

Intel[®] PRO/Wireless 2011 LAN PC Card

Product Reference Guide

July 2000

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Patents

This product is covered by one or more of the following U.S. and foreign Patents:

U.S. Patent No.

14,387,297; 4,460,120; 4,496,831; 4,593,186; 4,603,262; 4,607,156; 4,652,750; 4,673,805; 4,736,095; 4,758,717; 4,816,660; 4,845,350; 4,896,026; 4,897,532; 4,923,281; 4,933,538; 4,992,717; 5,015,833; 5,017,765; 5,021,641; 5,029,183; 5,047,617; 5,103,461; 5,113,445; 5,130,520; 5,140,144; 5,142,550; 5,149,950; 5,157,687; 5,168,148; 5,168,149; 5,180,904; 5,216,232; 5,229,591; 5,230,088; 5,235,167; 5,243,655; 5,247,162; 5,250,791; 5,250,792; 5,260,553; 5,262,627; 5,262,628; 5,266,787; 5,278,398; 5,280,162; 5,280,163; 5,280,164; 5,280,498; 5,304,786; 5,304,788; 5,306,900; 5,321,246; 5,324,924; 5,337,361; 5,367,151; 5,373,148; 5,378,882; 5,396,053; 5,396,055; 5,399,846; 5,408,081; 5,410,139; 5,410,140; 5,412,198; 5,418,812; 5,420,411; 5,436,440; 5,444,231; 5,449,891; 5,449,893; 5,468,949; 5,471,042; 5,478,998; 5,479,000; 5,479,002; 5,479,441; 5,504,322; 5,519,577; 5,528,621; 5,532,469; 5,543,610; 5,545,889; 5,552,592; 5,557,093; 5,578,810; 5,581,070; 5,589,679; 5,589,680; 5,608,202; 5,612,531; 5,619,028; 5,627,359; 5,637,852; 5,664,229; 5,668,803; 5,675,139; 5,693,929; 5,698,835; 5,705,800; 5,714,746; 5,723,851; 5,734,152; 5,734,153; 5,742,043; 5,745,794; 5,754,587; 5,762,516; 5,763,863; 5,767,500; 5,789,728; 5,789,731; 5,808,287; 5,811,785; 5,811,787; 5,815,811; 5,821,519; 5,821,520; 5,823,812; 5,828,050; 5,850,078; 5,861,615; 5,874,720; 5,875,415; 5,900,617; 5,902,989; 5,907,146; 5,912,450; 5,914,478; 5,917,173; 5,920,059; 5,923,025; 5,929,420; 5,945,658; 5,945,659; 5,946,194; 5,959,285; 6,002,918; D305,885; D341,584; D344,501; D359,483; D362,453; D363,700; D363,918; D370,478; D383,124; D391,250; D405,077; D406,581; D414,171; D414,172; D419,548

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A28555-01

Revision A

About This Document

Reference Documents

This Reference Guide refers to the following documents:

Part Number	Document Title
A28551-01	Intel® PRO/Wireless 2011 Access Point Product Reference Guide
A28553-01	Intel® PRO/Wireless 2011 LAN Utilities User Guide
A28557-01	Intel® PRO/Wireless 2011 Site Survey

Conventions

Keystrokes are indicated as follows:

ENTER	identifies a key.
FUNC, CTRL, C	identifies a key sequence. Press and release each key in turn.
Press A+B	press the indicated keys simultaneously.
Hold A+B	press and hold the indicated keys while performing or waiting for another function. Used in combination with another keystroke.

Typeface conventions used include:

<angles>	indicates mandatory parameters in a given syntax.
[brackets]	for command line, indicates available parameters; in configuration files brackets act as separators for options.
GUI Screen text	indicates the control name in a GUI-based application.
<i>Italics</i>	indicates the first use of a term, book title, or menu.

'single quotes'	indicates the exact setting for a parameter.
Screen	indicates monitor screen dialog. Also indicates user input. A screen is the hardware device on which data appears. A display is data arranged on a screen.
Terminal	indicates text shown on a terminal screen.
URL	indicates Uniform Resource Locator. Click the URL to launch browser.

This document uses the following icons for certain conditions or types of information:



Indicates tips or special requirements.



Indicates conditions that can cause equipment damage or data loss.



Indicates a potentially dangerous condition or procedure that only Intel-trained personnel should attempt to correct or perform.

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The Intel® Wireless LAN PC Card is a direct-sequence (DS) product. The Intel® PRO/Wireless 2011 LAN is a spread spectrum network operating between 2.4 and 2.5 GHz. Spread spectrum communication provides a high-capacity network within large or small environments. Intel® PRO/Wireless 2011 LAN products provide a high-capacity network using multiple access points within large or small environments.

- Intel® PRO/Wireless 2011 LAN bridging architecture allows communication between wired network devices and mobile devices.
- Intel® PRO/Wireless 2011 LAN supports the IEEE 802.11 specification. This open architecture allows devices to communicate with wireless devices from other manufacturers.
- Intel® PRO/Wireless 2011 LAN allows mobile devices to roam throughout large facilities while remaining connected to the LAN.
- Intel® PRO/Wireless 2011 LAN allows protocol firmware upgrades while devices remain operational.
- Intel® PRO/Wireless 2011 LAN antenna diversity feature alternates between antennas with the best reception, increasing overall performance.

Chapter 2 **About the Intel[®] PRO/Wireless 2011 LAN Adapter**

The Intel[®] PRO/Wireless 2011 LAN adapter allows PC Card equipped host systems to configure, connect to and establish a wireless network.

Features Include:

- Low-power operation for battery-powered devices with PC Card slots
- Standard *NDIS (Network Driver Interface Specification)*
- Windows 95, 98, NT 4.0 and 2000 driver support
- Card and Socket Services support
- Plug and Play support
- Power management [*Continuously Aware Mode (CAM)* and *Power Save Polling (PSP)*].

2.1 MU Mode

In the *Mobile Unit (MU)* mode, the WLAN adapter connects to an access point (AP) or another WLAN installed system. MU mode allows the device to roam freely between AP cells in the network. MUs appear as network nodes to other devices.

2.2 11 Mbps Operation

The Intel® PRO/Wireless 2011 LAN adapter supports an 11 Mbps data rate. The adapter can default to a 5.5, 2 or 1 Mbps data rate when unable to establish an 11 Mbps association.

