NOKIA

Nokia C110/C111 Wireless LAN Card

User's guide

For your safety

Read these simple guidelines. Breaking the rules may be dangerous or illegal. Further detailed information is given in this user's guide.

Road safety comes first

Do not use the wireless LAN card while driving; park the vehicle first.

Interference

All wireless LAN cards may receive interference, which could affect performance.

Hospitals and aircrafts

Wireless LAN cards can cause interference. Observe restrictions for use in these areas.

Switch off when refuelling

Do not use the wireless LAN card at a refuelling point. Do not use near fuel or chemicals.

Switch off near blasting

Do not use the wireless LAN card where blasting is in progress. Observe restrictions, and follow any regulations or rules.

Use sensibly

Use only in the normal operating position.

Use qualified service

Only qualified service personnel must repair equipment.

Accessories

Use approved accessories only. Do not connect incompatible products.

Water resistance

Your wireless LAN card is NOT water-resistant. The wireless LAN card is not covered under warranty for damage by any liquid substance.

Make backup copies

Remember to make backup copies of all important data.

Connecting to other devices

When connecting to any other device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

DECLARATION OF CONFORMITY

We, NOKIA MOBILE PHONES Ltd declare under our sole responsibility that the products DTN-10 and DTN-11 are in conformity with the provisions of the following Council Directive: 1999/5/EC.

CE 0523 !

Includes MD5 algorithm software from RSA Security.

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The availability of particular products may vary by region. Please check with the Nokia dealer nearest to you.

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Introduction

The Nokia C110 Wireless LAN Card and the Nokia C111 Wireless LAN Card are extended type II PC cards, offering a data transmission rate of up to 11 Mbit/s in a wireless local area network (LAN) environment. The Nokia C110 features two internal antennas for compact size. The Nokia C111 is equipped with internal antennas and two external antenna connectors.

The Nokia C110/C111 Wireless LAN Card:

- Complies with the IEEE 802.11b standard.
- Supports data rates of 1, 2, 5.5, and 11 Mbit/s.
- Operates at a frequency of 2.4 GHz using direct sequence spread spectrum (DSSS) radio technology.
- Supports the Windows® 95, Windows® 98, Windows® 2000, Windows® Me, and Windows NT® 4.0 operating systems. For other supported operating systems, please check the Nokia Web site at *www.forum.nokia.com*.

Nokia's wireless LAN cards enable you to wirelessly connect compatible laptop computers, hand-held devices, desktop PCs, and other devices with a type II or III PC card slot to a wired local area network through an access point. Instead of cables, radio waves are used to transmit and receive data over the air. With the Nokia C110/C111 you can:

- set up an infrastructure network where wireless stations communicate with wired and wireless stations through an access point. You can wirelessly access your company database, e-mail, the Internet, and other network resources, for example.
- set up an ad hoc network where wireless stations send and receive data directly with each other. No access point is needed, and as long as the stations are within range, you can, for example, share and exchange files.

The Nokia C110/C111 comes with an integrated smart card reader. Vital information, such as security keys and personal network profiles that make moving between networks easy, can be stored on a smart card.

Wireless LAN

The wireless LAN cards described in this document are approved for use in a wireless local area network.

The wireless LAN card employs the data transmission capabilities of a wireless LAN in order to send and receive data, to browse the Internet, and to establish connections with other computers, for example.

Data connections can be made from most locations where your wireless LAN card operates. However, it is recommended that you move the wireless LAN card to a location where the strongest possible network signal can be obtained. When the signal is strong, data transmission is efficient.

The following factors may impair wireless connections:

Noise

Electronic appliances and equipment can cause radio interference. Also in areas where wireless LAN cards are prevalent, other wireless LAN cards can impair the wireless connection.

Roaming

As the wireless LAN card user moves from one access point coverage area to another, the signal strength of the channel drops. As a consequence, the network may hand the user over to a coverage area and frequency where the signal is stronger. Due to varying network traffic loads, roaming may also occur when the user is stationary.

Electrostatic discharge

A discharge of static electricity from a finger or a conductor may cause erroneous functions in electrical devices. The discharge may result in unstable software operation. Network connections may become unreliable, data may be corrupted, and the transmission halted. In this case, end the existing connection (if any), stop the wireless LAN card, and remove it from the PC card slot. Then re-insert the wireless LAN card into the PC card slot and try connecting again.

Dead spots and dropouts

Dead spots are areas where radio signals cannot be received. Dropouts occur when the wireless LAN card user passes through an area where the radio signal is blocked or reduced by geographical or structural obstructions, such as concrete walls.

Signal impairment

Distance and obstacles can cause out-of-phase reflected signals that result in a loss of signal strength.

Low signal strength

Due to either distance or obstacles, the radio signal strength from an access point may not be strong or stable enough to provide a reliable wireless connection for communication. Therefore, to ensure the best possible communication, remember to consider the following points:

- Data connection works best when the wireless LAN card is in a stationary position.
- Do not place the wireless LAN card on a metal surface.

Important!

Warning: Do not use the wireless LAN card when the use of a wireless device is prohibited or when it may cause interference or danger. Note that the wireless LAN card may cause similar interference as a cellular device and must not be used in areas where the use of a cellular device is prohibited.

Warning: Be careful when moving your computer so that you do not cause damage to the protruding end of the inserted wireless LAN card.

Warning: In Europe, this equipment is intended to be used in the following EU Member States: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom. This equipment can also be used in Norway and Switzerland.

Warning: Use the wireless LAN card in the specified countries only. Using the wireless LAN card in any other country or with an incorrect country setting may be illegal.

Warning: This equipment operates at 2.4 - 2.4835 GHz. Note that in France the use of this equipment is only allowed at the frequency band of 2.445 - 2.4835 GHz (channels 10, 11, 12, and 13).

