Z-Com

LANEscape™ WL2440
Wireless LAN PC104 Adapter

User's Manual

Z-Com, Inc.
Science-Based Industrial Park
TAIWAN

FCC Information

The Federal Communication Commission Radio Frequency Interference Statement includes the following paragraph:

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

♦ Reorient or relocate the receiving antenna.

♦ Increase the separation between the equipment and receiver.

♦ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

♦ Consult the dealer or an experienced radio / TV technician for help.

The user should not modify or change this equipment without written approval from company name. Modification could void authority to use this equipment.

For the safety reason, people should not work in a situation which RF Exposure limits be exceeded. To prevent the situation happening, people who work with the antenna should be aware of the following rules:

1. Install the antenna in a location where a distance of 6.5 cm from the antenna may be maintained.

2. While installing the antenna in the location, please do not turn on the power of wireless card.

3. While the device is working, please do not contact the antenna.

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Limited Warranty

Technical Support

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About This Manual

LANEscape WL2440 User's Manual is first published by Z-Com, Inc. in 1996.   This Revision is for LANEscape WL2440 Version 1.20, issued in November, 1997. The purpose of this manual is for the setup of the product LANEscape WL2440.   It includes procedures which help you to avoid unforeseen problems. README.TXT in the Driver & Utility Diskette has the latest product information.   You can use any text editor to open this file.

Contents

Chapter 1   Introduction

LANEscape is Z-Com's solution to IEEE 802.11 wireless LAN, which operates at 2.4GHz ISM band and throughput up to 2Mbps.   LANEscape series include WL2410 Access Point, WL2420 ISA adapter, WL2430 PCMCIA Type II adapter, and WL2440 PC104 adapter.   This manual covers LANEscape WL2440 PC104 adapter .

1-1 Features and Benefits

LANEscape products have numerous features and benefits, such as:

1. Data rate up to 2 Mbps.

2. Working range up to 800 ft. in an open environment.

3. Supports point-to-point and point-to-multipoint access.

4. Seamless integration with IEEE 802.3 Ethernet LAN.

5. Direct Sequence Spread Spectrum (DSSS) technology provides robust, interference-resistant and secured wireless connection.

6. Wireless connection without the hassles and cost of cabling.

7. Supports wide range of LAN operating systems, such as Novell Netware, Microsoft LAN Manager, Microsoft Windows NT and Microsoft Windows 95.

8. Supports Plug and Play.

9. Easy installation.

1-2 Applications

Applications of LANEscape are easy to obtain and highly efficient, for example:

1. **Access to corporate network information**
    E-mail, file transfer and terminal emulation.

2. **Difficult wiring environments**
    Historical or old buildings, asbestos installations, and open area where wiring is difficult and expensive.

3. **Frequently changed environments**
    Retailers, manufacturers and banks who frequently rearrange the workplace and change location.

4. **Temporary LANs for special projects or peak time**

   Trade shows, exhibitions and construction sites need temporary setup for a short time period. Retailers, airline and shipping companies need additional workstations for a peak period. Auditors require workgroups at customer sites.

5. **Access to database for mobile workers**

   Doctors, nurses, retailers, white-collar workers need access to database while being mobile in the hospital, retail store or office campus.

6. **SOHO (Small Office and Home Office) users**

   SOHO users need easy and quick installation of a small computer network.

1-3 Product Package

LANEscape WL2440 includes the following items. Please go through each listed item below. If any listed item is not included, please contact your dealer.

A. LANEscape WL2440 / PC104 Adapter

- WL2440 / PC104 Interface Adapter...................................... x 1
- Antenna (dipole, omni-directional)...................................... x 1

- Driver & Utility Diskette...................................... x 1
- User's Manual...................................... x 1

1-4 System Requirements

A. Installation of WL2440 requires:

1. A PC/AT compatible computer.
2. PC104 interface slot.
3. MS-DOS 3.0 or higher.
4. Minimum 500Kbytes free disk space for installing driver and utility program.

LANEscape supports the same network configuration options of the existing wired LANs as defined by IEEE 802 standard committee.

LANEscape could be configured as:
◆ Ad-Hoc for departmental or SOHO LANs
◆ Infrastructure for enterprise LANs
◆ LAN-Interconnection for point-to-point link as a campus backbone.

2-1 Network Topology

◆ **Ad-Hoc**
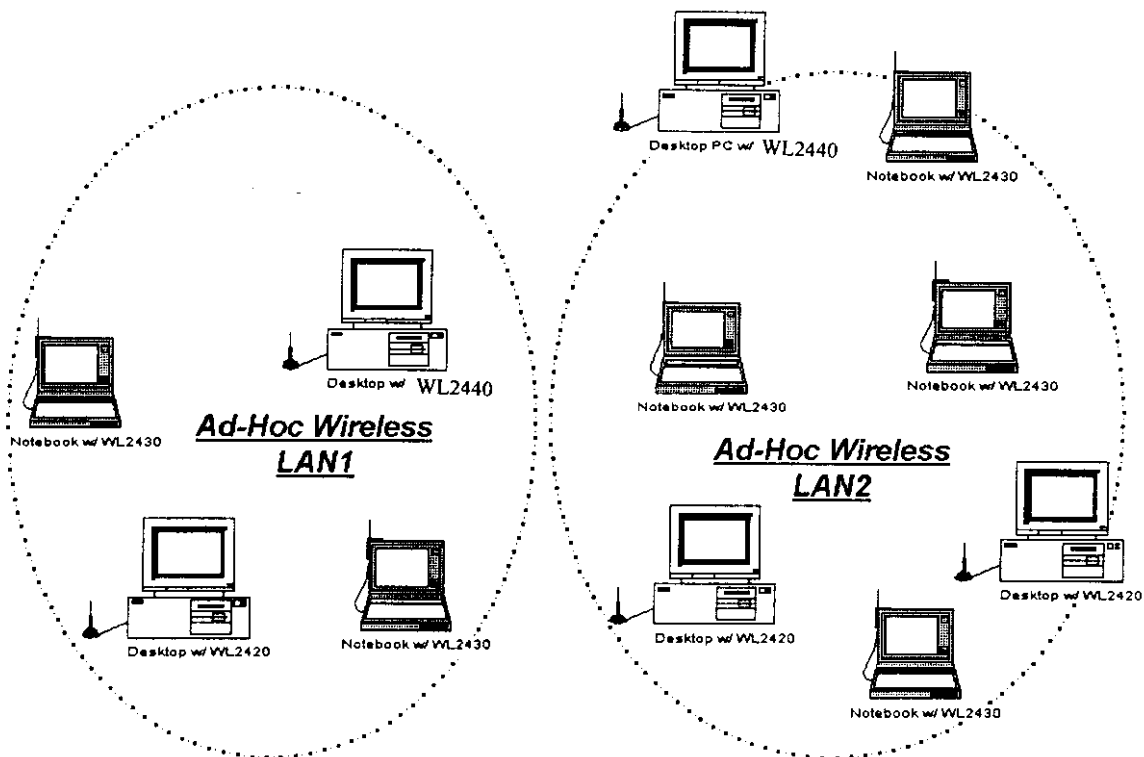
Fig 2.1 An Example of Ad-Hoc Wireless LANs

An Ad-Hoc wireless LAN is a group of computers, each equipped with one LANEscape adapter, connected as an independent wireless LAN.   Computers in a specific Ad-Hoc wireless LAN must be configured with the same radio channel.

Ad-Hoc wireless LAN is applicable at a departmental scale for a branch or SOHO operation.

◆ **Infrastructure**
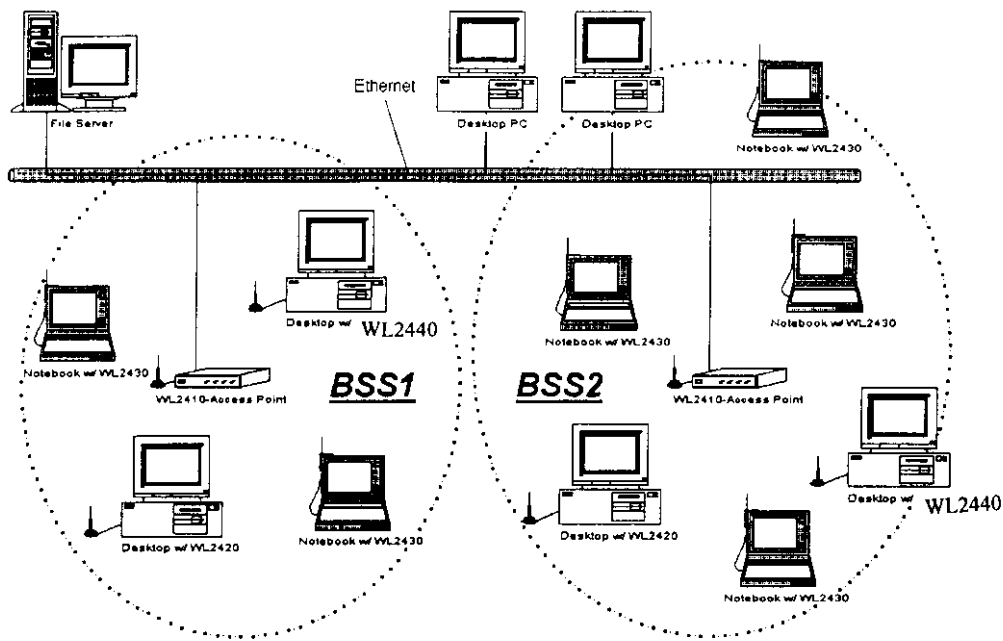
Fig 2.2 An Example of Infrastructure Wireless LAN

LANEscape provides access to a (wired) Ethernet for wireless workstations. An integrated wireless and wired LAN is called an Infrastructure configuration. A group of LANEscape PC users and a LANEscape WL2410 Access Point construct a Basic Service Set (BSS). Each LANEscape PC in this BSS can talk to any computer in the wired LAN infrastructure via the WL2410 Access Point.