The following factors can dynamically alter the data rate:

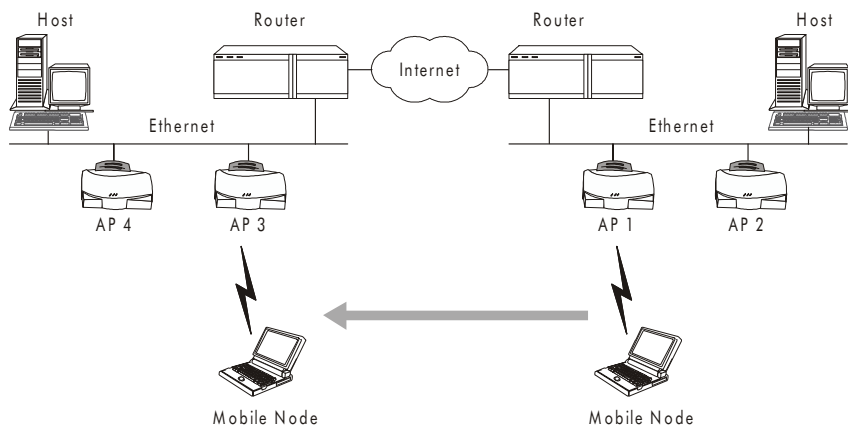
- signal strength between the AP and the MU
- the ratio of good transmitted packets to attempted
- transmitted packets fall below a threshold
- the MU finds a higher transmit rate with another AP or it encounters an unspecified data rate.

2.3 Mobile IP

The Intel® PRO/Wireless 2011 LAN adapter supports Mobile IP (roaming across routers) when properly configured to support Mobile IP. The Mobile IP feature allows Wireless LAN devices to roam across routers.

The MU retains its IP address when configured for Mobile IP and can:

- move from one IP subnet to another
- move from an Ethernet segment to a wireless LAN
- move from one Ethernet segment to another.



2.4 Power Management

The WLAN adapter supports the Continuously Aware (CAM) and Power Save Polling (PSP) power-management modes. CAM requires the radio to remain on. Intel does not recommend CAM for battery powered devices.

PSP mode allows the MU to conserve power by suspending communication while still associated with an AP. The AP saves data for transmission to the MU when it wakes at given intervals. When the adapter wakes to check for data, it switches back into CAM until it is ready suspend communications again.

The PSP performance index, which varies from 1 to 5, allows users to specify how often the MU wakes up to check for data. PSP performance index 1 provides the quickest response time (shortest sleep interval), while PSP performance index 5 provides efficient power consumption (longest sleep interval).



Use the Intel Network Control Panel Applet (NCPA) or the Intel WLAN Monitor utility to manually set the PSP performance index.

2.5 Card and Socket Services

The Intel® PRO/Wireless 2011 LAN supports Card and Socket services. Card and Socket Service software packages work with the host computer operating system enabling the Wireless LAN adapter to interface with host computer configuration and power management functions. Card and Socket Service software packages include SystemSoft and Phoenix.

2.6 Intel® PRO/Wireless 2011 LAN Adapter LED Descriptions

The WLAN adapter LED illuminates during connection or data transfer to indicate the functional status of the adapter.

Status	Function
Off	WLAN adapter radio is disabled or incapable of transmission
Slow Yellow Flash	Adapter associated with an access point
Rapid Yellow Flash	Indicates data traffic between adapter and access point. The faster the flash, the more data traffic on the network.

Chapter 3 **Hardware Installation**

Physical installation of the PC Card differs for each system. Refer to the system manufacturer documentation for specific information.

3.1 Preparation

Before beginning the installation, verify the hardware package contains:

- Intel® PRO/Wireless 2011 LAN adapter
- installation CD and utilities.



Verify the model indicated on the card and packaging before use. Contact the Intel Support Center if an item is missing or not functioning.

3.2 Installing the PC Card

The Intel® PRO/Wireless 2011 LAN PC Card installation requires:

- a computer with a Type II PC Card slot
- a CDROM drive
- an available interrupt (IRQ)
- an available I/O port address
- Intel® PRO/Wireless 2011 LAN driver installation CDROM.



Installation and removal methods vary for different host devices. Refer to system documentation for information.



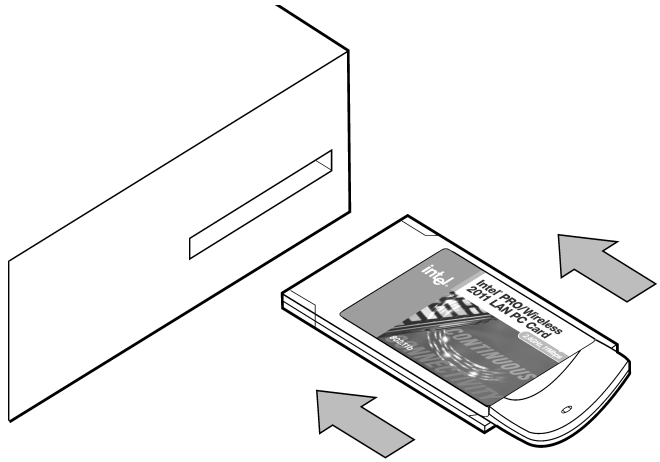
Avoid WLAN adapter contact with liquids or abrasive materials.

To install the PC Card:

1. Insert the PC Card into the PC slot. Arrows on the front of the PC Card indicate the insertion point to the slot.
2. Slide in the PC Card until it firmly seats.



Align the card properly when inserting. Insert the card firmly without forcing. Forcing the card into the slot can damage the device or the card.



FCC RF exposure requirements state the PC Card antenna should be positioned so it is at least 5 cm (2 inches) away from the user.

Chapter 4 **Installing and Configuring the Windows 95/98 Driver**

4.1 **Installing the Intel[®] PRO/Wireless 2011 LAN Driver in Windows 95**

The Intel[®] PRO/Wireless 2011 LAN Windows driver ships with the Network Control Panel Applet (NCPA) utility on a CDROM. Use NCPA to view and edit WLAN adapter settings.



Intel recommends updating the Intel[®] PRO/Wireless 2011 LAN adapter to the latest firmware. After the driver and Wireless LAN Utilities have been installed, use the WLAN Update utility to update the firmware in Windows 95. Refer to the documentation shipped with the Intel[®] PRO/Wireless 2011 LAN Utilities for instructions on using WLAN Update. To download the latest firmware, go to (<http://support.intel.com>).

Before installing the Intel[®] PRO/Wireless 2011 LAN Windows driver:

- verify the Intel[®] PRO/Wireless 2011 LAN adapter is installed
- obtain the driver installation CDROM.

To install the Intel® PRO/Wireless 2011 LAN driver for the first time in Windows 95:

1. Install the Intel WLAN adapter as described in Chapter 3.
2. Power up the system.
3. Insert the Intel® PRO/Wireless 2011 LAN Windows driver installation CD.
4. When Windows 95 recognizes the adapter, an **Update Device Driver Wizard** dialog box appears requesting a driver to install. Click **Next**.
5. Click **Finish** when Windows displays the following message:

Windows found the following updated driver for this device: Intel® PRO/Wireless 2011 LAN PC Card.

Complete the installation instructions displayed by Windows 95.

6. Enter the network ESSID in the **Easy Setup** window. Click **OK**.
7. Click **Finish**.
8. When prompted, restart the computer.
9. Proceed to 4.3 *Intel® PRO/Wireless 2011 LAN Adapter Configuration for Windows 95/98* on page 17.