Note: Transmitted data is not encrypted by the wireless LAN card by default. For more information about security in data transmission, please visit *www.forum.nokia.com*.

Security

Security issues should always be carefully considered to ensure the secure transmission of data in both wired and wireless LANs. In current wireless systems, for example, access points need to authenticate wireless stations to prevent unauthorised access to the network. Authentication is a service that confirms the identity of an entity, such as a user or a computer, or confirms the origin of a transmitted message.

The Nokia C110/C111 supports the wired equivalent privacy (WEP) protocol to provide security equivalent to that of a wired local area network. The WEP protocol utilises the RC4 algorithm with an up to 128-bit secret key, which encrypts data before it is transmitted over the radio waves. This provides protection against intruders and unauthorised access to the data. When the wireless stations in a wireless LAN wish to communicate using WEP, they must have the same secret key in possession.

The Nokia C110/C111 is equipped with an integrated smart card reader. Smart cards and smart card readers provide a tool for managing secure user authentication in a wireless LAN. Smart cards also provide an easy way for users to carry an authentication device with them. On a smart card users can store important information, such as security keys and network profiles. The

smart card reader reads the data stored on the computer chip and sends it to the network for processing. The smart card is protected by a PIN code; to access the contents of the smart card, you need to enter the correct PIN code.

Warning: Keep all miniature smart cards out of small children's reach.

Antennas

The Nokia C110/C111 Wireless LAN Card is equipped with two internal antennas placed inside an extension box providing improved signal quality and coverage area. As with any other radio transmitting device, do not touch the antenna unnecessarily when the wireless LAN card is in use. Contact with the antenna affects the quality of the transmission and may cause the wireless LAN card to operate at a higher power level than otherwise needed.

Note: Make sure that the antenna is pointing towards the access point and placed in an open area. Do not cover the antenna.

The Nokia C111 has two antenna connectors for attaching external antennas for coverage area extension. The Nokia C111 can be used with up to two external antennas at the same time. Use only the supplied antennas or an approved external antenna. Unauthorised antennas, modifications, or attachments could damage the wireless LAN card and may violate regulations governing radio devices.

If only one external antenna is used, best performance is obtained by connecting the external antenna to the right antenna connector of the wireless LAN card.

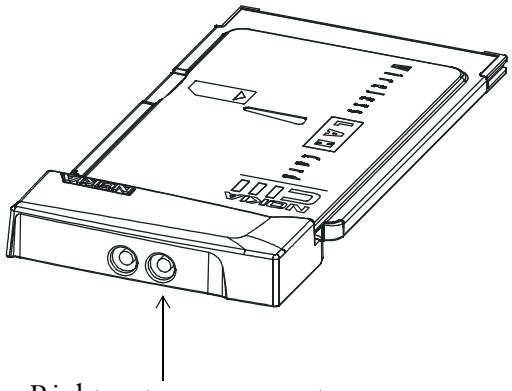

Figure 1 - Nokia C111

Warning: Use only accessories approved by the wireless LAN card manufacturer for use with this particular wireless LAN card. The use of any other type of accessories will invalidate any approval or warranty applying to the wireless LAN card, and may be dangerous.

Caution: When you disconnect the cable of any external antenna, grasp and pull the plug, not the cable.

Note: For availability of approved accessories, please check with your dealer.

Caution: In order to comply with FCC RF exposure requirements for a mobile transmitter, a minimum separation distance of 20 cm must be maintained between the antenna and all persons during transmission.

Getting started

To access and to operate in a wireless LAN with the Nokia C110/C111 Wireless LAN Card, you need to specify a number of network settings. If wireless stations are to communicate with each other in the wireless LAN, the stations must share certain settings. You can leave most settings at their default value, or use the automatic option when applicable, unless, for example, the system administrator advises you to the contrary.

Note: When you have changed certain settings, the system may prompt you to restart it. Restart your computer to enable the new settings.

Different wireless LANs require different settings. All necessary settings are configured when you create a network *profile*. A profile is a collection of settings needed for connecting to a wireless LAN. With the Nokia C110/C111 you do not need to remember these settings by heart or configure them every time you use your wireless LAN card. You can easily switch between networks, for example, from headquarters to field office, simply by selecting the appropriate profile. Any of the settings can be changed by editing the existing profiles. See “Profiles” on page 20 for more information.

Three profiles with pre-defined settings are automatically created during software installation. The *Quick Infrastructure* and *Quick Ad Hoc* profiles enable quick and easy access to a wireless LAN: you need not configure any network settings. The Quick Infrastructure profile is used for accessing public access zones or your corporate network. The Quick Ad Hoc profile is used for setting up a network where wireless stations communicate directly with each other without access points. When you activate either of these profiles, a list of available networks appears where you can select the network which offers the best signal strength and data rate for communication. The third pre-defined profile, *Wired LAN*, contains the original network settings needed for accessing the wired local area network. See “Using default profiles” on page 16 for more information.

Installation

For instructions on installing the Nokia C110/C111, please see the separate *Installation guide* on the CD-ROM.

Basic settings

The minimum set of parameters to be configured are listed below.

Note: All wireless stations within a wireless LAN must share the basic settings if the stations are to communicate with each other.

Country

You must always configure the country setting according to the country where you are currently using your wireless LAN card. Using the Nokia C110/C111 Wireless LAN Card in any other country not specified, or with an incorrect country setting may be illegal.

The country setting can be configured on the General settings page.

Operating mode

The Nokia C110/C111 enables different types of communication in a wireless LAN. There are two operating modes to choose from: *infrastructure* and *ad hoc*.

Infrastructure

The infrastructure operating mode allows two kinds of communication:

- Wireless stations communicate with each other through an access point.
- Wireless stations communicate with a wired LAN station through an access point.