Infrastructure configuration not only extends the accessibility of a LANEscape PC to the wired LAN, but also doubled the effective wireless transmission range for 2 LANEscape PCs. Since WL2410 is able to forward data within its BSS, the effective transmission range in an Ad-Hoc LAN is **doubled**. (See Fig 2.3)
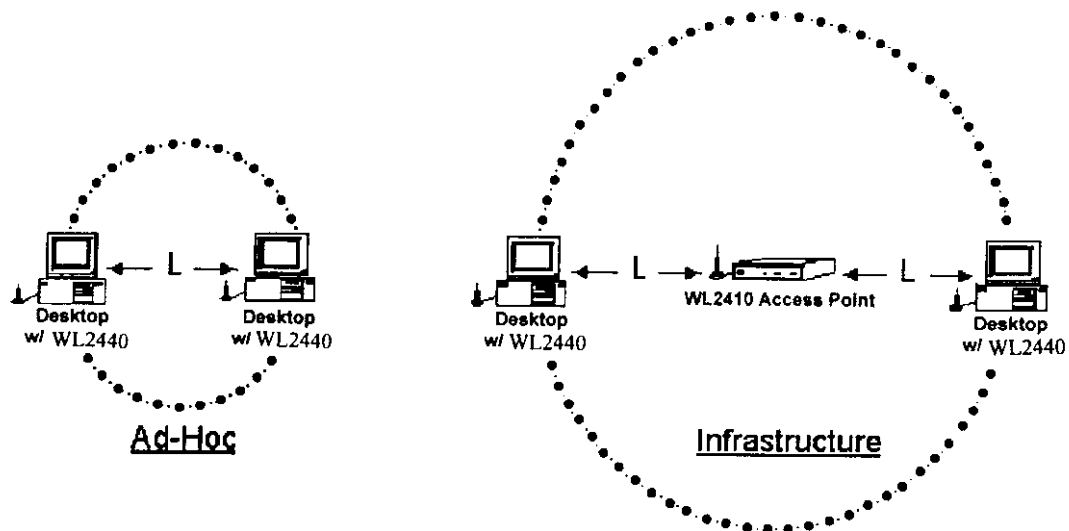
Fig 2.3 The effective Transmission Range

BSS ID is, in essential, the ID of each independent WL2410. All LANEscape PCs configured without the roaming option in this independent BSS must be configured with BSS ID of that WL2410. Check your WL2410 for its BSS ID or use the Access Point Browser Utility program described in next section - "Roaming".

Infrastructure is applicable to enterprise scale for wireless access to central database, or wireless application for mobile workers.

2-2 Roaming

An Infrastructure configuration also supports roaming capability for mobile workers. More than one BSS can be configured as an Extended Service Set (ESS). On account of a continuous connection to the network, users **within this ESS** could roam freely. All LANEscape PCs and WL2410s within one ESS must be configured with the same ESS ID and at the same radio channel.
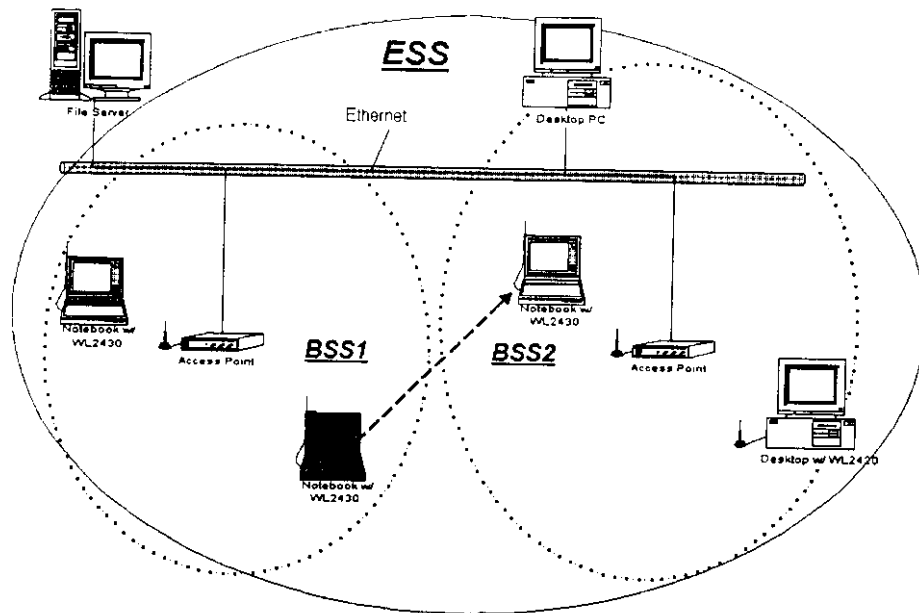
Fig 2.4 Roaming in an Extended Service Set (ESS)

Before setting up an ESS for roaming, it would be helpful to improve the performance by choosing a feasible radio channel and the right places for Access Points. LANEscape provides *Site Survey* and *Access Point Browser* utilities for the above purposes.

Site Survey and Access Point Browser are functions of the LANEscape Utility program (WLU.EXE), which can be found in the WL2440 Driver & Utility Diskette. Before utilizing Site Survey and Access Point Browser, a PC with LANEscape WL2440 adapter and the Utility program installed is necessary. For details of WLU.EXE, please check the chapter of "LANEscape Utility-WLU.EXE" in this manual.

◆ **Site Survey**
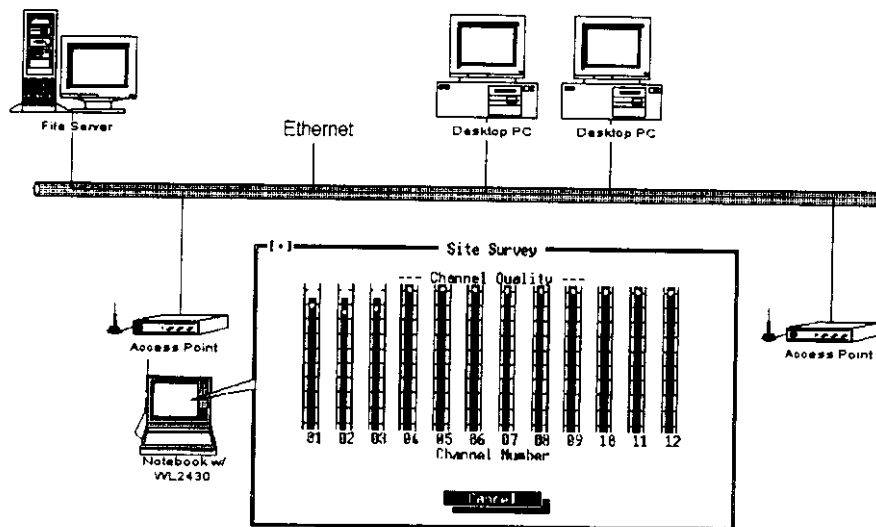
Fig 2.5 Site Survey Utility

Site Survey function can be found in the WLU program. After running WLU.EXE, select **[Diagnostics Tools]**→**[Site Survey]**. Site Survey displays the quality of all 12 radio channels

in your environment.   Generally, the **higher** the bar is, the better the quality will be.   Choose the radio channel with the best quality as your operating radio channel.   If you are setting up an ESS for roaming, configure all the LANEscape PCs and WL2410s within this ESS at that channel.

◆ **Access Point Browser**
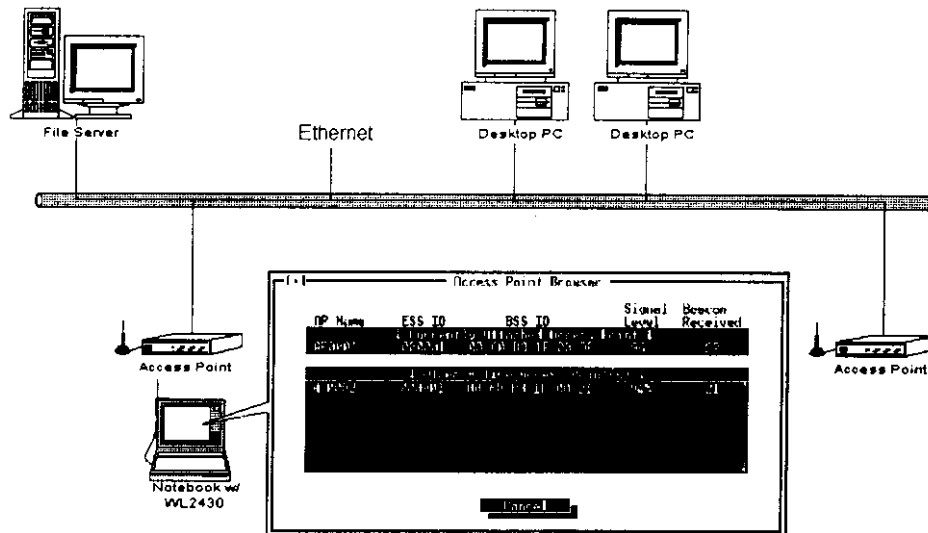
Fig 2.6 Access Point Browser Utility

Access Point Browser functions can be found in the WLU program. After running WLU.EXE, select [**Diagnostics Tools**]→[**Access Point Browser**].   Each Access Point broadcasts "beacon" periodically.   The mobile station (with the "roaming" option being enabled) receives beacons from different Access Points, compares their signal level (technically, the RSSI, Radio Signal Strength Indicator), then the mobile station connects to the Access Point with the highest (i.e., best) signal level.   Signal level is the indicator of the radio signal coverage of an Access Point.

Access Point Browser displays all the beacons received and its signal level from Access Points in the current physical location.   Use a notebook PC running the Access Point Browser to walk around the coverage area of your ESS.   The coverage of each Access Point can therefore be measured.   Adjust the placement of your Access Points to form a continuous radio signal coverage within the ESS.