4.2 Installing the Intel[®] PRO/Wireless 2011 LAN Driver in Windows 98

The Intel[®] PRO/Wireless 2011 LAN Windows driver ships with the Network Control Panel Applet (NCPA) utility on a CDROM. Use NCPA to view and edit WLAN adapter settings.



Intel recommends updating the WLAN adapter to the latest firmware. After the driver and Wireless LAN Utilities have been installed, use the WLAN Update utility to update the firmware in Windows 98. Refer to the documentation shipped with the Wireless LAN Utilities for instructions on using WLAN Update. To download the latest firmware, go to <http://support.intel.com>.

Before installing the Intel[®] PRO/Wireless 2011 LAN Windows driver:

- verify the WLAN adapter is installed
- obtain the Intel[®] PRO/Wireless 2011 LAN Windows driver installation CDROM.

To install the Intel® PRO/Wireless 2011 LAN driver for the first time in Windows 98:

1. Install the Intel® PRO/Wireless 2011 LAN adapter as described in Chapter 3.
2. Power up the system.
3. Insert the Intel® PRO/Wireless 2011 LAN Windows driver installation CD.
4. When Windows 98 recognizes the adapter, the **Add New Hardware Wizard** dialog box appears. Click **Next**.
5. Select **Search for best driver for your device**. Click **Next**.
6. Specify the location of the driver files. Click **Next**.
7. Click **Next** when Windows locates and displays the adapter.
The **Easy Setup** dialog box displays.
8. Enter the network ESSID in the **Easy Setup** window. Click **OK**.
The **Add New Hardware Wizard** dialog box displays stating the required software has been installed.
9. Click **Finish**.
10. When prompted, restart the computer.
11. Proceed to 4.3 *Intel® PRO/Wireless 2011 LAN Adapter Configuration for Windows 95/98* on page 17.

4.3 Intel® PRO/Wireless 2011 LAN Adapter Configuration for Windows 95/98

To configure the Intel® PRO/Wireless 2011 LAN adapter in Windows 95/98:

1. Click **Start**, select **Settings** and **Control Panel**.
2. Select the **Network** icon and click on the Intel® Wireless LAN PC Card.
3. Select the **Properties** button.

The **Easy Setup** dialog box displays.

4. Click the **Advanced** button to view the default adapter configuration.

Use the **Mobile Unit**, **Power**, **Mobile IP**, **Encryption** and **WLAN Adapter** tabs to view or adjust the adapter configuration settings.



For information on using the NCPA utility to configure Intel® PRO/Wireless 2011 LAN adapter properties, refer to Appendix A.

5. Exit and save the configuration settings by clicking **OK** or **Finish**. Select **Cancel** to use the default values.
6. Restart the system for the changes to take effect.

Chapter 5

Installing and Configuring the Windows NT Driver

The Intel® PRO/Wireless 2011 LAN Windows driver ships with the Network Control Panel Applet (NCPA) utility on a CDROM. Use NCPA to view and edit WLAN adapter settings.



Intel recommends updating the WLAN adapter to the latest firmware. After the driver and Wireless LAN Utilities have been installed, use the WLAN Update utility to update the firmware in Windows NT. Refer to the documentation shipped with the Wireless LAN Utilities for instructions on using WLAN Update. To download the latest firmware, go to <http://support.intel.com>.

Before installing the Intel® PRO/Wireless 2011 LAN Windows NT driver:

- verify the WLAN adapter is installed
- obtain the Intel® PRO/Wireless 2011 LAN Windows driver installation CDROM.

5.1 New Intel® PRO/Wireless 2011 LAN Adapter Installation

To install the Intel® PRO/Wireless 2011 LAN driver for the first time in Windows NT:



Verify there is no existing Intel® PRO/Wireless 2011 LAN Windows NT driver in the system. If there is an existing driver, remove it and complete the instructions in this section.



If IRQ or I/O conflicts occur during the installation, configure the IRQ and I/O addresses for available values. Refer to the Windows NT Diagnostics Tool to verify the values. Use the NCPA WLAN Adapter page to set the Interrupt Number, the I/O Port Address and the Memory Base Address values.

1. Install the WLAN adapter as described in Chapter 3.
2. Power up the system.
3. Insert the Intel® PRO/Wireless 2011 LAN Windows driver installation CD.
4. Click **Start**, select **Settings** and **Control Panel**.
5. Click on the **Network** icon and select the **Adapters** tab. Click **Add**.
6. Click **Have Disk**.

A window appears prompting for the location of the driver files.

7. Enter the driver letter assigned to the CD drive. Click **OK**.
The **Select OEM Option** dialog box displays.
8. Select the **Intel® Wireless LAN PC Card**. Click **OK**.
The **Easy Setup** dialog box displays.
9. Enter the network **ESSID** in the **Easy Setup** dialog box. Click **OK**.
The **Network** dialog box appears.
10. Click **Close**, and complete the installation instructions displayed by the Windows operating system.
11. Reboot the computer when prompted by Windows NT.
12. Proceed to *5.2 Intel® PRO/Wireless 2011 LAN Adapter Configuration for Windows NT* on page 22.

5.2 Intel[®] PRO/Wireless 2011 LAN Adapter Configuration for Windows NT

To configure the WLAN adapter for Windows NT:

1. Click **Start**, select **Settings** and **Control Panel**.
2. Click on the **Network** icon.
3. Select the **Adapters** tab and click on the Intel[®] **Wireless LAN PC Card**.
4. Click the **Properties** button.

The **Easy Setup** dialog box displays.

5. Click the **Advanced** button to view the default adapter configuration.

Use the **Mobile Unit**, **Power**, **Mobile IP**, **Encryption** and **WLAN Adapter** tabs to view or adjust the adapter configuration settings.



For information on using the Intel[®] PRO/Wireless 2011 LAN NCPA utility to configure adapter properties, refer to Appendix A.

6. Click **OK** or **Close** to save the changes to the adapter configuration and exit the NCPA utility. Select **Cancel** to use the default values.
7. Remove the Intel[®] PRO/Wireless 2011 LAN Windows driver installation CD and follow the remaining instructions.
8. Restart the computer when prompted by Windows NT.

Chapter 6

Installing and Configuring the Driver in Windows 2000

The Intel® PRO/Wireless 2011 LAN Windows driver ships with the Intel Network Control Panel Applet (NCPA) utility on a CDROM. Use NCPA to view and edit WLAN adapter settings.



Intel recommends updating the WLAN adapter to the latest firmware. After the driver and Wireless LAN Utilities have been installed, use the WLAN Update utility to update the firmware in Windows 2000. Refer to the documentation shipped with the Wireless LAN Utilities for instructions on using WLAN Update. To download the latest firmware, go to <http://support.intel.com>.

Before installing the Intel® PRO/Wireless 2011 LAN Windows 2000 driver:

- verify the WLAN adapter is installed
- obtain the Intel® PRO/Wireless 2011 LAN Windows driver installation CDROM.