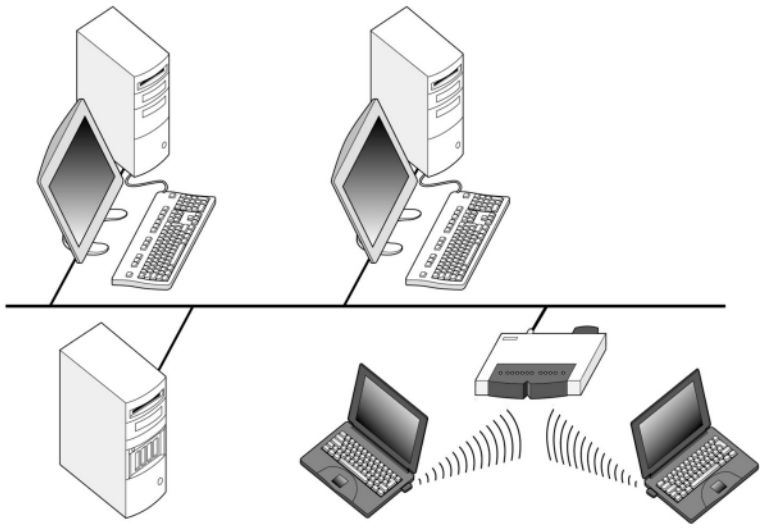

Figure 2 - Infrastructure networking

The advantage of the infrastructure operating mode is that you can have more control over network connections because they pass through an access point. A wireless station can access the services that are available for a regular wired LAN by using an access point.

Ad hoc

In the ad hoc operating mode, wireless stations communicate directly with each other; no access point is required. Simply insert the wireless LAN cards into the stations, make the necessary configurations, and start

communicating. Ad hoc networking is easy to set up, but communication is limited to stations that are within range.

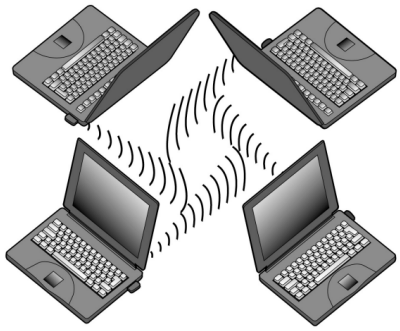

Figure 3 - Ad hoc networking

Select the desired operating mode when you are creating a new profile with the Profile Wizard. If you want to change the operating mode later, go to the Profiles page and click **Edit**.

Network name

The network name is the name of the wireless LAN to which the card can connect. It is usually programmed into an access point by a system administrator. You should ask the system administrator for the network name.

You can save more than one network name for each profile. If you enter more than one network name, the names must be separated from each other by a semicolon, for example: *Headquarters;Office4*.

Within a network, there may be subnetworks that all have different names, for example: *Office_wlan1*, *Office_wlan2*, *Office_wlan3*, etc. One profile can be used to connect the wireless LAN card to all the subnetworks. The network name may include a special character, a wildcard *, which can be used as a place holder for one or more letters or numbers. By using the wildcard, you can specify *Office_wlan** as the network name, and the wireless LAN card can be connected to any of the networks whose name starts with *Office_wlan*.

In the ad hoc operating mode, the users themselves give a name to the network.

Note: The network name can consist of up to 32 alphanumeric characters. By default, the network name is case-sensitive. To change this property, go to the General settings page and select the **Advanced** tab. There you can clear the **Case-sensitive network names** check box.

If you want to change the network name later, go to the Profiles page and click **Edit**.

Channel

The Nokia C110/C111 operates in the 2.4 GHz frequency band. You need to specify a radio frequency channel on which the wireless LAN card is used. The selection of available channels may vary from country to country, as certain countries have a limited number of channels that can be used.

You can select the **Automatic channel selection** option when you are creating a new profile with the Profile Wizard: you are automatically allocated an available channel without needing to specify one. You can, however, also select the correct channel yourself. In that case, make sure that the wireless LAN card and the access point are using the same channel.

If you want to change the channel setting, go to the Profiles page and click **Edit**.

Connecting to a network

The Nokia C110/C111 Wireless LAN Card connects your computer automatically to the access point and network that offer the best quality for communications. If you move the computer to another location within the network and out of range of the access point, the roaming functionality will automatically connect your computer to another access point that belongs to the same network. As long as you remain within range of access points that belong to the same network, your computer will stay connected to the network.

Once you have installed the software for the Nokia C110/C111, you can connect to a wireless LAN. For instructions on installing the Nokia C110/C111, please see the *Installation guide* on the CD-ROM.

1 Insert the wireless LAN card firmly into the PC card slot of the computer. See Figure 4.

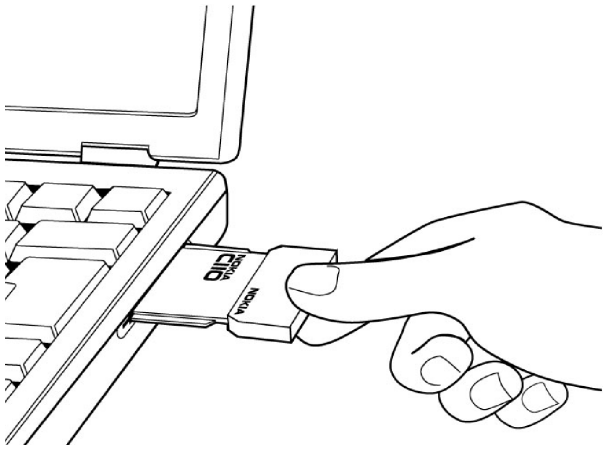

Figure 4 - Inserting the card

Caution: Note that the wireless LAN card is not inserted all the way into the PC card slot and there is a gap between the protruding extension box and the computer. Do not use excess force when inserting the card.