2-3 Wireless LAN System Configuration

This flow chart summarizes the installation procedure and provides a reference which can help you quickly identify the steps to setup your LANEscape wireless LAN system.   For details, please check the respective chapters in this manual and Access Point's manual.

```
                          ( Start )

              ┌──────────────────────┐
              │  Install adapter hardware │   (Chapter 3 in Adapter's manual)
              │  for your wireless STA   │
              └──────────────────────┘

              ┌──────────────────────┐
              │  Install software with   │   (Chapter 4 in Adapter's manual)
              │  Driver & Utility Diskette │
              └──────────────────────┘

              ┌──────────────────────┐
              │  Run WLU.EXE on your    │
              │  wireless station, use site │   (Chapter 5 in Adapter's manual)
              │  survey function to select │
              │  your operating channel  │
              └──────────────────────┘
```

Infrastructure ◄─────── ◆ Interconnection ◆ ───────► Ad-Hoc

```
┌──────────────────────┐
│  Hardware installation  │   (Chapter 3 in AP's manual)
│  for your AP           │
└──────────────────────┘

            ◆ Roaming ? ◆
        Y ◄─────    ─────► N
```

┌──────────────────────┐
│ Configure the operating │   (Chapter 4 in
│ parameters for all your │   AP's manual)
│ APs.   APs within a   │
│ roaming domain (ESS)   │
│ must operate on the   │
│ same radio channel   │
│ and ESS ID   │
└──────────────────────┘

┌──────────────────────┐
│ Configure the operating │   (Chapter 4
│ parameters for your AP, │   in AP's
│ and startup the system │   manual)
└──────────────────────┘

┌──────────────────────┐
│ Configure operating   │   (Chapter 5
│ parameters with   │   in Adapter's
│ WLU.EXE program   │   manual)
└──────────────────────┘

┌──────────────────────┐
│ Select and configure   │   (Chapter 4
│ drivers for your LAN   │   in Adapter's
│ operating system   │   manual)
└──────────────────────┘

┌──────────────────────┐
│ Run WLU.EXE on   │
│ wireless mobile STA,   │   (Chapter 2)
│ use Access Point   │
│ Browser to adjust the   │
│ locations for your APs │
└──────────────────────┘

┌──────────────────────┐
│ Run WLU.EXE on   │
│ wireless STA, use Access │
│ Point Browser to find out │   (Chapter 2)
│ the BSS ID of your AP   │
└──────────────────────┘

┌──────────────────────┐
│ Configure the operating │   (Chapter 5
│ parameters of your   │   in AP's
│ wireless STA with WLU.EXE │   manual)
└──────────────────────┘

┌──────────────────────┐
│ Select and configure   │   (Chapter 4
│ drivers for your LAN   │   in Adapter's
│ operating system   │   manual)
└──────────────────────┘

STA= Station

AP= Access Point

              (Installation
                completed)

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Chapter 3   Hardware Installation

3-1 Hardware Installation for WL2440

The installation of WL2440 wireless LAN PC104 adapter includes the following steps:

Step1: Insert The Interface Adapter
1. If the power of your computer is on, please turn it off.
2. Open the chassis of your computer.
3. Insert your WL2440 adapter carefully and firmly into any empty PC104 slot and then close the computer chassis.
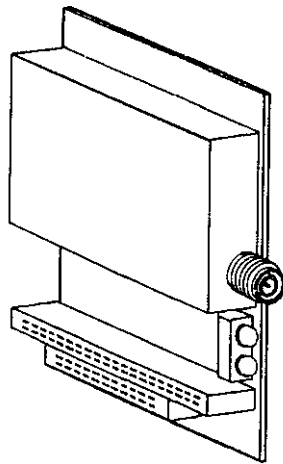
Red LED: Power
Green LED: Tx/Rx

Fig 3.1 LANEscape WL2440 – PC104 Adapter

Step2: Attach the Antenna

Screw in the antenna connector clockwise to attach on the LANEscape WL2440 interface adapter.   Place your antenna in a suitable position that might get the best Tx/Rx performance.   Normally, the higher the position is, the better the performance will be.

Step3: Power on Your Computer

Turn on the power of your PC then continue the installation steps in next chapter - "Software Installation".

> **NOTE:** The LANEscape WL2440 wireless LAN adapter is a jumperless plug-and-play PC104 adapter.   The IRQ and I/O Port of the adapter will be configured automatically by the **Plug-and-Play BIOS** or **Windows 95**.
> If you install the WL2440 wireless LAN adapter into a computer neither with **Microsoft Windows 95** nor the **Plug-and-Play BIOS**, you should load plug-and-play configuration manager (such as **Intel Plug and Play Configuration Manager, CM**) to configure the WL2440 wireless LAN

adapter automatically. Otherwise, you should use the **WLJMP.EXE** program (also included in the LANEscape WL2440 Driver & Utility diskette) to setup the adapter manually before the network driver or utility is running.

WLJMP is an MS-DOS command. You can simply issue the command in the DOS prompt:

WLJMP -irq <IRQ Number> -port <IO Port Address>

The <IRQ Number> can be 10, 11, or 12. The <IO Port Address> is from 0x280 to 0xFFC0 stepped by 0x40, such as 0x280, 0x2C0, 0x300, 0x340, 0x380, 0x3C0, ..., 0xFFC0.

You should provide the **IRQ Number** and **I/O Port Address** manually depend on the configuration of your computer. Wrong (conflicting) setting may cause the system hung-up.

We suggest you to add this command into your AUTOEXEC.BAT file if your computer need to run **WLJMP**.

NOTE: If you had setup wrong IRQ or I/O-port parameters when issued WLJMP command, or you want to change the parameter, you **must** power off your computer and reboot your computer then issue WLJMP command again. Otherwise, the IRQ and I/O-port parameters cannot be modified simply by running WLJMP again.

Chapter 4   Software Installation

Please follow these steps to install all LANEscape software into your PC:

Step 1: Copy the LANEscape software to the hard disk:

1.   Insert the diskette labeled "LANEscape WL2440 Driver & Utility Diskette" into your floppy drive (A: or B:).
2.   In MS-DOS prompt, type A: (or B:). Then press <Enter>.
3.   Then, type

        INSTALL C:\WL2440 <Enter>   (for PC104 adapter)

to install software into your hard drive.

Step 2: Make sure that both the hardware and software are installed properly, then read Chapter 5 for instructions to use the LANEscape Utility-WLU.EXE to make any necessary configuration.

> ☞ **TIP:**   All LANEscape wireless LAN adapters and Access Points are shipped with default settings can operate, without any further configuration, for building a basic Infrastructure wireless LAN. If you want nothing but a basic Infrastructure wireless LAN, you can simply forget the WLU program and go directly to install network drivers now. Then, enjoy your Infrastructure wireless LAN!

(A) For building an **Infrastructure** (this is the default setting while the adapter is shipped) wireless LAN, WL2410 Access Point should be set up initially. Please refer to "LANEscape WL2410 Access Point User's Manual" for the installation and setup of the Access Point before running LANEscape Utility.

(B) For building an **Ad-Hoc** wireless LAN, the installation is only applied to adapters. Please refer to Chapter 5 - "LANEscape Utility - WLU.EXE" for configuring the adapter into Ad-Hoc mode.

4-1 Setup LANEscape for Windows 95

1. Shut down your computer.

2. Insert WL2440 adapter.

3. Start Microsoft Windows 95.

4. Insert the WL2440 Driver & Utility Diskette into any 3½" floppy driver.

5. Follow the instructions on the "New Hardware Found" window and install LANEscape driver.

4-2 Setup LANEscape for Windows NT 3.51 or 4.0

1. Login as Administrator.

2. From the desktop, select <Control Panel> ➪ <Network> ➪ <Add Adapter>.

3. Windows NT will present a list of all its supported adapters. Select OTHERS (or, press [**Have Disk**] button) to continue.

4. Windows NT will ask for the drive/path containing the LANEscape WL2440 Windows NT drivers. Insert the WL2440 Driver and Utility diskette in drive A, and then type:

    A:\NT

5. Windows NT will attempt to locate an INF file in the specified path. If you have entered the path name correctly, Windows NT should copy the appropriate drivers to the Windows NT system.

6. A "LANEscape/WL2440 Wireless LAN Adapter Setup" dialog box will show up. Please select the IRQ Level and I/O Port Address manually. Your WL2440 adapter will thereafter work on this configuration under Windows NT. Press OK to continue.
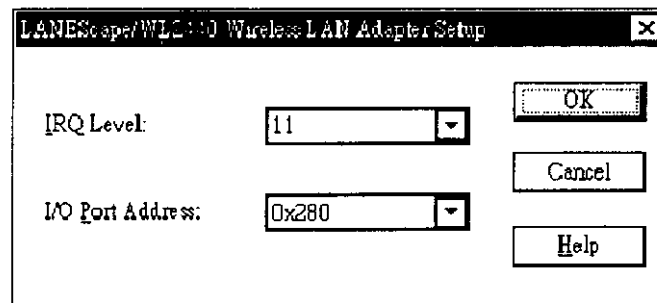
Fig 4.1 LANEscape WL2440 Wireless LAN Adapter Setup

7. At this point, the drivers would have been properly copied and the installation would proceed to the next step. Please refer to your Windows NT installation guide for the correct procedure.

4-3 Setup LANEscape for Netware Client – Using ODI Driver (DOS/Win3.1)

For DOS and Windows 3.1 Netware Clients, LANEscape provides the ODI driver. The ODI driver program allows you to run Novell Netware's IPX protocol stack in your workstation. The LANEscape ODI driver supports the Port, Node Address, Protocol and Frame options for creating your own **NET.CFG** file. For more information on these keywords, please refer to Novell's "Netware ODI shell for DOS - NET.CFG options."

A. Install a **Netware 3.x/4.x ODI DOS and Windows 3.1 Workstation (using Netware Client Install)**

Install the Netware ODI Client Driver files into your workstation, if not yet installed. Follow the installation procedure described in the Netware installation manual.

The suggested way to install a Netware Client (workstation) is to use the **Netware Client Install** program to install all necessary files. Please follow its prompted screens to accomplish the installation procedure and select the LANEscape ODI driver as the network driver.

To select the ODI driver of the LANEscape wireless LAN adapter, go to the driver list (Press <Enter> to see list) and select "**Other Drivers**" from the *Network Board* list box.

In the *Insert the Driver Disk* dialog box, please input the path where the ODI driver resides in your computer. For example,

> `C:\WL2440\ODI`   (for WL2440 PC104 adapter)

Or, you may insert the "Driver & Utility Diskette", and input:

> `A:\ODI`   (the disk is in drive A:, for example)

Press <Enter>, the *Network Board* list box then appears again. Please select the model name of LANEscape hardware which you've installed in your computer then press <Enter>.