To install the Intel® PRO/Wireless 2011 LAN driver for the first time in Windows 2000:

1. Install the WLAN adapter as described in Chapter 3.
2. Power up the system.
3. Insert the Intel® PRO/Wireless 2011 LAN Windows driver installation CD.
4. When the **Found New Hardware Wizard** dialog box displays, click **Next**.
5. When Windows 2000 recognizes the adapter, the **Found New Hardware Wizard** dialog box displays again.
6. Select the **Search for a suitable driver for my device** button. Click **Next**.
7. Specify the location of the driver files. Click **Next**.
8. Click **Next** when a message displays stating Windows has found the required device driver.



The Microsoft **Digital Signature Not Found** dialog box could appear at this point in the installation. A Microsoft digital signature is not required for the driver installation. Click **Yes** to continue with the driver installation

A progress bar displays showing the progress of the driver file download.

When the driver download is complete, the **Easy Setup** dialog box displays.

9. Enter the network ESSID in the **Easy Setup** window. Click **OK**.

The **Found New Hardware Wizard** dialog box displays again stating Windows has finished installing the software required for this device.

10. Click **Finish**.
11. Restart the computer for the changes to take effect.
12. Proceed to *6.1 Configuring the Intel® PRO/Wireless 2011 LAN Adapter for Windows 2000* on page 26.

6.1 Configuring the Intel[®] PRO/Wireless 2011 LAN Adapter for Windows 2000

To configure the Intel[®] PRO/Wireless 2011 LAN adapter for 2000:

1. Click **Start**, select **Settings** and **Control Panel**.
2. Click on the **System** icon and select the **Hardware** tab.
3. Click on the **Device Manager** button.
4. Double-click on **Network Adapters**.
5. Right-click on the Intel[®] PRO/Wireless 2011 LAN WLAN adapter.
6. Select **Properties**.

The Intel PC Card Properties dialog box displays.

7. Select the Intel[®] PRO/Wireless 2011 LAN tab.
The NCPA Easy Setup dialog box displays.
8. Select the **Advanced** button to view the default adapter configuration.

Use the **Mobile Unit**, **Power**, **Mobile IP**, **Encryption** and **WLAN Adapter** tabs to view or adjust the adapter configuration settings.



For information on using the NCPA utility to configure adapter properties, refer to Appendix A.

9. Click **OK** or **Close** to save the changes to the adapter configuration and exit the NCPA utility. Select **Cancel** to use the default values.
10. Restart the computer when prompted by the Windows operating system.

Chapter 7 **Verifying the Firmware Version**

Verify the Intel® PRO/Wireless 2011 LAN adapter firmware is the most recent version to ensure optimal functionality. In Windows 95/98, NT 4.0 and 2000, WLAN adapters use the Wireless LAN Monitor utility to view driver and firmware revision data. The WLAN Monitor **General** properties page allow users to verify driver firmware version data and view wireless LAN adapter signal and transmission quality information.

The WLAN Update utility updates the firmware in a PC Card. Refer to the documentation shipped with the Wireless LAN Utilities suite for instructions on using WLAN Update.



The driver and Wireless LAN Utilities installation is required to run the WLAN Update utility.

Appendix A

Network Control Panel Applet (NCPA)

A.1 Installing NCPA



NCPA supports Windows 95/98, NT 4.0 and 2000.

The Intel *Network Control Panel Applet* (NCPA) utility comes bundled with the Intel[®] PRO/Wireless 2011 LAN Windows device driver on a CDROM. Use NCPA to configure the adapter. Complete the driver installation instructions described in Chapters 4, 5 and 6 for the Windows 95/98, NT and 2000 operating systems to install NCPA.

A.2 Using NCPA

NCPA allows users to view and edit Intel® PRO/Wireless 2011 LAN adapter settings. Access NCPA through the Windows Network Control Panel. When NCPA is installed, the applet displays an **Easy Setup** window allowing users to set the 802.11 ESSID.



Clicking the **Advanced** button allows users to view or edit adapter settings using the **Mobile Unit**, **Power**, **Mobile IP**, **Encryption** and **WLAN Adapter** property pages.



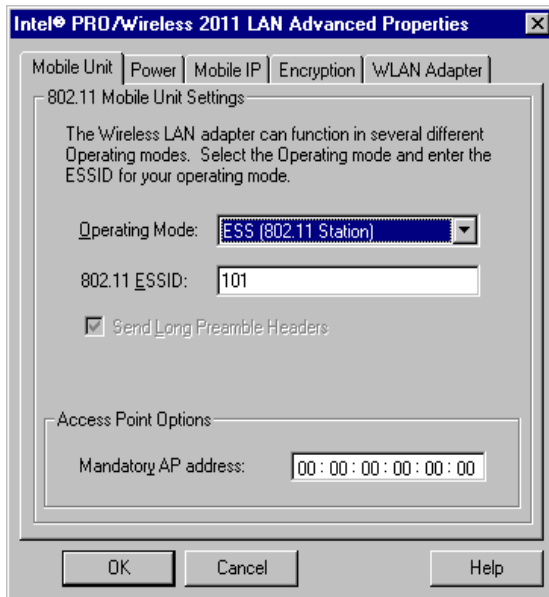
The **Easy Setup** window and the five **Advanced** property pages can appear different between the Windows 95, 98, NT and 2000 operating systems.

Use the **WLAN Adapter** property page to create a NCPA Advanced property pages password dialog box. The password dialog box displays when the user clicks the **Advanced** button on the Easy Setup window. When enabled, users cannot access the Advanced property pages without entering the correct password.

A.2.1 Mobile Unit Property Page

Use the **Mobile Unit** property page to configure the adapter operating mode and ESSID.

Use the **Operating Mode** pull-down menu to select one of the following operating modes for the adapter:



ESS (802.11 Station) - Select **ESS (802.11 Station)** to enable the MU to transmit and receive data with an access point. The MU data rate is based on transmit retries. When a data rate is not achieved the MU defaults to the next highest selected data rate. ESS is the MU default mode.

IBSS (802.11 Ad Hoc) - Select **IBSS (802.11 Ad Hoc)** to enable MUs to form their own local network where MUs communicate peer-to-peer without access points. Use IBSS to create networks where needed within established cells. In IBSS, MUs take turns generating beacons and handling probe responses. The MU starting the IBSS network (the first station transmitting a beacon) determines the channel and data rate used for the IBSS network. If a single MU is sending every beacon, there are no other MUs in the IBSS network and at least one more MU is needed to communicate peer-to-peer.

Pseudo IBSS (Proprietary Ad Hoc) - Select **Pseudo IBSS** when the highest throughput is required in an IBSS network for testing MUs. Pseudo IBSS does not support PSP MUs and does not use beacons or authentication. In Pseudo IBSS mode, each MU is required to be on the same channel. Pseudo IBSS is not recommended as a normal operational mode or for MUs operating on battery power.

Enter an ESSID in the **802.11 ESSID** field. The ESSID is the 802.11 Extended Service Set Identifier. The ESSID is a 32-character (maximum) string identifying the wireless local area network. The ESSID assigned to the adapter is required to match the access point ESSID for the adapter to communicate with the access point. The ESSID can also be entered from the **Easy Setup** window.