2 Switch on your computer.

3 If you are using a smart card, enter the PIN code and click **OK**.

Note: If the dialog box asking for your PIN code appears before the network logon dialog box, type the PIN code first.

4 Open the program by right-clicking the Nokia C110/C111 icon on the taskbar. A shortcut menu opens. Click **Manager window** or **Profiles**.

5 The Profiles page opens. Under **Profile selection**, select the profile you want to use with the wireless LAN in question. Click **Apply**. You may need to restart your computer. If you are about to connect to a new network and therefore need to create a new profile, or if you need to modify an existing profile, see "Creating new profiles" on page 21, or "Editing profiles" on page 22.

Note: In Windows 2000 and Windows NT 4.0, if you want to connect to a wireless LAN when logging onto a domain, insert the wireless LAN card into your computer and switch on the computer, then wait until the small Nokia C110/C111 icon appears in the bottom right corner of the screen. After that you can type your user name and password.

Setting up and joining an ad hoc network

Ad hoc networks allow wireless stations to communicate directly with each other without any access points. The stations can, for instance, share folders. One user creates the ad hoc network and other users then join the network.

You can choose to use a password to protect the network from unauthorised users. Only those stations that have the correct password can join the network.

To start an ad hoc network:

1 On the Profiles page, select the Quick Ad Hoc profile and click **Apply**.

2 Give the ad hoc network a name. You can also define a password for the network. Click **Start**.

3 Select an appropriate data rate: 2 or 11 Mbit/s. Note that all stations on an ad hoc network must be using the same data rate. Click **OK**.

To join an ad hoc network:

1 On the Profiles page, select the Quick Ad Hoc profile and click **Apply**.

2 Select the network you want to join and click **Join**. If a password is used in the network, type the password and click **OK**.

3 Select an appropriate data rate: 2 or 11 Mbit/s. Note that all stations on an ad hoc network must be using the same data rate. Click **OK**.

Note: When you select a profile for ad hoc networking, the system asks you to restart your computer if your network settings need to be changed. Restart your computer and then either start a network or select the network you want to join.

Tip: Create your own profile for ad hoc networking with the Profile Wizard if you use the ad hoc operating mode frequently. This saves you from having to start a network each time and allows quicker access. See "Creating new profiles" on page 21 for more information.

Using default profiles

Three default profiles are created during the installation: *Quick Infrastructure*, *Quick Ad Hoc*, and *Wired LAN*. With these profiles you can easily and quickly establish a network connection: you get a list of available networks and can join one without having to change the network settings manually. The Wired LAN profile contains the original network settings needed for accessing the wired local area network. Note that these profiles cannot be edited, deleted, or exported. The Wired LAN profile, however, can be updated to comply with the current wired LAN settings.

1 On the Profiles page, select the appropriate default profile and click **Apply**. If your network settings need to be changed, the system asks you to restart your computer. In that case, restart the computer.

2 A dialog box with a list of available networks opens. Select a desired network and click **OK**. The wireless LAN card joins the network.

Removing the card

You should always stop the wireless LAN card before removing it from the PC card slot of your computer.

Caution: In Windows NT 4.0, by default, you should not remove the wireless LAN card without switching off the computer first.

To stop the card:

1 Click **Start**. Select **Settings** and **Control Panel**. Double-click the **PC Card** icon to open the **PC Card Properties** dialog box.

2 Select **Nokia C110/C111 Wireless LAN Card** from the list and click **Stop**.

3 When the operating system prompts you, remove the wireless LAN card.

4 Click **OK** to exit the **PC Card Properties** dialog box.

Tip: A quicker way to stop the wireless LAN card is to click the **PC Card** icon on the taskbar and to select the option **Stop Nokia C110/C111 Wireless LAN Card**. Again, wait until the operating system prompts you to remove the card.

Caution: Closing the Monitor or the Manager window does not quit the program. To quit the program, you must stop the wireless LAN card.

Caution: The Windows 98 operating system stops all PC cards when a new PC card is inserted into the computer. If you insert another PC card into your computer, make sure that you first stop the Nokia C110/C111 and remove it from the PC card slot.

Uninstalling the Nokia C110/C111

Caution: Before you start uninstalling the Nokia C110/C111, you must first stop the wireless LAN card and then remove it from the PC card slot of the computer. See "Removing the card" for more information.

Note: Network profiles will remain unchanged even if you uninstall the Nokia C110/C111 software and then reinstall it.

Windows 95, 98, 2000, Me

1. Click **Start**, select **Programs** and **Nokia C110**. Click **Uninstall Nokia C110**.
2. A dialog box asks you to confirm whether you want to remove the program. Click **OK**.
3. The uninstallation starts. A dialog box informs you when the uninstallation is completed. Click **Finish**.

Windows NT 4.0

1. Click **Start**, select **Programs** and **Nokia C110**. Click **Uninstall Nokia C110**.
2. A dialog box asks if you are sure you want to uninstall the program. Click **OK**.
3. In the **Network** dialog box, select **Nokia C110/C111 Wireless LAN Card** and click **Remove**.
4. Click **Close** to close the **Network** dialog box.
5. You are asked if you want to restart your computer. Click **No**.
6. In the **Network Driver Uninstall** dialog box, click **OK** and the program starts uninstalling the files.
7. A dialog box informs you when the uninstallation is completed. Click **Finish**.

Nokia C110/C111 features

Monitor window

The user interface of the Nokia C110/C111 consists of two types of windows: the *Monitor* window and the *Manager* window.

The Monitor window is a small window displaying information on the status of the network connection. When you are using the Nokia C110/C111, you can quickly check the Monitor window to see that you are still within the coverage area, for example, or that the wireless LAN card is connected to the network.