In the *Setting for the LANEscape WL2440 Wireless LAN Adapter* dialog box, select all the frame types you want to use or just press <ESC> to continue the installation.

Then, follow the rest of procedures to accomplish the Netware Client (workstation) installation.

The Netware Client Install program copies the necessary files for Netware Client. Please continue its installation procedure to completion. Upon completion, a new

`NET.CFG` file will be created in your NWCLIENT directory. Typically, this file contains the following lines:

Link Driver WL2440   ; or WL2440 for PC104
FRAME Ethernet_802.3
FRAME Ethernet_802.2
                       :

A typical **STARTNET.BAT** for the ODI workstation performs the following commands:

```
SET NWLANGUAGE=ENGLISH  ; Set Netware 4.X to English
                        ; language
LSL                     ; Link Support Layer Module (provided by
                        ; Novell)
WL2440                  ; Hardware Specific Module (For PCMCIA, uses
                        ; WL2430)
IPXODI                  ; IPX Protocol Stack Module (provided by Novell)
VLM                     ; DOS Support Module (provided by Novell)
F:                      ; Change current drive to connected device
                        ; (F:, for example)
LOGIN                   ; Issue login command to login to file server
```

You may run **STARTNET.BAT** to access (logon) the Novell Netware server.

B. Install ODIPKT Driver (Optional)

ODIPKT is a public domain program that provides Packet Drive API over Novell's ODI interface.   It also supports the coexistence of Packet Driver applications (NCSA Telnet, for example) and ODI applications (Netware Client, for example).

The ODIPKT can be downloaded from the following anonymous FTP site with URL:

ftp://ndtl.harvard.edu/pub/odipkt

There are two sample **NET.CFG** and **STARTNET.BAT** files for a reference installation of ODIPKT. They are located in the **C:\WL2440\ODIPKT** (for PC104) directory if you have already installed LANEscape software into your hard drive.

4-3 Setup LANEscape for DOS TCP/IP Applications

For all the legacy TCP/IP applications in DOS environment, please install LANEscape

Packet Driver.

To install Packet Driver for WL2440, load "WL2420P.COM/WL2430P.COM" from DOS command prompt.

Syntax: W2420P.COM [-u] <packet_int_no> [<interrupt level> <IO base address>]

Options:

[-u]	Uninstall packet driver.
<packet_int_no>	the software interrupt vector number used by the packet driver program, which can be from 96 (0x60) to 128 (0x80).
<interrupt level>	the interrupt request number(IRQ) for WL2440 card
<IO base address>	the IO base address assigned to WL2440 card

Example 1: To load packet driver for the WL2440 card, which will be found first by the driver, on packet interrupt vector 0x60:

```
C:\WL2440\PKTDRV>WL2440P 0x60
```

Example 2: To load packet driver for the WL2440 card, whose interrupt level is 11 and IO base address is 0x280, on packet interrupt vector 0x62:

```
C:\WL2440\PKTDRV>WL2440P 0x62 11 0x280
```

Example 3: To unload packet driver WL2440P.COM on packet interrupt vector 0x60:

```
C:\WL2440\PKTDRV>WL2440P -u 0x60
```

4-4 Setup LANEscape for other LAN OS Using NDIS 2.0 (DOS/Win3.1)

4-4-1 Install DOS NDIS 2.0 Driver for Microsoft LAN Manager

MS LAN Manager provides a SETUP.EXE program. Execute this SETUP program to specify the proper driver for WL2440.

1. Complete the hardware installation of WL2440.
2. Execute SETUP.EXE provided by MS LAN manager software. For example:

```
C:\LANMAN.DOS>setup
```

3. Select "Configuration"→ "Add New Config"→"Other Driver"
4. Insert the WL2440 Driver & Utility diskette in drive 'A' and follow the instructions on the screen. The SETUP program will copy the necessary NDIS driver programs from the diskette to your hard disk (into the LAN Manager directory).
5. After completion of the SETUP, your CONFIG.SYS file will be modified as well as containing statements referring to the LANEscape driver programs.
6. Reboot your computer and follow the NDIS binding procedure to use the LANEscape NDIS driver programs.

4-4-2 Install DOS NDIS 2.0 Driver for Other LAN OS

Please follow the installation procedures of the respective LAN OS, and select LANEscape NDIS 2.0 as your LAN driver.

Chapter 5   LANEscape Utility-WLU.EXE

5-1 Introduction

WLU.EXE (LANEscape Utility) is an easy-to-use utility program with user-friendly graphical interface.   It helps you to set up your network environment, configure your LANEscape wireless LAN adapter, and diagnose the operation of your wireless LAN.

The LANEscape Utility is a DOS mode Graphic User Interface (GUI) program.   For Microsoft Windows 95, you must run WLU.EXE within the DOS window.   You can navigate through the screens simply by using the **mouse** or the **keyboard**.

(A) Using the Mouse

If you have installed the mouse driver, you are ready to use the mouse to operate the LANEscape Utility.   We suggest users to use mouse for more convenient operation.

The instruction to use the mouse:

Move - move the cursor.
Left Button - click to press a button.
Right Button - not used.

(B) Using The Keyboard

If your PC or notebook does not equipped with a mouse or you have not installed the mouse driver, you can still use the keyboard to operate the LANEscape Utility.

The instruction to use the keyboard:

TAB - select highlighted button or input field.
ENTER - press the highlighted button.
Alt + [character key] - press the button with the highlighted character.

NOTE: An error message will be displayed if the LANEscape wireless LAN adapter is not installed correctly into your PC.

ERROR: Z-Com LANEscape wireless LAN adapter does not exist.

Make sure the installation of your LANEscape wireless LAN adapter is OK and start WLU.EXE again.

5-2 Navigating The LANEscape Utility

To set up your wireless network environment, please follow these steps:

Step 1: Configure the adapter - Select "Network Configuration" in the main menu screen (Fig 5.2) and follow the instructions.

Step 2: Diagnose the operation - Using "Diagnostics Tools" in the main menu screen and follow the instructions.

You will see a welcome screen (Fig 5.1) after you simply executing WLU command, for example:

C:\WL2440>wlu <Enter>
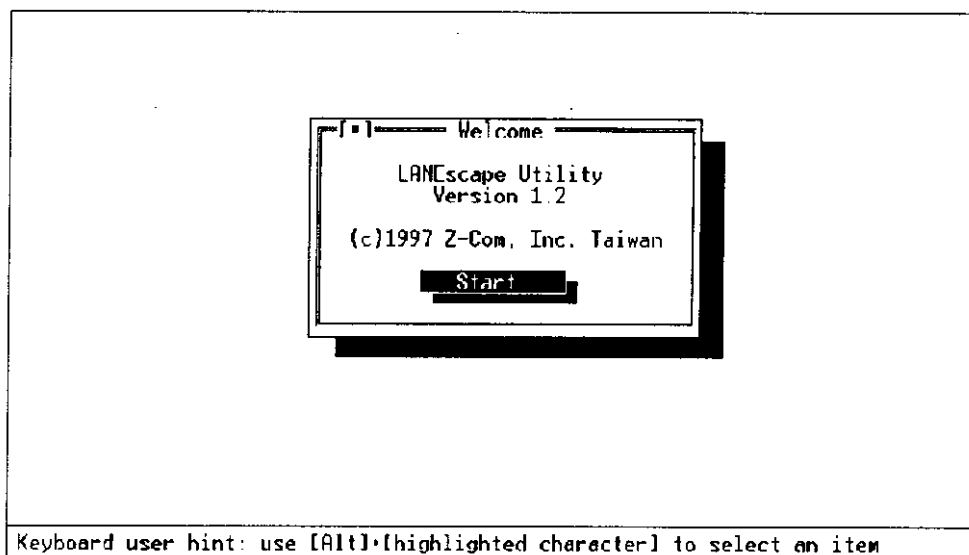
Fig 5.1 LANEscape Utility Welcome Screen

Press [**Start**] button (<Alt>+'S' or <Enter>) to see the Main Menu screen.

A. Main Menu

The Main Menu screen (Fig 5.2) shows all main functions of the LANEscape Utility:

☐ [**Network Configuration**] - LANEscape Utility provides a screen for you to configure parameters of the LANEscape wireless LAN adapter for your wireless network environment.

☐ [**Diagnostics Tools**] - The LANEscape Utility provides several diagnostic tools for you to diagnose the operation of your wireless network environment.

☐ [**Firmware Upgrade**] - LANEscape Utility provides the function of upgrading the firmware in the wireless adapter.

☐ [**Exit**] - End the execution of LANEscape Utility, return to DOS.

```
┌──────── LANEscape wireless LAN adapter hardware information ─────────┐
│ Physical Address: [ 00 60 B3 F0 00 0C ]                             │
│ Firmware Version: WI 2440 Ver.1.10                                  │
│       Frequencies: FCC and IC (North America) domain                │
│          IRQ Number: 11                                             │
│ I/O Port Address: 0x280                                             │
└─────────────────────────────────────────────────────────────────────┘
        ┌──────────────── LANEscape Utility ────────────────┐
        │                                                     │
        │   ███ Network Configuration ███   Configure the adapter for │
        │                                   your wireless network.    │
        │                                                     │
        │   ███ Diagnostics Tools ███       Diagnose the operation of │
        │                                   your wireless network.    │
        │                                                     │
        │   ███ Firmware Upgrade ███         Upgrade the firmware in the │
        │                                    wireless LAN adapter.     │
        │                                                     │
        │   ███ Exit ███                    Return to DOS.    │
        │                                                     │
        └─────────────────────────────────────────────────────┘
│ Keyboard user hint: use [Alt]+[highlighted character] to select an item │
```

Fig 5.2 LANEscape Utility Main Menu Screen

B. Adapter Hardware Information Window

A LANEscape wireless LAN adapter hardware information window will show on the top of the screen (Fig 5.2) while Main Menu screen is displayed. In this window, you will see current adapter configuration information, that is, the physical address, firmware version, frequency domain, IRQ number, and I/O port address of the adapter which you installed in your desktop or notebook computers.

