR00031W
Explanation: The value specified for the network address parameter in PROTOCOL.INI is not valid for one of the following reasons:
- Invalid local station address
- Too long
- Too short
- Contains non-hexadecimal characters
- Not enclosed in double quotes.

Recovery: Remove or correct the network address parameter (NETADDRESS). The value for this parameter must be 12 characters long and enclosed in double quotes. The locally administered address must be in CANONICAL format, such as: 020000000000. Do not set the corresponding group address bit.

IR00037W
Explanation: The value specified for the transmission queue depth in PROTOCOL.INI is invalid when it is:
- Zero
- Greater than its limit (100).

In this case, a default value is assumed.
Recovery: Remove the parameter or correct it in PROTOCOL.INI.

IR00038W
Explanation: A memory management problem happened during transmission queue initialization. In this case, the queue depth is set to 1 (one).
Recovery: Try to use a smaller value for the parameter in PROTOCOL.INI.

Power on Self Test (POST)

POST runs whenever you turn on your computer. If an error occurs, it indicates that your adapter is defective and will need to be replaced. Refer to page 81 for warranty and service information.

Contacting Technical Support

If you cannot resolve your problem using the suggestions in this chapter, refer to page 81 for warranty and service information.

Appendix D. Product Warranties and Notices

International Business Machines Corporation	Armonk, New York, 10504

Statement of Limited Warranty

The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you originally purchase for your use, and not for resale, from IBM or an IBM authorized reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. Machines are subject to these terms only if purchased in the United States or Puerto Rico, or Canada, and located in the country of purchase. If you have any questions, contact IBM or your reseller.

Machine: IBM Infrared Wireless LAN Adapter

Warranty Period*: Three Years

**Elements and accessories are warranted for three months. Contact your place of purchase for warranty service information.*

Production Status

Each Machine is manufactured from new parts, or new and serviceable used parts (which perform like new parts). In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's warranty terms apply.

The IBM Warranty

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications. IBM calculates the expiration of the warranty period from the Machine's Date of Installation. The date on your receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period, IBM or your reseller will provide warranty service under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine. IBM or your reseller will specify the type of service.

For a feature, conversion, or upgrade, IBM or your reseller may require that the Machine on which it is installed be 1) the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Some of these transactions (called "Net-Priced" transactions) may include additional parts and associated replacement parts that are provided on an exchange basis. All removed parts become the property of IBM and must be returned to IBM.

Replacement parts assume the remaining warranty of the parts they replace.

If a Machine does not function as warranted during the warranty period, IBM or your reseller will repair or replace it (with a Machine that is at least functionally equivalent) without charge. If IBM or your reseller is unable to do so, you may return it to your place of purchase and your money will be refunded.

If you transfer a Machine to another user, warranty service is available to that user for the remainder of the warranty period. You should give your proof of purchase and this Statement to that user.

Warranty Service

To obtain warranty service for the Machine, you should contact your reseller or call IBM. In the United States, call IBM at **1-800-426-7299**. In Canada, call IBM at **1-800-565-3344**. You may be required to present proof of purchase.

Depending on the Machine, the service may be 1) a "Repair" service at your location (called "On-site") or at one of IBM's or a reseller's service locations (called "Carry-in") or 2) an "Exchange" service, either On-site or Carry-in.

When a type of service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced.

It is your responsibility to:

1. obtain authorization from the owner (for example, your lessor) to have IBM or your reseller service a Machine that you do not own;
2. where applicable, before service is provided —
   a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provide,
   b. secure all programs, data, and funds contained in a Machine,
   c. inform IBM or your reseller of changes in a Machine's location, and
   d. for a Machine with exchange service, remove all features, parts, options, alterations, and attachments not under warranty service. Also, the Machine must be free of any legal obligations or restrictions that prevent its exchange; and
3. be responsible for loss of, or damage to, a Machine in transit when you are responsible for the transportation charges.

Extent of Warranty

IBM does not warrant uninterrupted or error-free operation of a Machine.

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2. the amount of any other actual loss or damage, up to the greater of $100,000 or the charge for the Machine that is the subject of the claim.

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2. loss of, or damage to, your records or data; or
3. economic consequential damages (including lost profits or savings) or incidental damages, even if IBM is informed of their possibility.

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Netware Lite	Novell, Inc.
Novell	Novell, Inc.
Personal Netware	Novell, Inc.
Windows	Microsoft Corporation
Windows for Workgroups	Microsoft Corporation

Electronic Emissions

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are 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. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled: *Digital Apparatus*, ICES-003 of Industry Canada.

Avis de conformité aux normes d'Industrie Canada

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouiller: *Appareils numériques*, NMB-003 édictée par Industrie Canada.

European Council Compliance Statement

This product is in conformity with the protection requirements of EC Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.

IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

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+++EDF058W Invalid document number on DOCNUM tag for an IBM manual. (Page 86 File: IRLAFNTM)
DSMMOM397I '.EDF#CV' WAS IMBEDDED AT LINE 210 OF '.EDF#BCV7'
DSMMOM397I '.EDF#BCV7' WAS IMBEDDED AT LINE 680 OF '.EDF#END'
DSMMOM397I '.EDF#END' WAS IMBEDDED AT LINE 187 OF 'EDFPRF40'
DSMBEG323I STARTING PASS 2 OF 3.
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DSMMOM397I '.EDF#BCV7' WAS IMBEDDED AT LINE 680 OF '.EDF#END'
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DSMMOM397I '.EDF#END' WAS IMBEDDED AT LINE 187 OF 'EDFPRF40'