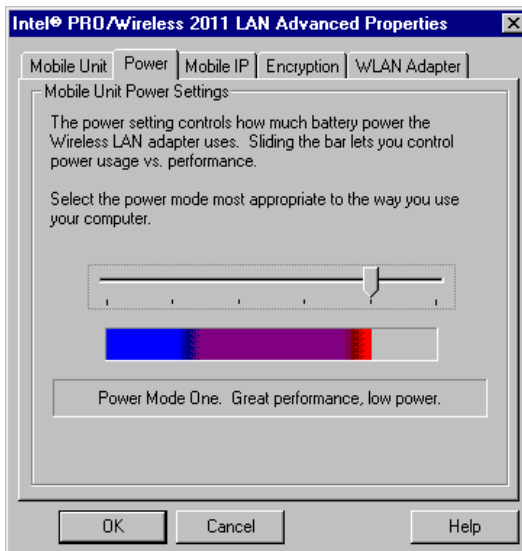
Use the **Mandatory AP address** field to enter the IEEE MAC address of the access point where the adapter is required to associate. The adapter associates to only this access point when communicating on the network. Enter an access point MAC address to associate to an access point that has a compatible ESSID.

A.2.2 Power Property Page

Use the Power property page to control adapter power consumption in the ESS and IBSS operating modes.

The adapter has two power consumption modes, Continuous Access Mode (CAM) and Power Save Poll (PSP) mode. CAM yields the best performance but uses the most power. CAM is the preferred mode for systems running on AC power. PSP saves significant amounts of power over CAM. PSP is the preferred mode for systems running on battery power.

Set the slider to the far right to keep the adapter in CAM or set the slider to a PSP performance index (1 to 5). Each mode is described underneath the sliding scale.



Note

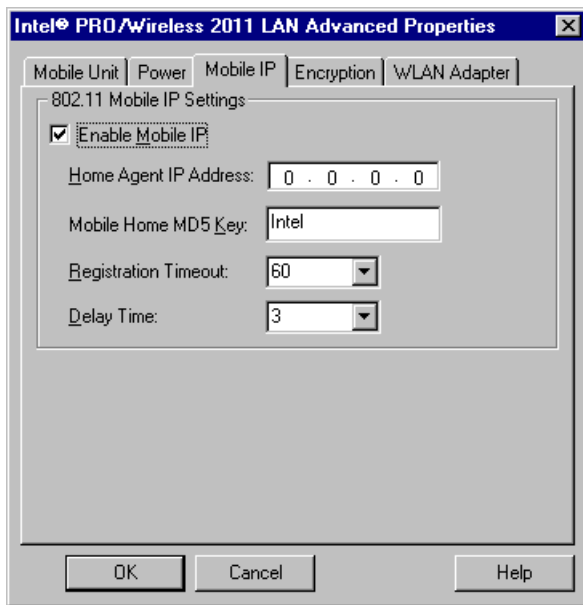
Disable Power Management in WLAN Monitor to use the settings in Network Control Panel Applet (NCPA).

Set the adapter power consumption mode and click OK.

A.2.3 Mobile IP Property Page

Use the **Mobile IP** property page to configure the adapter to support the roaming across routers function. Mobile IP enables an MU to communicate with other hosts using only its home IP address after changing its point-of-attachment to the internet/intranet.

Select the **Enable Mobile IP** checkbox to enable Mobile IP support. Restart the system for the changes to take effect.



Enter the **Home Agent AP Address** of an AP on the home subnet. This enables the MU to register with a foreign subnet AP and tell the AP where the MU home AP is located.

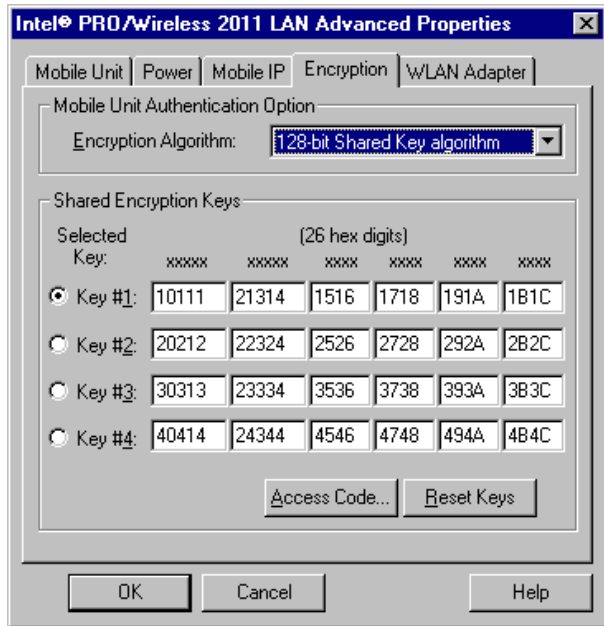
Enter a **Mobile Home MD5 Key** matching the MD5 key on the AP of the home subnet. Use this password to protect the registration packets from being tampered when forwarded to the home agent AP.

Use the **Registration Timeout** pull-down menu to select a timeout value. When the MU registers with a foreign subnet AP the registration is required to take place within the time specified. The default registration time is 60 seconds. If the MU does not register with the foreign subnet AP within the specified time, the foreign subnet AP removes the MU from its list of registered MUs.

Use the **Delay Time** pull-down menu to select the time an MU waits for a response from a foreign subnet AP when trying to register with that AP. An Mu attempts to register with an AP three times before stopping.

A.2.4 Encryption Property Page

Use the **Encryption** property page for configuring WLAN adapter Encryption settings. The absence of a physical connection makes wireless links vulnerable to information theft. Encryption is an efficient method of preventing data theft and improving data security. The firmware supports **Open System**, **40-bit** and **128-bit** Encryption algorithms.



Use the **Encryption Algorithm** pull-down menu to select the **Open System**, **40-bit** or **128-bit** Encryption algorithm to be used for the adapter. The **Open System** algorithm (default setting) does not encrypt packets over the network. Select **Open System** to disable Encryption for the WLAN adapter and allow for the transmission and receipt of data with no security.

An access point and MU are required to use the same Encryption algorithm to associate and transmit data. If an access point is set to WEP (Privacy) disabled and an MU is set to 40-bit or 128-bit, no association takes place. The same is true if the MU is set for Open System and the access point is set to 40-bit or 128-bit.

If an access point is set to 40-bit and the MU is set to 128-bit the devices can associate, but no data transmission can take place between the two devices.

Access Point	MU	Association Status
Open	Open	OK
40	40	OK
128	40	Association, No data transmission
Open	40	No Association
Open	128	No Association
40	128	Association, No data transmission
40	Open	No Association
128	Open	No Association
128	128	OK

When 40-bit Encryption is selected, the user is required to enter a 10 Hex digit Encryption key. The key can be entered by spreading the 10 Hex digits between the two fields provided. Click **OK** to save and implement the Encryption key data.