C. Network Configuration Screen

The Network Configuration screen (Fig 5.3) allows you to check and modify current configuration of the LANEscape wireless LAN adapter. The user-configurable parameters are divided into two groups: **radio parameters** and **network parameters**.

```
┌─[•]═══════════════ Configure The Adapter... ═══════════════┐
│                                                             │
│  RADIO PARAMETERS:                                          │
│                                                             │
│      Channel: ███CH01 2412MHz █   Speed: ┌─────────────┐    │
│                                          │ ( ) 1.0 Mb/s │    │
│  NETWORK PARAMETERS:                     │ (♦) 2.0 Mb/s │    │
│                                          └─────────────┘    │
│      Station operation mode:                                │
│      ┌──────────────────────────────────────┐              │
│      │ ( ) Ad-hoc (without Access Point)     │              │
│      │ (♦) Infrastructure (with Access Point)│              │
│      └──────────────────────────────────────┘              │
│                                                             │
│      ┌───────────────┐                                      │
│      │ [ ] Use Security │                                   │
│      └───────────────┘                                      │
│                                                             │
│      ┌───────────────┐                                      │
│      │ [X] Roaming    │   ESS ID ███000001                  │
│      └───────────────┘                                      │
│                                                             │
│        ███ Modify ███    ███ Default ███    ███ Cancel ███  │
│                                                             │
└─────────────────────────────────────────────────────────────┘
```
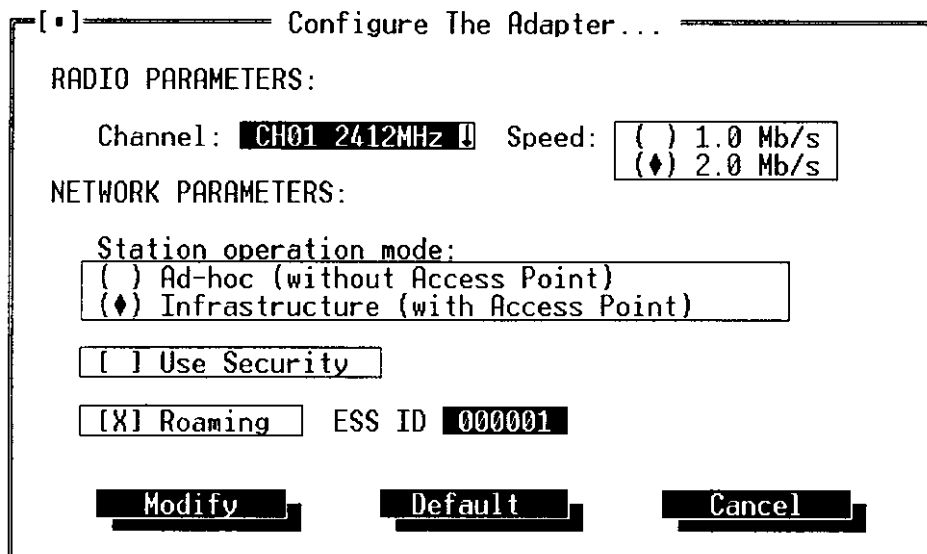
Fig 5.3 LANEscape Utility Network Configuration Screen

C-1. RADIO PARAMETERS

Channel: Select the channel number as your operating radio channel.

Speed: Select the speed (bit rate) that will be used for transmitting and receiving wireless data. Owing to the RF modulation characteristics, the 1 Mbps operation speed sustains a longer working range than 2 Mbps. Select the proper operation speed that best meets your throughput and working range requirement.

C-2. NETWORK PARAMETERS

Station Operation Mode: Set the station operation mode to **Ad-Hoc** (without Access Point) or **Infrastructure** (with Access Point).

Use Security: Check this box if you want to enable the security feature.

Security Key: Input a security key while the security feature is enabled.

Roaming: Check this box if you want to enable the roaming feature.

ESS ID: Input a six-digit ESS ID (i.e., 000000~999999) while the roaming feature is enabled.

BSS ID: Input a six-byte hexadecimal value of BSS ID in an Infrastructure operation mode while the roaming feature is disabled (example of BSS ID value: 00 60 B3 0F 00 01).

The BBS ID is, in essential, the ID of the WL2410 Access Point with which this station associated. Each WL2410 Access Point has its unique BSS ID. Check your WL2410 or use the Access Point Browser (in the Diagnostics Tools) to find out the BSS ID of your WL2410 Access Point.

NOTE: All parameters you modified on the wireless LAN adapter is kept in the flash ROM (non-volatile memory) on the adapter. The new parameters will take effect thereafter even though you boot your PC into any other operating systems or insert the adapter into another PC.

D. Diagnostics Tools Screen

The Diagnostics Tools screen (Fig 5.4) shows all diagnostics tools in the LANEscape Utility. There are buttons for executing the following diagnostics tools:

```
┌─[ ▪ ]════════════════════ Diagnostics Tools ═════════════════════┐
│                                                                    │
│    ███████████████████████                                         │
│    ██  Test Adapter   ██▌    Perform diagnostics of your          │
│    ███████████████████████   wireless adapter.                    │
│                                                                    │
│    ███████████████████████                                         │
│    ██   Site Survey   ██▌    Inspect frequency availability       │
│    ███████████████████████   for your site.                       │
│                                                                    │
│    ███████████████████████                                         │
│    ██ Link Quality Test ██▌  Test the point-to-point              │
│    ███████████████████████   communication quality.               │
│                                                                    │
│    ███████████████████████                                         │
│    ██ Access Points Browser ██▌  Show all active Access Points    │
│    ███████████████████████       in your site.                    │
│                                                                    │
│                    ██████████████                                  │
│                    ██  Cancel  ██▌                                 │
│                    ██████████████                                  │
└────────────────────────────────────────────────────────────────────┘
```
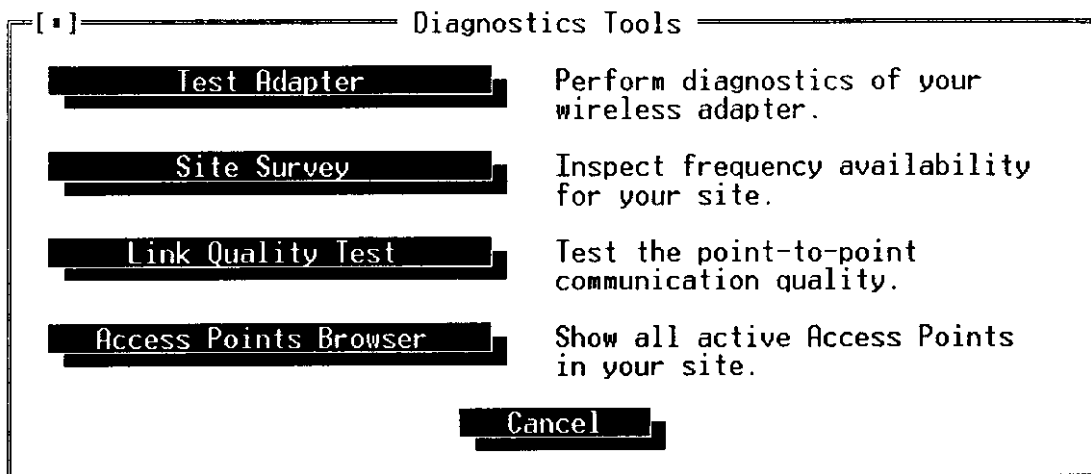
Fig 5.4 LANEscape Utility Diagnostics Tools Screen

☐ **[Test Adapter]** - Perform diagnostics of your LANEscape adapter.

☐ **[Site Survey]** - Inspect channel quality for your site.

☐ **[Link Quality Test]** - Test point-to-point communication quality.

☐ **[Access Point Browser]** - Show all active LANEscape Access Points in your site.

The instructions of using each diagnostics tool are as follows:

● **Test Adapter**

When Test Adapter screen (Fig 5.5) is displayed, you can see three adapter internal test routines performed consequently. Their results (passed or failed) will be shown on each corresponding box.

This diagnostics tool is provided for testing the hardware components of your LANEscape wireless LAN adapter. The following important components will be tested:

- Flash Memory

- SRAM

- Internal Loopback Test

Press **[OK]** button to exit the screen.

```
┌[ ■ ]════════════ Test Adapter ════════════════════┐
│                                                     │
│        Performing Adapter Internal Test Routines:   │
│                                                     │
│           Test Flash Memory........ [passed]        │
│           Test SRAM Memory......... [passed]        │
│           Internal Loopback Test... [passed]        │
│                                                     │
│                                                     │
│                    ███████ OK ███████               │
│                                                     │
└─────────────────────────────────────────────────────┘
```
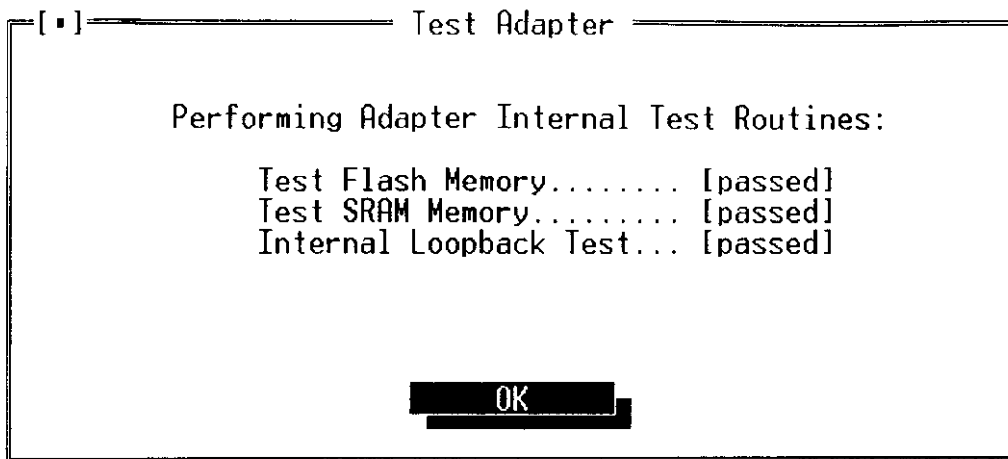
Fig 5.5 LANEscape Utility Test Adapter Screen

NOTE: If you run the LANEscape Utility on a multiprocessing operating system (such as MS-Windows), during Test Adapter session, all concurrent network data transmission (if any) will be stopped temporarily.