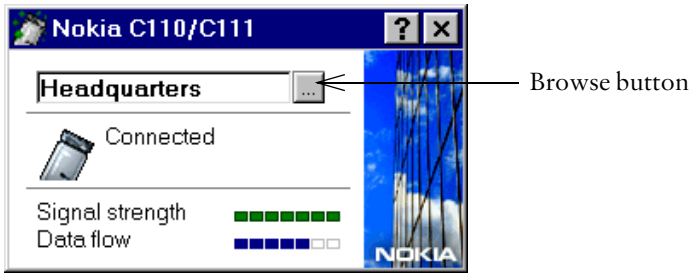

Figure 5 - Monitor window

When you insert the Nokia C110/C111 Wireless LAN Card into your computer, the Nokia C110/C111 icon appears on the taskbar. Double-click the icon to open the Monitor window.

The Monitor window displays the name of the profile which is currently used and information on the network connection. The following messages are displayed in the Monitor window according to the status of the connection:

CONNECTED	The wireless LAN card is connected to the network.
NOT CONNECTED	The connection could not be established. Make sure that you are within the coverage area, and all the settings are correct.
CONNECTION WEAK	A network connection has been established, but the connection is weak. Something may be either obstructing the connection (a concrete wall, for example) or the wireless station has moved too far away from the access point, or, in the ad hoc operating mode, moved too far away from the other stations.

CONNECTED WITH SECURITY	WEP keys are used for securing data transmission.
NO CARD	Either the wireless LAN card is not inserted or is not inserted properly.
CONNECTED TO SIM SERVICES	You are connected to subscribed services provided by your network operator or service provider.

The Nokia C110/C111 icon on the taskbar changes in a similar manner and displays the current status of the connection.

The Monitor window also has a signal strength indicator and a data flow indicator. The signal strength indicator shows the strength and quality of the radio signal between a wireless LAN card and an access point in the current location. Remember that the strength of the radio signal is affected by distance and obstacles, and that the computer needs to be within an access point coverage area, or, in the ad hoc operating mode, within range of other stations (see "Wireless LAN" on page 6). The data flow indicator shows the relative speed at which data is transferred.

The browse button (see Figure 5 on page 18) opens the Manager window and the page last visited.

Manager window

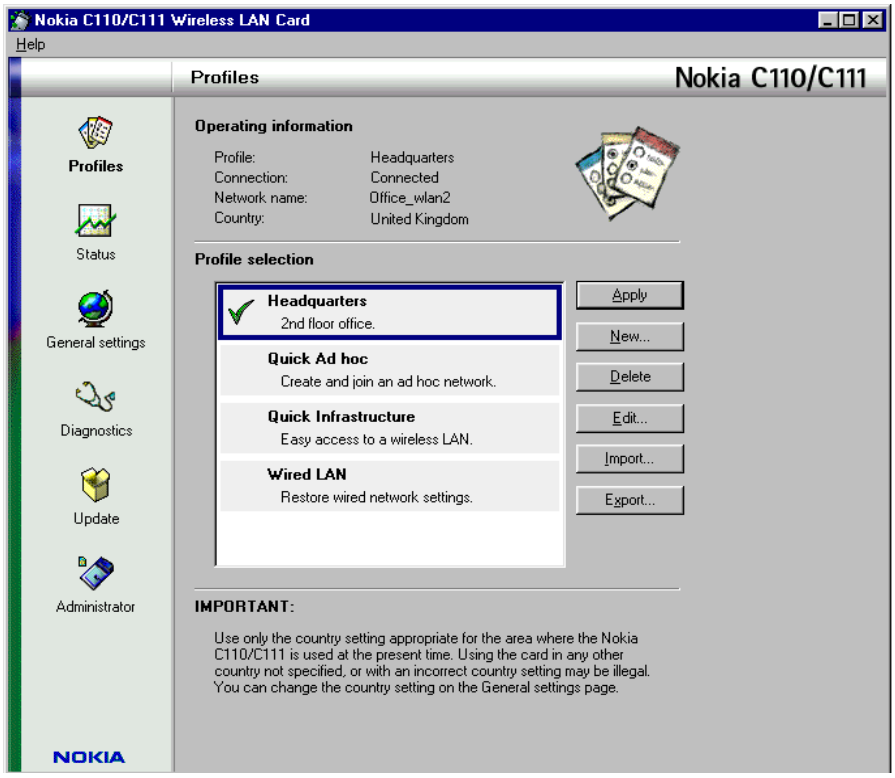

Figure 6 - Manager window

In the Manager window, you can configure various settings for your wireless LAN card and get more detailed information on the status of the connection. You can access it either by clicking the browse button in the Monitor window (see Figure 5 on page 18), or by right-clicking the Nokia C110/C111 icon on the task bar and by selecting **Manager window** from the shortcut menu.

The Manager window can consist of the following *pages*: Profiles, Status, General settings, Diagnostics, Update, Administrator, and SIM services. The Administrator page is used by system administrators. The number of pages may vary depending on which pages were selected during installation. You can view the different pages by clicking the icons on the left icon bar.

Profiles

For the Nokia C110/C111 to operate in wireless local area networks, you need to configure certain settings for each network. For example, when you use the card in your office LAN, you need different settings from those of the LAN at an airport you are visiting. On the Profiles page you can configure the necessary settings and create network profiles for specific wireless LAN environments.

A profile is a group of wireless LAN specific and Windows networking settings that you need for accessing wireless LANs. Profiles enable easy transfer from one network to another without having to remember all the different settings. On the Profiles page you can also modify existing profiles and create new profiles. Profiles are stored to a hard disk or a smart card.

Selecting profiles

You need to select a network profile suitable for the wireless LAN in which you want your wireless LAN card to operate. When you insert the wireless LAN card into your computer, the card selects the profile last used as a default profile. If, however, you want to use another profile, you can either select it from the list of existing profiles or create a new one.