128-bit Encryption is subject to export restrictions. An access code is required if 128-bit Encryption is selected and an export restrictions dialog box displays. Contact Intel Automated Customer Support (<http://support.intel.com>) for information on acquiring an access code for 128-bit Encryption.



If an access code is required, click the **Access Code** button to display the **Enable 128-bit Encryption** dialog box. Enter the access code in the three fields provided and click **OK**. Once the access code is entered, the **Access Code** button is no longer displayed on the **Encryption** property page and the access code is stored.



Once 128-bit Encryption is enabled, select **128-bit Encryption** from the **Encryption Algorithm** pull-down menu. Enter the 26 Hex digit Encryption key by spreading the 26 Hex digits across the six fields provided. Click **OK** to save and implement the Encryption key data.

Click **Reset Keys** to clear the entries in the **Shared Encryption Key** fields.

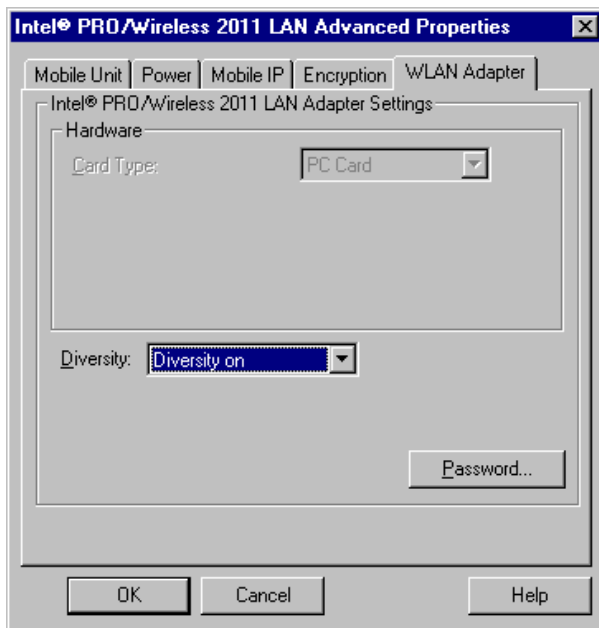
A.2.5 WLAN Adapter Property Page

Use the **WLAN Adapter** property page to configure hardware and radio settings.

Use the **Card Type** pull-down menu to specify the type of adapter in the system.

The **Interrupt Number**, **IO Port Address** and **Memory Base Address** fields are automatically updated.

If resource conflicts exist (on Windows NT systems) modify these settings to fit system needs.



Select **Diversity on** if dual antenna support is required. Diversity improves communication in highly reflective environments. Do not select Diversity on if a secondary antenna is not being used. Using diversity in a single antenna application can cause poor wireless network performance.

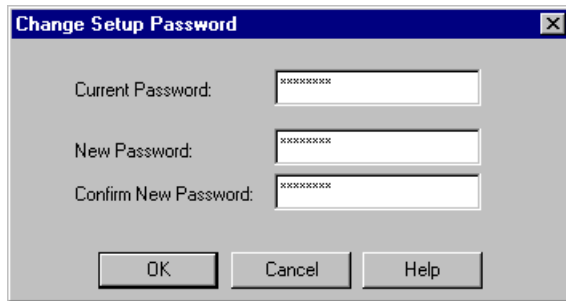
Password Protecting NCPA

NCPA has a password protection feature that can be turned on and off from the WLAN Adapter property page. When the NCPA program is initially launched, the password is off (default).

To create a password for the NCPA Advanced property pages:

1. Click the **Password** button from the WLAN Adapter property page.

The **Change Setup Password** dialog box displays.



2. Enter the case-sensitive password (10 characters maximum) in the **Current Password** field and click **OK**.

The NCPA Advanced property pages dialog box is enabled and now appears when the **Advanced** button is clicked from Easy Setup window.

To disable the password dialog box, enter the current password and leave the **New Password** and **Confirm New Password** fields blank. Click **OK**.

To change the password, enter the current password and enter a new password in the **New Password** and **Confirm New Password** fields. Click **OK**.

Appendix B

WLAN Adapter Specifications

PC Card Physical

<i>Dimensions</i> (less antenna)	3.3 inches x 2.1 in. x 0.2 inches (85 mm x 54 mm x 5 mm)
<i>Weight</i> (with antenna)	1.6 oz (45.36 g)
<i>Operating temperature</i>	32 to 130 °F (20 to 70 °C)
<i>Humidity</i>	95% maximum non condensing
<i>Cargo/Packaged</i>	6ft(1.8m) drop 5hz vibration Mil-Std 810E
<i>Altitude</i>	15,000 ft. (4.6 km) - Storage 8,000 ft. (2.4 km) - Operating
<i>Vibration</i>	2 G peak, sine; 0.02 G peak random (5Hz - 2000Hz)
<i>Shock</i>	40 G, 11mS, half sine
<i>ESD</i>	meets CE-Mark
<i>PCMCIA Compliance</i>	Type II, Card and Socket Services

Radio

<i>Frequency Range</i>	country dependent. Typically 2412 MHz to 2462 MHz
<i>Radio Data Rate</i>	11 Mbps - Optional 5.5 Mbps - Optional 2 Mbps - Optional 1 Mbps - Required
<i>Range</i>	open environment over 100 ft (at 11 Mbps). Typical office or retail environment 30 - 50 ft (at 11 Mbps).
<i>TX Max. Radiated EIRP</i>	US: FCC part 15.247 Europe: ETS 300 320 Japan: RCR STD-33
<i>Modulation</i>	Binary GFSK
<i>TX Out-of-Band Emissions</i>	US: FCC part 15.247, 15.205, 15.209 Europe: ETS 300 320 Japan: RCR STD-33

Appendix C

Troubleshooting

C.1 Windows 95/98 Troubleshooting Tips

Use the tools provided by Windows 95/98 and LAN analyzers (FTP Software NETXRAY, Novell LAN analyzer) to diagnose problems. Some common problems exhibited when the Intel® PRO/Wireless 2011 LAN adapter has not been properly installed include:

- Windows 95/98 does not recognize the Intel® PRO/Wireless 2011 LAN adapter when installed.
 - Verify that Windows 95/98 PCMCIA support is installed.
- The driver fails to load.
 - A resource conflict could exist. Use the **Device Manager** to resolve resource conflicts. Select the System applet from the Control Panel. Select the **Device Manager** tab.
- The workstation cannot associate to the Intel® PRO/Wireless 2011 LAN access point.
 - Verify the adapter ESSID matches the ESSID of the access point. Refer to the *Configuration* section of this document for details.

- Degraded performance from the Intel[®] PRO/Wireless 2011 LAN adapter.
 - Verify a secure antenna connection on the PC Card.
 - Verify two antennas remain attached to the PC Card if Diversity is selected.
- Network drive mappings disappear when the laptop suspends or the adapter is removed then reinserted. Windows 95/98 does not restore Netware network drive mappings under these conditions.
 - Log out and log in again, or restart the machine to restore the connections.
- Nonfunctioning adapter LEDs.
 - Verify that the adapter ESSID matches the ESSID of the access point.