- **Site Survey**

When Site Survey screen (Fig 5.6) is displayed, the channel quality of all 12 radio channels will be displayed.   These channel quality measurements are shown on each gauge for the 12 radio channels.   The **higher** bar means the radio channel having **better** quality (i.e., less interference).

The channel quality is scanned channel-by-channel repeatedly.   You may see some of the gauges changing their height occasionally.   To determine the channel quality in a longer time span, you can refer to the average channel quality measurement from the small-shaped dot in each channel quality gauge.
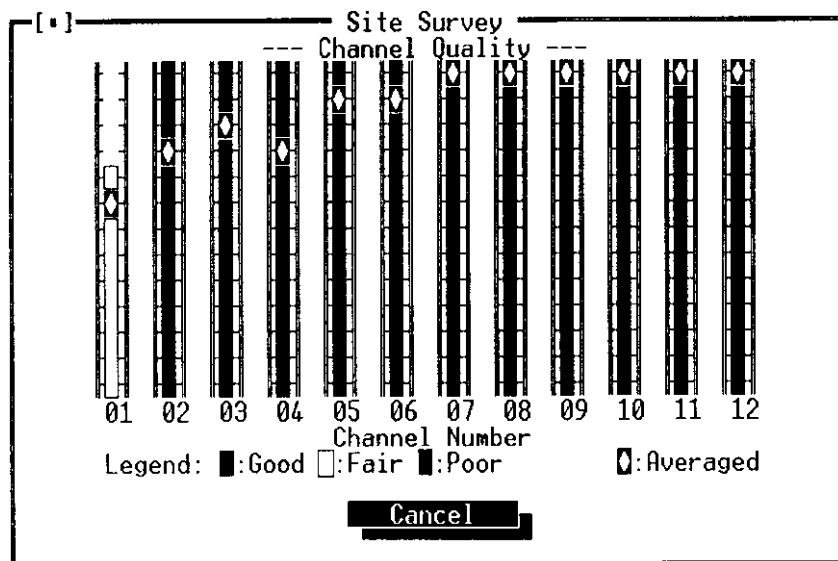
Fig 5.6 LANEscape Utility Site Survey Screen

NOTE: If you run the LANEscape Utility on a multi-processing operating system (such as MS-Windows), all concurrent network data transmission (if any) will be stopped temporarily during Site Survey session.

● **Link Quality Test**

Link Quality Test is a useful diagnostics tool for you to understand the point-to-point data transmission quality between two wireless LAN station. Or, if you use the Infrastructure wireless LAN configuration, you can test the transmission quality between your wireless LAN station and the WL2410 Access Point.

When Link Quality Test Screen is displayed, you may choose one of the roles that this wireless LAN station should perform.

NOTE: If you run the LANEscape Utility on a multi-processing operating system (such as MS-Windows), all concurrent network data transmission (if any) will be stopped temporarily during Link Quality Test session.

1. **Act as Master test station (see Fig 5.7a):**
   You should input the destination slave test station address before press [**Start**] button. The slave address can be found from the slave test station's screen (Fig 5.7b). The "Master Test Station" window (Fig 5.8) will be displayed after pressing [**Start**] button.

```
┌[ ▪ ]━━━━━━━━━━━ Link Quality Test ━━━━━━━━━━━━━━━━┐
│                                                          │
│        ┌── Choose the role of this station: ──┐          │
│        │ (♦) Act as Master test station        │          │
│        │ ( ) Act as Slave test station         │          │
│        │ ( ) Loopback Through Access Point      │          │
│        └──────────────────────────────────────┘          │
│                                                          │
│        Please Enter Destination Slave Address:           │
│        ▐ 00 60 B3 F0 00 0C ▌                              │
│                                                          │
│             ▐ Start  ▌            ▐ Cancel ▌             │
│                                                          │
└──────────────────────────────────────────────────────────┘
```

Fig 5.7a LANEscape Utility Link Quality Test Screen - Master Selected

```
┌─[■]══════════════ Master Test Station ══════════┐
│                                                  │
│   Test Address is:  ██ 60 B3 F0 00 0C            │
│                                                  │
│   Packet Sent:  █      907  Packet Received:  █      907 │
│                                                  │
│   Packet Loss:  █  0.00%     Elapsed Time: 00:00:13 │
│                                                  │
│   Current Signal Level:  █  95.78%               │
│                                                  │
│   Link Quality is Excellent                      │
│                                                  │
│              █    Cancel    █▄                   │
│                                                  │
└──────────────────────────────────────────────────┘
```
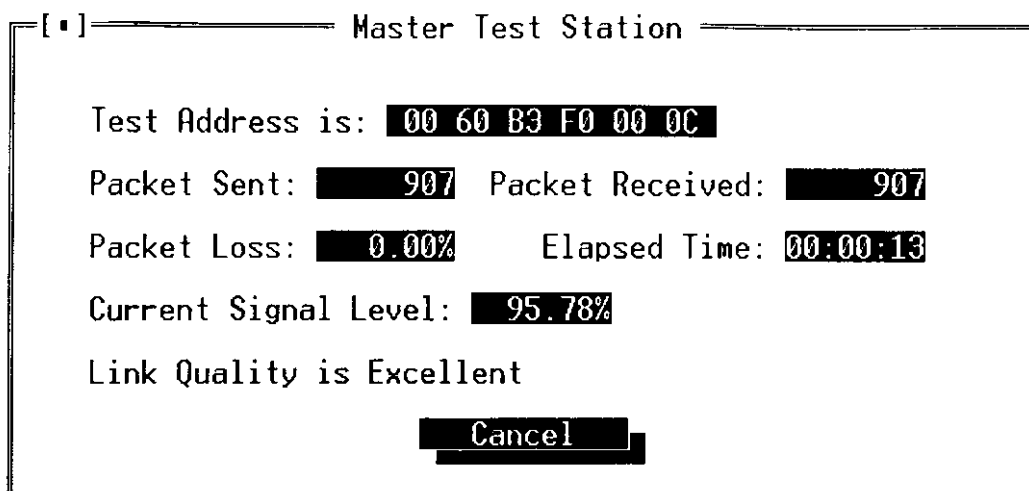
Fig 5.8 Master Test Station

The "Master Test Station" window (Fig 5.8) contains the following status/ statistical information during the Link Quality Test session:

☐ **Test Address:** The physical address of the destination slave test station. (Self physical address will be displayed while performing Access Point loopback test.)

☐ **Packet Sent:** Total test packets have been sent.

☐ **Packet Received:** Total responding packets have been received.

☐ **Packet Loss:** The percentage of packet loss.

☐ **Current Signal level:** The signal level when receiving last responding packet. The signal level is calculated as the percentage of its signal level measurement relative to the full signal level.

☐ **Link Quality:** A textual expression of the link quality evaluation. The evaluation of the link quality is judged by packet loss statistics. It can be one of following categories:

   A. **Excellent:**   packet loss is less than 0.5%.
   B. **Good:**   packet loss is between 0.5% to 2.0%
   C. **Acceptable:**   packet loss is between 2.0 % to 5%
   D. **Poor:**   packet loss is between 5.0% to 10%
   E. **Unacceptable:** packet loss is more than 10.0%

2. **Act as Slave test station (see Fig 5.7b):**

   You can press [**Start**] button to start the slave test station. The "Slave Test Station" window (Fig 5.9) will be displayed after pressing [**Start**] button.

-24-

```
┌─[ ■ ]───────────── Link Quality Test ══════════════════┐
│                                                          │
│        ┌─ Choose the role of this station: ─┐           │
│        │ ( ) Act as Master test station     │           │
│        │ (♦) Act as Slave test station      │           │
│        │ ( ) Loopback Through Access Point   │           │
│        └─────────────────────────────────────┘          │
│                                                          │
│        My Address is ▌00 60 B3 95 00 01▐                 │
│                                                          │
│                                                          │
│            ▌Start ▌          ▌Cancel▌                    │
│                                                          │
└──────────────────────────────────────────────────────────┘
```
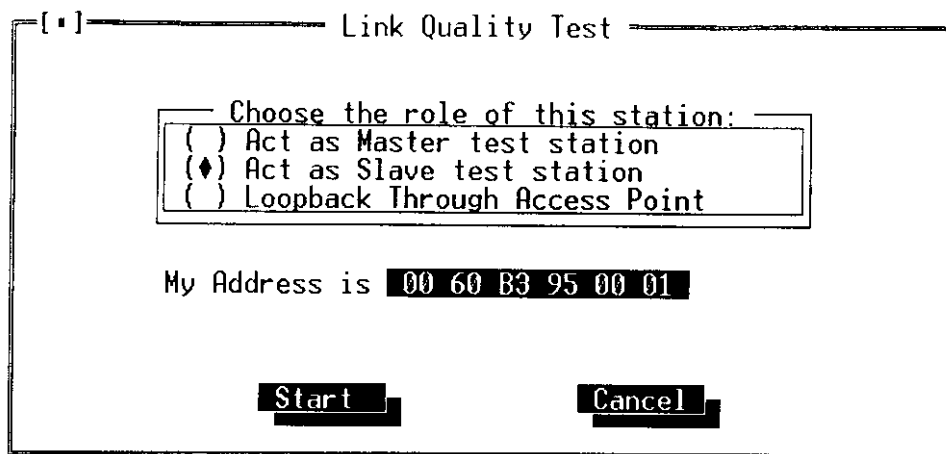
Fig 5.7b LANEscape Utility Link Quality Test Screen - Slave Selected

```
┌─[ ■ ]───────────── Slave Test Station ═════════════════┐
│                                                          │
│    My Address is: ▌00 60 B3 95 00 01▐                    │
│                                                          │
│    Test Packet Received: ▌   186▐                        │
│                                                          │
│    Current Signal Level: ▌78.00%▐                        │
│                                                          │
│                                                          │
│                    ▌Cancel    ▌                          │
│                                                          │
└──────────────────────────────────────────────────────────┘
```
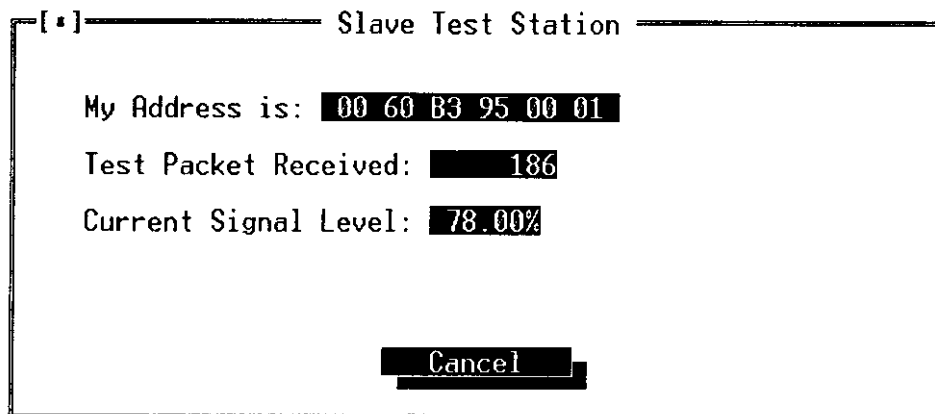
Fig 5.9 Slave Test Station

The "Slave Test Station" window (Fig 5.9) contains following status/statistical information during the Link Quality Test session:

☐ **My Address:** The slave test station's physical address.