In the **Profile selection** area, there is a list of profiles from which you can select a profile with all necessary settings for a particular wireless LAN. If you have connected to a network previously, you can simply select the profile for that network and then click the **Apply** button. The profile that is currently active is indicated with a green check mark, while a profile that has been selected but is not yet activated has a frame around it. A profile which is stored on a smart card is indicated with a small smart card symbol. The name of the active profile is displayed in the **Operating information** area. See Figure 6 on page 19.

Note: When you select a different profile, you may be prompted to restart your computer.

Note: You may need to change the proxy settings when you change profiles.

Creating new profiles

By creating different profiles for different wireless LANs, you can easily switch from one wireless LAN to another without having to memorise the network settings.

1 To create a new profile, click **New**. The Profile Wizard opens. This wizard will guide you through creating a new profile. To continue, click **Next**.

Note: Most settings can be left at their default values, as in most cases these settings are sufficient to provide good quality communications. However, there are situations when you may need to change the default settings.

2 Type a name for the new profile. You can select a name yourself that consists of up to 30 alphanumeric characters. In the text box you can enter information to help you identify different profiles. This information can contain up to 108 characters. Click **Next**.

Tip: When you create new profiles, make the name of the new profile as descriptive as possible. This enables quick selection among different profiles. You can also add in the text box further details about the profile, for example the name or address of the place where the wireless LAN is located.

3 Select one of the two available operating modes. In the *infrastructure* mode, computers can communicate with each other and with wired LAN stations through an access point. In the *ad hoc* mode, computers can send and receive data directly with each other. No access point is needed. See “Operating mode” on page 12 for more information. Click **Next**.

4 Type the network name as defined by the system administrator, or select one from the list box. In the ad hoc operating mode, the users themselves name the wireless LAN. The network name can consist of up to 32 alphanumeric characters. By default, the network name is case-sensitive. To change this property, go to the General settings page and select the **Advanced** tab. There you can clear the **Case-sensitive network names** check box.

Select a channel for wireless communications. If you select the **Automatic channel selection** option, you are automatically allocated an available channel without needing to specify one. You can, however, also select the correct channel yourself. In that case, make sure that the wireless LAN card and the access point are using the same channel. Click **Next**.

5 Select the **Obtain an IP address from a DHCP server** box if you want the DHCP server to assign an IP address for the wireless LAN card automatically. Make sure the network has a DHCP server. Alternatively, the IP address, subnet mask, default gateway, and the advanced TCP/IP

settings can also be specified and configured manually. Ask your system administrator for the correct values.

Note: Make sure that the **Manage TCP/IP properties together with profiles** check box is selected on the General settings page/**Advanced** tab. If this check box is not selected, the TCP/IP settings are managed by network settings which can be configured in the **Control Panel**.

If you want your computer to log on to a specific domain, select the **Log on to domain** check box. You must have a user name and password for the domain.

Note: Make sure that the **Manage domain settings together with profiles** check box is selected (General settings page, **Advanced** tab). If this check box is not selected, the logon settings are managed by network settings which can be configured in the **Control Panel**.

In the **Workgroup** text box you can type a name of a workgroup if you want your computer to join one. Click **Next**.

Note: In Windows 95/98/Me, you must always specify a workgroup name.

6 The **Profile creation complete** window informs you when the creation of a new profile is completed. Click **Finish**.

Note: When you have created a new profile and want to use it for the first time, you may be prompted to restart your computer.

Removing profiles

You can remove a profile from the list of profiles. Select a profile from the list and click **Remove**.

The default profiles that were created automatically during installation (*Quick Infrastructure*, *Quick Ad Hoc*, and *Wired LAN*) cannot be deleted.

Profiles that are stored on a smart card can only be removed on the Administrator page by the system administrator.

Editing profiles

You may want to edit an existing profile or create a new profile with similar settings to an old one.

1 On the Profiles page, select the profile from the list of profiles and click **Edit**.

2 Make the necessary changes and click **OK**. If you want to create an entirely new profile, click **Save As** and give the modified profile a new name.

Note: The **Edit Profile** dialog box consists of several tabs (General, Logon, Security, TCP/IP, Advanced), and from some of the tabs you can open additional dialog boxes. On each tab you can change the existing settings, but the changes will take effect only when you click the **OK** or **Save As** button in the main **Edit Profile** dialog box.

The following types of profiles cannot be edited:

- Quick Infrastructure and Quick Ad Hoc profiles. The Wired LAN profile can only be updated to comply with the current wired LAN settings.
- Profiles that are stored on a smart card.
- Profiles that are write-protected. See "Write-protect profile" on page 25.

You can leave most settings at their default values, as in most cases these settings are sufficient to provide good quality communications. However, there are situations when you may need to change the default settings. On the **General** tab you can edit the following properties:

DESCRIPTION — You can enter detailed information on the profile, such as the name or address of the place where the wireless LAN is located. This free text field is for information that helps you identify different profiles.

OPERATING MODE — There are two available operating modes to choose from: In the *infrastructure* mode, computers can communicate with each other and with wired LAN stations through an access point. In the *ad hoc* mode, computers can send and receive data directly with each other. No access point is needed. See "Operating mode" on page 12 for more information.

NETWORK NAME — The name of the wireless LAN as defined by the system administrator. In the ad hoc operating mode, the users themselves name the wireless LAN. The network name can contain up to 32 characters.

CHANNEL — The radio frequency channel used for wireless communication. You can choose the Automatic channel selection option, or you can set the channel manually.

On the **Logon** tab, you can edit the following properties:

LOG ON TO DOMAIN If you select this option, your wireless LAN card automatically logs on to a specified domain. You must have a user name and password for the domain.