C.2 Windows NT 4.0 Troubleshooting

Use the tools provided by Windows NT and LAN analyzers (FTP Software NETXRAY, Novell LAN analyzer) to diagnose problems.

- A resource conflict (usually IRQ or I/O base address) caused the driver not to load.
 - Check entries in the System Log to look for the conflicts.
- Check Service Monitor entries in the System Log to look for the conflicts.
 - Use the Windows NT Diagnostics program to locate a free resource.



Resource conflicts could exist without an entry in the event log when another adapter failed to register its resources. When event log entries do not appear and the ESSID is set appropriately, try different settings with the **Memory Base Address**, **Interrupt Number** and **IO Port Address** parameters.

- No resource conflicts were detected, but the system does not attach to the network.
 - Verify the ESSID of the Intel® PRO/Wireless 2011 LAN adapter matches the ESSID of the access point. Use NCPA to modify ESSID.
 - Verify the Mandatory BSSID setting of the Intel® PRO/Wireless 2011 LAN adapter is set to 0 or matches the BSSID of the access point. Use NCPA to modify the Mandatory BSSID.

- A degraded performance from the Intel® PRO/Wireless 2011 LAN adapter is detected.
 - Verify a secure antenna connection on the PC Card.
 - Verify two antennas remain attached to the PC Card when Diversity is selected.
- Nonfunctioning adapter LEDs.
 - Verify the adapter is selected in the Card Type field.
 - Verify the adapter ESSID matches the ESSID of the access point.

C.2.1 Useful Tool for Windows NT Troubleshooting

Windows NT Provides an additional tool for analyzing the network installation and performance.

PCMCIA Applet A Control Panel utility included with Windows NT 4.0 displays information about the Intel® PRO/Wireless 2011 LAN adapter. If the card is installed, but does not appear in the display it is probably defective.

If it appears with an X, it is not configured properly.

C.2.2 Windows NT Errors



When errors occur during driver installation, they appear in the System Log. Use the Event Viewer program from the Administrative Tools group to view the System Log. Locate the WLA11ND4 or Service Monitor entries. If the driver fails to load, one of the following messages display in the System Log.

WLA11ND4: Could not allocate the resources necessary for operation.

- The driver could not allocate enough memory for internal data.

WLA11ND4: Has determined that the adapter is not functioning properly.

- The driver could not initialize the Intel[®] PRO/Wireless 2011 LAN PC Card. Possible problems include:
 - The PC Card firmware could be corrupted. Use WLAN Update to verify the firmware status.
 - The Intel[®] PRO/Wireless 2011 LAN PC Card could have a hardware problem.
 - The PCMCIA controller or host bus adapter is not operating properly. Use an alternate PCMCIA socket.

WLA11ND4: Could not find an adapter.

- The driver could not locate an Intel[®] PRO/Wireless 2011 LAN PC Card in any PCMCIA socket.

- Verify that the Intel® PRO/Wireless 2011 LAN PC Card is firmly seated.

WLA11ND4: Could not connect to the interrupt number supplied.

- The driver could not claim the configured interrupt.
 - The configured interrupt number could be in use by another adapter. Choose a different interrupt number.

WLA11ND4: Does not support the configuration supplied.

- An invalid driver configuration parameter was specified.
 - Use NCPA to view the driver configuration. Make sure values appear in each data entry field. If a value is missing, key in or use the associated list box to select an appropriate value.

WLA11ND4: A required parameter is missing from the Registry.

- A required configuration parameter was not found in the system registry.
 - Use NCPA to view the driver configuration. Ensure values appear in each data entry field. If a value is missing, key in or use the associated list box to select an appropriate value.

C.3 Windows 2000 Troubleshooting Tips

Use the tools provided by Windows 2000 to diagnose problems.

- The workstation cannot associate to the Intel[®] PRO/Wireless 2011 LAN access point.
 - Verify the adapter ESSID matches the ESSID of the access point. Refer to the *Configuration* section of this document for details.
- Degraded performance from the Intel[®] PRO/Wireless 2011 LAN adapter is detected.
 - Verify a secure antenna connection on the PC Card.
 - Verify the antennas remain attached to the PC Card if **Diversity** is selected.
- Nonfunctioning adapter LEDs.
 - Verify that the adapter ESSID matches the ESSID of the access point.

Appendix D

Customer Support

D.1 Intel Automated Customer Support

You can reach Intel automated support services 24 hours a day, every day at no charge. The services contain the most up-to-date information about Intel products. You can access installation instructions, troubleshooting information, and product information.

User Guide on Your Product CDROM

For more information about installing drivers or troubleshooting other topics, see the online User Guide. To view the guide, insert the Intel CD in your drive and wait for the Autorun to display. Click the User Guide button to view the guide. Note that a web browser is required to view the guide.

Web and Internet Sites

- Support: <http://support.intel.com>
- Network Products: <http://www.intel.com/network>
- Corporate: <http://www.intel.com>
- Newsgroups: <news://cs.intel.com>
- FTP Host: download.intel.com
- FTP Directory: [/support/network/adapter/](ftp://support/network/adapter/)

Customer Support Technicians

US and Canada: 1-916-377-7000
(7:00 - 17:00 M-F Pacific Time)

Worldwide access: Intel has technical support centers worldwide. Many of the centers are staffed by technicians who speak the local languages. For a list of all Intel support centers, the telephone numbers, and the times they are open, download document 9089 from one of the automated services.

D.2 Software License Agreement

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D.3 Limited Lifetime Hardware Warranty

Intel warrants to the original owner that the adapter product delivered in this package will be free from defects in material and workmanship. This warranty does not cover the adapter product if it is damaged in the process of being installed or improperly used.

THE ABOVE WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF NONINFRINGEMENT OF INTELLECTUAL PROPERTY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE ARISING OUT OF ANY PROPOSAL, SPECIFICATION, OR SAMPLE.

This warranty does not cover replacement of adapter products damaged by abuse, accident, misuse, neglect, alteration, repair, disaster, improper installation, or improper testing. If the adapter product is found to be defective, Intel, at its option, will replace or repair the hardware product at no charge except as set forth below, or refund your purchase price provided that you deliver the adapter product along with a Return Material Authorization (RMA) number (see below), along with proof of purchase (if not registered), either to the dealer from whom you purchased it or to Intel with an explanation of any deficiency. If you ship the adapter product, you must assume the risk of damage or loss in transit. You must use the original container (or the equivalent) and pay the shipping charge.

Intel may replace or repair the adapter product with either new or reconditioned parts, and any adapter product, or part thereof replaced by Intel becomes Intel's property. Repaired or replaced adapter products will be returned to you at the same revision level as received or higher, at Intel's option. Intel reserves the right to replace discontinued adapter products with an equivalent current generation adapter product.