☐ **Test Packet Received:** Total test packets received.

☐ **Current Signal Level:** The signal level when receiving last test packet. The signal level is calculated as the percentage of its signal level measurement relative to the full signal level.

3. **Loopback through Access Point (see Fig 5.7c):**

If you use the infrastructure wireless LAN configuration, you can select the Access Point loopback test. The loopback test is between this wireless station and the associated Access Point.

```
┌─[ · ]──────────── Link Quality Test ════════════════════╗
║                                                          ║
║         ┌── Choose the role of this station: ──┐         ║
║         │ ( ) Act as Master test station       │         ║
║         │ ( ) Act as Slave test station        │         ║
║         │ (♦) Loopback Through Access Point     │         ║
║         └───────────────────────────────────────┘        ║
║                                                          ║
║         AP BSS_ID is  ██ 60 B3 C0 00 00                   ║
║                                                          ║
║                                                          ║
║             ██ Start ██         ██ Cancel ██             ║
║                                                          ║
╚══════════════════════════════════════════════════════════╝
```
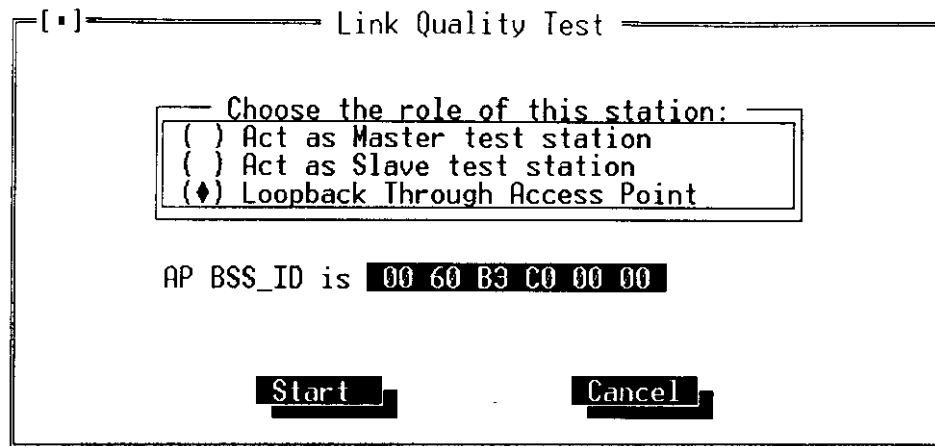
Fig 5.7c LANEscape Utility Link Quality Test screen -Loopback Selected

The "Access Point Loopback Test" window (Fig 5.10) will be displayed after pressing the **[Start]** button. This window contains same status / statistical information in the "Master Test Station" window.

```
┌─[ · ]──────────── Access Point Loopback Test ════════════╗
║                                                          ║
║   Test Address is:  ██ 60 B3 10 00 9A                     ║
║                                                          ║
║   Packet Sent:  ██    3826  Packet Received:  ██    3826  ║
║                                                          ║
║   Packet Loss:  ██ 0.00%      Elapsed Time:  ██ 00:00:38  ║
║                                                          ║
║   Current Signal Level:  ██ 91.57%                        ║
║                                                          ║
║   Link Quality is Excellent                              ║
║                                                          ║
║                  ██ Cancel ██                            ║
║                                                          ║
╚══════════════════════════════════════════════════════════╝
```
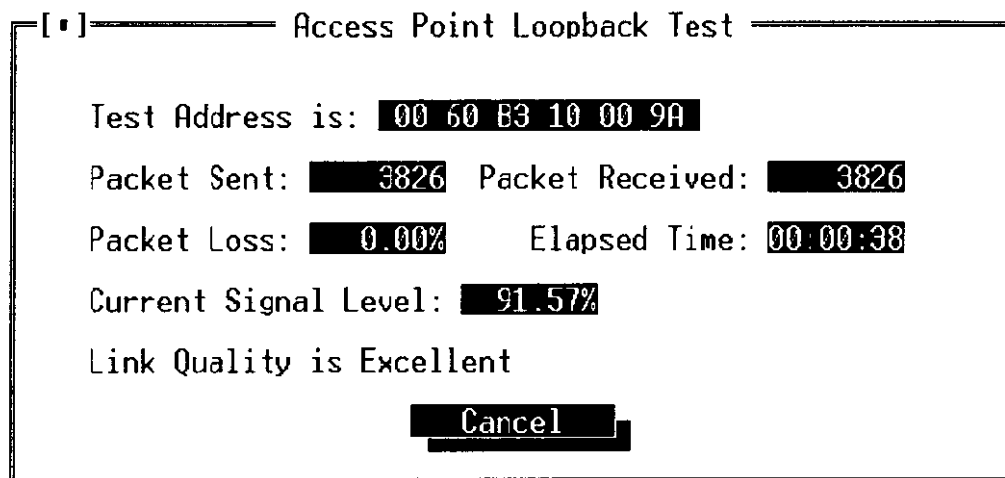
Fig 5.10 Access Point Loopback Test

● **Access Point Browser**

Select the [Access Point Browser] in Fig 5.4 and you will see a screen shown as Fig 5.11. Choose **[Single Channel]** if all your Access Points are operating on the same channel, and you will see the screen on Fig 5.12.   You can monitor the Access Point on which your working station is currently attached to.   If you have Access Points working on different channels, choose **[Multi-Channel]**, and all the active Access Points will be shown. (For example: Fig 5.13)

```
┌─[ ■ ]════════════════ Select Access Point Browser Type ═══════════════
│  Browser Type:                    ┌──────Adapter Configuration──────┐
│  │(♦) Single Channel │            │Channel: CH11                    │
│  │( ) Multi-Channel  │            │Speed: 2.0 Mb/s                  │
│                                   └─────────────────────────────────┘
│  Single Channel:
│      Works on the channel which your wireless LAN adapter is
│      configured. It will display the status of beacon receipt
│      from Access Point(s). This type of browser is ideal for
│      observing the activity of all Access Points operating on
│      a single channel.
│
│  Multi-Channel:
│      Scan all the IEEE 802.11 channels. This type of browser is
│      ideal for display all active Access Points in your site.
│
│            ┌──────────Go──────────┐      ┌────────Cancel────────┐
│            └──────────────────────┘      └──────────────────────┘
└─────────────────────────────────────────────────────────────────────
```

Fig 5.11 LANEscape Access Point Browser Screen -Select the browser type

```
┌─[ ■ ]════════════════════ Access Point Browser ══════════════════════
│                                              Signal   Beacon
│   AP Name     ESS ID        BSS ID           Level    Received
│   ┌─────────↓ Currently Attached Access Point ↓──────────────────┐
│   │AP0001      000001   00 60 B3 1F 00 3F      96%        22      │
│   └────────────────────────────────────────────────────────────┘
│   ┌─────────────↓ Other Active Access Point(s) ↓────────────────┐
│   │AP0002      000001   00 60 B3 1F 00 21      94%        21    ↑│
│   │                                                             ││
│   │                                                             ││
│   │                                                             ││
│   │                                                             ││
│   │                                                             ↓│
│   └────────────────────────────────────────────────────────────┘
│
│                    ┌──────────Cancel──────────┐
│                    └───────────────────────────┘
└─────────────────────────────────────────────────────────────────────
```

Fig 5.12 LANEscape Access Point Browser Screen -Single Channel

```
┌─[ ■ ]════════════════════ Access Point Browser ══════════════════════
│
│   AP Name     ESS ID        BSS ID           RSSI      Channel
│   ┌─────────↓ Currently Attached Access Point ↓──────────────────┐
│   │** Under Multi-Channel brower, no AP will be attached. **     │
│   └────────────────────────────────────────────────────────────┘
│   ┌─────────────↓ Other Active Access Point(s) ↓────────────────┐
│   │AP0001      000001   00 60 B3 1F 00 3F      96%     CH11     ↑│
│   │AP0002      000001   00 60 B3 1F 00 21      94%     CH07      │
│   │                                                             ││
│   │                                                             ││
│   │                                                             ││
│   │                                                             ↓│
│   └────────────────────────────────────────────────────────────┘
│  Scanning channel...CH11
│                    ┌──────────Cancel──────────┐
│                    └───────────────────────────┘
└─────────────────────────────────────────────────────────────────────
```

Fig 5.13 LANEscape Access Point Browser Screen -Multi-Channel

When Access Point Browser screen (Fig 5.12 or 5.13) is displayed, you will see two Access Point information boxes:

1. **Currently Attached Access Point:** This box will display the Access Point which the wireless LAN station is currently attached to. (**NOTE**: There is no currently attached Access Point if this wireless LAN station is in Ad-Hoc mode or Multi-Channel browser is performed.)

2. **Other Active Access Point(s):** If there are any other active Access Point can be listened by this wireless LAN station, they will be displayed in this box.

Each row of the Access Point information contains the following columns:

☐ **AP Name:** The name of the Access Point.

☐ **ESS_ID:** The ESS ID of the Access Point.

☐ **BSS_ID:** The BSS ID of the Access Point.