Note: Make sure that the **Manage domain settings together with profiles** check box is selected on the General settings page/ **Advanced** tab. If this check box is not selected, the logon settings are managed by network settings which can be configured in the **Control Panel**.

WORKGROUP The name of the workgroup if you want your computer to join one.

Note: In Windows 95/98/Me, you must always specify a workgroup name.

On the **Security** tab, you can manage your shared WEP keys which are used for ensuring secure radio communication. For a more detailed description of WEP and how to create and manage different WEP keys, see "WEP security" on page 38.

USE WEP SECURITY WEP uses keys to protect the information transmitted in a wireless LAN. If this check box is not selected, communication is not protected against unauthorised persons.

USE A PERSONAL WEP KEY Personal WEP keys are used for authenticating users in a wireless LAN. To create a personal WEP key, go to the General settings page and select the **Personal Keys** tab. See "Creating and editing personal keys" on page 40 for more information.

Various network and radio settings can be edited on the **TCP/IP** and **Advanced** tabs:

OBTAIN AN IP ADDRESS FROM A DHCP SERVER An IP address for the wireless LAN card can be obtained automatically from a DHCP server. Make sure the network has a DHCP server. If needed, the IP address, subnet mask, default gateway, and the advanced TCP/IP settings can also be specified and configured manually.

Note: Make sure that the Manage TCP/IP properties together with profiles check box is selected on the General settings page/Advanced tab. If this check box is not selected, the TCP/IP settings are managed by network settings which can be configured in the Control Panel.

AUTOMATIC CONFIGURATION

There are a number of advanced radio settings (DTIM period, fragmentation threshold, listen interval, RTS threshold, etc.) which are configured automatically. Alternatively, you can specify a new value manually, if necessary. See "Appendix" on page 57 for a list of advanced radio settings and their values.

Caution: Do not change the settings manually unless you are sure how each setting affects system performance. System performance may drop dramatically if automatic settings are not used.

WRITE-PROTECT PROFILE

You can write-protect a profile so that it cannot be edited. The profile can still be imported, exported and deleted, but it cannot be changed any more.

Note: You may need to restart your computer to enable the new settings.

Importing and exporting profiles

On the Profiles page, click **Import** and select the source from which you want to import the profile. You can import a profile from a folder. The system administrator can import profiles from a smart card.

Similarly, you can export a profile to a folder. Click **Export**, and select the folder where you want to save the profile.

The default profiles that were automatically created during installation (*Quick Infrastructure*, *Quick Ad Hoc*, and *Wired LAN*) cannot be exported.

Status

On the Status page, you can find general information on the current operation of the Nokia C110/C111 Wireless LAN Card and the network you are using.

General tab

The following properties are displayed on the **General** tab in the **Operating information** area:

PROFILE Name of the profile currently in use.

CONNECTION	Displays the current status of the wireless LAN connection. *Connected* indicates that the card is connected to the network. *Not connected* indicates that the card is not connected to the network. *Connected with security* indicates that the system is using WEP keys. *No card* indicates that no wireless LAN card has been inserted into the PC card slot of the computer. *Connection weak* indicates that something is either obstructing the connection (a concrete wall, for example) or the computer has moved too far away from the access point, or, in the ad hoc operating mode, moved too far away from the other stations. *Authorization failed* indicates that you have possibly used a wrong WEP key, or that you have no access rights for the network.
OPERATING MODE	Type of network communication in use. In the *infrastructure* mode, computers can communicate with each other and with wired LAN stations through an access point. In the *ad hoc* mode, computers can send and receive data directly with each other. No access point is needed.
NETWORK NAME	Name of the network to which the wireless LAN card is currently connected.
ACCESS POINT	Name of the access point to which the wireless LAN card is currently connected. You have a browse button visible in the user interface if you have the Administrator page installed or if your system administrator has chosen to install the button. Click it and you can configure the Nokia A032 Wireless LAN Access Point using a standard browser interface. For details on how to configure the Nokia A032, please refer to the *Nokia A032 Wireless LAN Access Point Advanced User Guide*.
CHANNEL	Radio frequency channel on which the wireless LAN card operates.

DATA RATE	Speed at which data is transferred. Possible rates are 1, 2, 5.5, and 11 Mbit/s
MAC ADDRESS	Unique hardware address of the wireless LAN card.

The **Statistics** area shows the status of the current connection in graphics.

SIGNAL STRENGTH	Indicates the quality of the radio connection between the computer and the access point, or, in the ad hoc mode, between two computers.
DATA FLOW	Indicates the relative speed of data transfer in the network.

Smart Card tab

The **Smart card information** area shows information on the smart card which is being used by the wireless LAN card: the name and status of the smart card, when data was last stored and by whom, and an optional description of the smart card.

If you temporarily want to lock the smart card in order to deny access to it, click **Lock Smart Card**. Those profiles that are used from the smart card will not be shown in the list of available profiles on the Profiles page. To access the smart card again, click **Unlock Smart Card**, type your PIN code, and click **OK**.

If you set the PIN code request on, you are asked for the PIN code every time the wireless LAN card is inserted with the smart card. To activate this setting, click **Enable PIN Code Request**. Alternatively, you can turn off the PIN code request.

Note: Some smart cards do not allow turning off the PIN code request.

Your smart card has a default PIN code, for example *0000*. For security reasons it is important that you change the PIN code. To change the PIN code, click **Change PIN Code** and type a new value for the PIN code. The PIN code can be 4 to 8 digits long. Retype the code and click **OK**. Keep the new code secret and in a safe place.

If you enter an incorrect PIN code three times in a row, the smart card is blocked and cannot be used. To change a disabled PIN code, you need a PUK (PIN Unblocking Key) code. The PUK code is unique for each smart card and it cannot be changed. You can find the PUK code for the Nokia Smart Card in the sales package of the smart card.