Returning a defective product

From North America:

Before returning any adapter product, contact Intel Customer Support and obtain a Return Material Authorization (RMA) number by calling +1 916-377-7000.

If the Customer Support Group verifies that the adapter product is defective, they will have the RMA department issue you an RMA number to place on the outer package of the adapter product. Intel cannot accept any product without an RMA number on the package.

All other locations:

Return the adapter product to the place of purchase for a refund or replacement.

Intel Adapter Money-back Guarantee
(North America Only)

Intel wants you to be completely satisfied with the Intel adapter product that you have purchased. Any time within ninety (90) days of purchase, you may return your Intel adapter to the original place of purchase for a full refund of the purchase price from your dealer. Resellers and distributors, respectively, accepting returns and refunding money back to their customers may return Intel adapters to their original place of purchase. Intel guarantees that it will accept returns under this policy and refund the original purchase price to customers purchasing directly from Intel.

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Software: Software provided with the adapter product is not covered under the hardware warranty described above. See the applicable software license agreement which shipped with the adapter product for details on any software warranty.

Appendix E

Regulatory Compliance

To comply with U.S. and international regulatory requirements, the following information has been included. The document applies to the complete line of Intel products. Some of the labels shown, and statements applicable to other devices might not apply to all products.

Radio Frequency Interference Requirements

This device has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the Federal Communications Commissions Rules and Regulation. 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.

However, there is no guarantee that interference will not occur in a particular installation. If the 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:

- Re-orient 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 which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Radio Frequency Interference Requirements - Canada

This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

CE Marking & European Union Compliance



Products intended for sale within the European Union are marked with the CEMark which indicates compliance to applicable Directives and European Normes (EN), as follows. Amendments to these Directives or ENs are included: Normes (EN), as follows.

Applicable Directives:

- Electromagnetic Compatibility Directive 89/336/EEC
- Low Voltage Directive 73/23/EEC

Applicable Standards:

- EN 55 022 - Limits and Methods of Measurement of Radio Interference Characteristics of Information technology Equipment
- EN 50 082-1 - Electromagnetic Compatibility - Generic Immunity Standard, Part 1: Residential, commercial, Light Industry
- IEC 801.2 - Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment Part 2: Electrostatic Discharge Requirements
- IEC 801.3 - Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment Part 3: Radiated Electromagnetic Field Requirements
- IEC 801.4 - Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment Part 4: Electrical Fast Transients Requirements
- EN 60 950 + Amd 1 + Amd 2 - Safety of Information Technology Equipment Including Electrical Business Equipment
- EN 60 825-1 (EN 60 825) - Safety of Devices Containing Lasers

RF Devices

Intel RF products are designed to be compliant with the rules and regulations in the locations into which they are sold and will be labeled as required. The majority of Intel's RF devices are type approved and do not require the user to obtain license or authorization before using the equipment. Any changes or modifications to Intel equipment not expressly approved by Intel could void the user's authority to operate the equipment.

Telephone Devices (Modems)

United States

If this product contains an internal modem it is compliant with Part 68 of the Federal Communications Commission Rules and Regulations and there will be a label on the product showing the FCC ID Number and the REN, Ringer Equivalence Number. The REN is used to determine the quantity of devices which maybe connected to the telephone line. Excessive RENs on the telephone line may result in the device not ringing in response to an incoming call. In most but not all areas, the sum of the RENs should not exceed 5.0. To be certain of the number of devices that may be connected to the line, as determined by the total number of RENs, contact the telephone company to determine the maximum REN for the calling area.

If the modem causes harm to the telephone network, the telephone company will notify you in advance; however, if advance notice is not practical, you will be notified as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the modem. If this happens the telephone company will provide advance notice so you may make any necessary modifications to maintain uninterrupted service.

Canada

If this product contains an internal modem it is compliant with CS-03 of Industry Canada and there will be a Canadian certification number (CANADA: _____) on a label on the outside of the product. This certification means that the equipment meets certain

telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single-line, individual service maybe extended by means of a certified convector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

User should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.



User should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to the telephone loop which is used by the device, to prevent overloading. The termination of a loop may consist of any combination of devices, subject only to the requirement that the total of the Load Numbers of all devices not exceed 100.

The Load Number is located on a label on the product.

Si ce produit contient un intérieur modem duquel est conformité avec le code CS-03 de l'industrie canadien alors il aura un numéro de la certification canadienne (CANADA: _____) sur l'étiquette affiché au produit. L'étiquette d'Industrie Canada a identifiée le matériel homologué. Cette étiquette a certifiée que le matériel est conformé aux certaines normes de protection, d'exploitation et de sécurité des réseaux de télécommunications. Toutefois, le Ministère n'assure pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit assurer qu'il soit permis de raccorder aux installations de l'entreprise télécommunications locales. Le matériel doit être également installé au suivant d'une méthode de raccordement. Dans certains cas, les fils intérieurs de l'entreprises utilisés pour un service individuel à la ligne unique peuvent être prolongés au moyen d'un dispositif de raccordement homologué (cordon rallongé téléphonique interne). L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions énoncées ci-dessus n'empêchent pas la dégradation du service dans les certaines situations. Actuellement, les entreprises de télécommunication ne permettent pas que l'on raccorde leur matériels à des jacks d'abonnés, sauf dans les cas précis et prévus pas les tarifs particuliers de ces entreprises.

Les réparations de matériel homologué doivent être effectuées par un centre d'entretien canadien autorisé par le fournisseur. La compagnie de télécommunications peut demander à l'utilisateur de débrancher un appareil à la suite des réparations ou des modifications effectuées par l'utilisateur, ou à cause des mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit assurer que tous les fils de mise à terre de la source d'énergie électrique, lignes téléphoniques et les canalisations d'eau métalliques, s'il y en a, soient raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.



AVERTISSEMENT: L'utilisateur ne doit pas tenter de faire ces raccordements lui-même; il doit avoir recours aux services d'électronicien.

L'indice de charge (IC) assigné à chaque dispositif terminal indique, pour éviter toute surcharge, le pourcentage de la charge totale qui peut être raccordé au circuit téléphonique bouclé d'utiliser par ce dispositif. La terminaison du circuit bouclé peut être constituée de n'importe quelle combinaison de dispositifs, pourvu que la somme des indices de charge dans l'ensemble des dispositifs ne dépassent pas 100.

L'indice de charge se trouve sur le produit.

Laser Devices

Intel products using lasers comply with US 21CFR1040.10, Subchapter J and IEC825/EN 60 825 (or IEC825-1/EN 60 825-1, depending on the date of manufacture). The laser classification is marked one of the labels on the product.

Class 1 Laser devices are not considered to be hazardous when used for their intended purpose. The following statement is required to comply with US and international regulations:



Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous visible or invisible laser light exposure.

Class 2 laser scanners use a low power, visible light diode. As with any very bright light source, such as the sun, the user should avoid staring directly into the light beam. Momentary exposure to a Class 2 laser is not known to be harmful.

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