☐ **Signal Level:** Signal Level is the indicator of the radio signal coverage of the Access Point. The signal level is displayed in the percentage value of its current signal level measurement relative to the full signal level.

☐ **Beacon Received:** Each Access Point broadcasts "beacon" periodically. The wireless station will process these beacons to keep in touch with the network. It counts the beacons cumulatively from the beginning of the Access Point Browser session. This item only shows in the Single-Channel browser screen.

☐ **Channel:** The operating channel number of the respective access point. This item only shows in the Multi-Channel browser screen.

NOTE: If you run the LANEscape Utility on a multi-processing operating system (such as MS-Windows), all concurrent network data transmission (if any) will be stopped temporarily while Access Point Brower is activing.

E. Firmware Upgrade

LANEscape WL2440 Utility provides the function of upgrading the firmware in the wireless adapter to newer version. Choose the [**Firmware Upgrade**] button in Main Menu (Fig 5.2), and follow the directions on the screen.

☠ CAUTION: Improper operation of firmware upgrade **could damage** your adapter. We strongly suggest that the firmware upgrade is done by experienced computer personnel and follows this instruction well to upgrade the firmware of your wireless LAN adapter.

● **Obtain The New Firmware**

The latest version of LANEscape firmware can be obtained from Z-Com's home page at

"www.zcomwireless.com" or contact your local dealer for detail information.
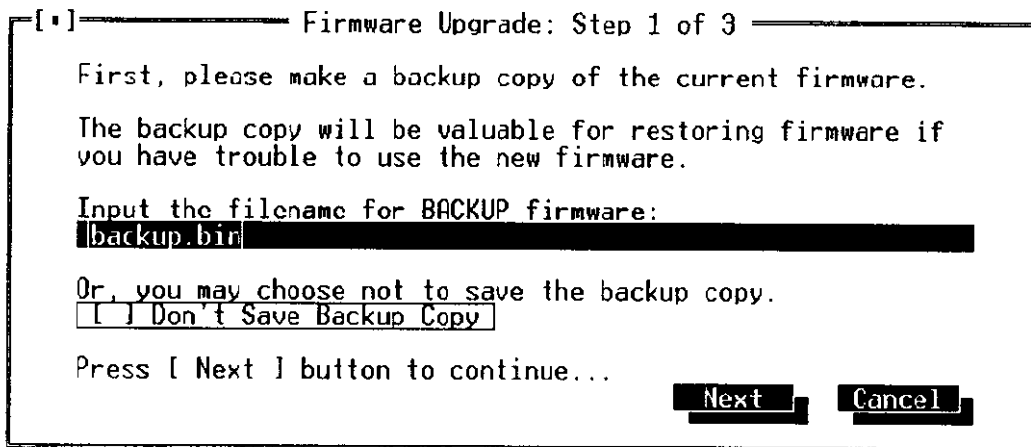
● **Preparation**

Before doing firmware upgrade, please:

1. Close all running applications (especially, network applications), or, a reboot of your system is preferred.

2. Launch the WLU program, perform **[Diagnostics Tools]** ⇨ **[Test Adapter]** to verify the operation of your wireless LAN adapter.

3. Make sure the new firmware file is for your type of wireless LAN adapter (i.e., WL2440/PC104 and WL2430/PCMCIA). Otherwise, the firmware upgrade tool will show up an "Invalid Firmware" message and refuse to do anything. The size of firmware file should be 32,768 bytes.

4. Memorize the path and filename to access the new firmware file. The firmware upgrade tool will ask you for that.

5. Always use the WLU program which works on your **current** version of firmware to do firmware upgrade. After firmware being upgraded, please read the documentation of the new firmware to determine if you need to upgrade your WLU program and drivers.

● **How to Operate the Firmware Upgrade Tool**

The Firmware Upgrade tool will perform the firmware upgrade in three steps. Please follow these step-by-step screens to upgrade the firmware of your LANEscape wireless LAN adapter.

First, a "Firmware Upgrade: Step 1 of 3" dialog box (Fig 5.14) will ask you for a filename to save a backup copy the current version of firmware in your LANEscape wireless LAN adapter. The backup copy will be valuable for restoring firmware if you have troubled to use the new firmware. Or, you can choose no to save the backup copy. Then, press the **[Next]** button to continue.

```
┌[ ■ ]━━━━━━━━━━━ Firmware Upgrade: Step 1 of 3 ━━━━━━━━━━━┐
│                                                          │
│   First, please make a backup copy of the current firmware.│
│                                                          │
│   The backup copy will be valuable for restoring firmware if │
│   you have trouble to use the new firmware.              │
│                                                          │
│   Input the filename for BACKUP firmware:                │
│   ▌backup.bin▐                                           │
│                                                          │
│   Or, you may choose not to save the backup copy.        │
│   [ ] Don't Save Backup Copy                             │
│                                                          │
│   Press [ Next ] button to continue...                   │
│                                   ▌ Next ▐  ▌ Cancel ▐   │
│                                                          │
└──────────────────────────────────────────────────────────┘
```
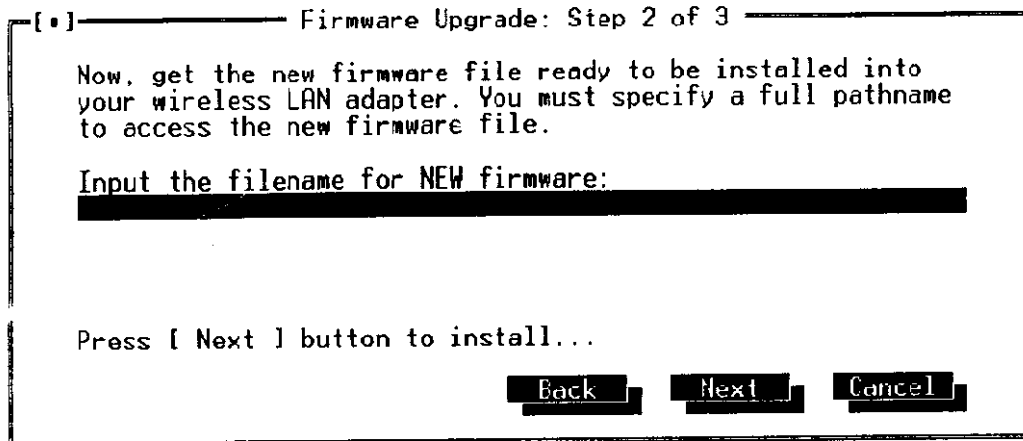
Fig 5.14 Firmware Upgrade: Step 1 of 3

Then, a "Firmware Upgrade: Step 2 of 3" dialog box (Fig 5.15) will show up. Please input
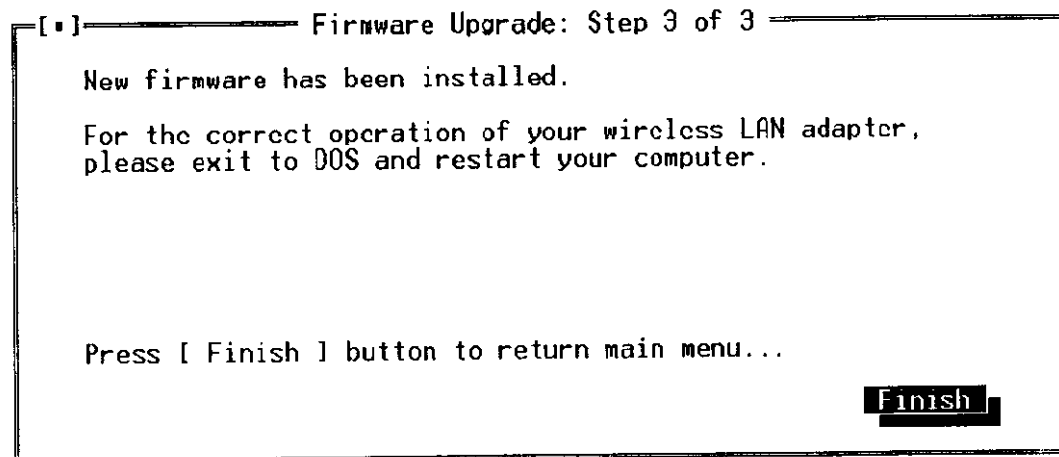
a full pathname to access the new firmware file. Once the filename is entered, press the [Next] button to install. If the file is successfully opened and verified, an "Install New Firmware..." message will be displayed. It will take about 5 seconds to finish the installation and verification. (If you access the new firmware file via a floppy drive, the process can take much longer than just 5 seconds.)

> ☠ CAUTION: Don't power off, reset, or try anything to terminate the firmware upgrade while "Install New Firmware..." pop-up dialog box is in progress. Otherwise, your wireless LAN adapter will be damaged.

```
┌─[ • ]──────────────── Firmware Upgrade: Step 2 of 3 ─────────────┐
│                                                                   │
│   Now, get the new firmware file ready to be installed into       │
│   your wireless LAN adapter. You must specify a full pathname      │
│   to access the new firmware file.                                │
│                                                                   │
│   Input the filename for NEW firmware: ███████████████████████    │
│   ████████████████████████████████████████████████████████████    │
│                                                                   │
│                                                                   │
│                                                                   │
│   Press [ Next ] button to install...                             │
│                                                                   │
│                              ▌Back ▐    ▌Next ▐    ▌Cancel▐        │
└───────────────────────────────────────────────────────────────────┘
```

Fig 5.15 Firmware Upgrade: Step 2 of 3

Finally, if the installation is complete, a "Firmware Upgrade: Step 3 of 3" dialog box (Fig 5.16) will be displayed to show the result of installation. For the correct operation of your LANEscape wireless LAN adapter, please exit WLU and restart your computer. Please read the documentation of the new firmware to determine if you need to upgrade your WLU program and drivers.

```
┌─[ • ]──────────────── Firmware Upgrade: Step 3 of 3 ═════════════┐
│                                                                   │
│   New firmware has been installed.                                │
│                                                                   │
│   For the correct operation of your wireless LAN adapter,         │
│   please exit to DOS and restart your computer.                   │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│   Press [ Finish ] button to return main menu...                  │
│                                                                   │
│                                                   ▌Finish▐         │
└───────────────────────────────────────────────────────────────────┘
```

Fig 5.16 Firmware Upgrade: Step 3 of 3

B