Access Points/Stations tab

In the infrastructure operating mode, the **Access points in range** area shows which access points are currently in range and available. As the wireless LAN

card user moves from one access point coverage area to another, the signal strength of the channel drops. Therefore the network may hand the user over to a coverage area and frequency where the signal is stronger.

In the ad hoc operating mode, the names of the other computers connected to the ad hoc network are displayed under the **Wireless stations in the ad hoc network** area. Note that only the names of those computers which are using the Nokia C110/C111 Wireless LAN Card are shown. By double-clicking the entries, you can access those folders that are shared.

History tab

Here you can monitor the status of the network connection. The following events can be reported:

Card has been reset - Due to a temporary hardware or software failure, the card may have lost the network connection for a while, but the card has reset itself.

Card found - The system has found the card.

Card not found - The system could not find the card.

Started network - An ad hoc network has been successfully established.

Failed to start network - An ad hoc network could not be established.

Joined network - The wireless LAN card has successfully joined the network and can start using its resources. The network can be either ad hoc or infrastructure.

Failed to join network - The issued command to join a network was unsuccessful.

Left network - The wireless LAN card has left the network which was previously used.

General settings

On the General settings page, you can set properties which are common for all profiles. These settings will remain unchanged even when you switch to using another profile.

General tab

Country selection

You must always configure the country setting according to the country where you are currently using your wireless LAN card. Select the correct country from the list of countries and click **Apply**.

Warning: Use only the country setting appropriate for the area where the wireless LAN card is used at the present time. Using the wireless LAN card in any other country not specified, or with an incorrect country setting may be illegal.

The Nokia C110/C111 operates in the license-free frequency band of 2.4 - 2.4835 GHz, but local regulations may limit the use of radio equipment. Therefore, the selection of available channels varies according to the country where the wireless LAN card is used.

Power saving

Since a wireless LAN card has no direct wire connection of its own, it uses power from the host computer. The Nokia C110/C111 is equipped with a power saving option which allows you to control the power consumption of your computer: you can prolong the life of the battery when needed.

If you select the **Enable power saving** check box, the wireless LAN card is fully powered up only when sending or receiving data. The card wakes up from the power saving mode at regular intervals to check if there is any data for it at an access point, and wakes up immediately when there is any outgoing data.

Note: The speed of communication decreases when the power saving option is used.

Note: The power saving option may not be compatible with access points that are not Wi-Fi™ (Wireless Fidelity) approved. Do not use power saving with such access points.

Monitor window

By default, the Monitor window opens in the middle of the display area of your computer. If you move the Monitor window to a different place on the screen and want it to be displayed in that position the next time you open it, select the **Remember Monitor window position** check box. The next time you open the Monitor window, it will be in the same place where you had moved it.

Select **Always show Monitor window on top** if you want the Monitor window to remain visible even when you have other applications open.

When you insert the Nokia C110/C111 Wireless LAN Card into your computer, a small icon appears on the taskbar. By right-clicking this icon a shortcut menu opens, and you can access either the Monitor window or the Manager window. If, however, you want the Monitor window to open automatically each time the card is inserted, you can select the **Open Monitor window automatically** option.

If you select **Always show icon on taskbar**, the small Nokia C110/C111 icon on the taskbar will be displayed even when the card has not been inserted.

For the changes to take effect, click the **Apply** button. If you have made changes to the settings but wish to restore the previous settings, click **Restore**.

Personal Keys tab

Personal WEP keys are used for authenticating the user in a network. Personal keys are usually created by the system administrator, who can store them on smart cards and then distribute them to the users. Personal keys can also be saved in a file. Because personal keys are not network specific, they cannot be saved together with profiles. They can, however, be saved independently from profiles.

Personal keys can be used only with the infrastructure operating mode. Ad hoc networks use shared keys only. See "WEP security" on page 38 for more information.

There are two types of personal keys, and the difference between the keys is the type of information which is used for identifying the user:

USER-SPECIFIC	Uses an identifier which the users can create themselves.
STATION-SPECIFIC	Uses the MAC address of the wireless LAN card to identify the user.

To create a new personal key:

1 Click **New**. Give the personal key a name. You can also add in the text box a further description of the key, such as the name of the network where the key is used.

2 Select the type of key you want to create: *user-specific* or *station-specific*. If you choose a station-specific key, the MAC address of the wireless LAN card is used as an identifier. If you choose a user-specific key, you can choose the identifier yourself. However, make sure that the same personal key is configured to the access point; if the access point and wireless LAN card are using incompatible keys, they cannot communicate.

3 Select the appropriate key length. Supported key lengths are 40, 56, 64, 104, and 128 bits. Remember that the more bits there are in the key, the higher the level of security. Click **Generate**. The system generates your personal key.

4 Click **OK** to save the WEP key and to close the dialog box.

Similarly, you can edit existing keys. You can also remove keys you do not need any more. Instead of creating a personal key yourself, you can import from a folder a key created by a system administrator. You can export and save personal keys in folders. The system administrator can also store personal keys on smart cards.

Tip: You can enter and edit the personal WEP key in text format, too. Click **As Text**, and type in the text. Click **OK** and the system converts the text into hexadecimal format. You can copy and paste the text by using the CTRL+ C and CTRL+V key combinations respectively.

Note that on the **Personal Key** tab you cannot select a personal WEP key to be used. **To select a personal key to be used with a certain profile:**

1 Go to the Profiles page, select the profile you want to modify, click **Edit**, and select the **Security** tab.
2 Select **Use WEP security**, then select **Use a personal WEP key**. Click **Select**.
3 A list of personal WEP keys is displayed. Select a personal key from the list and click **OK**.
4 Click **OK** to close the **Edit Profile** dialog box.

Advanced tab

When you create profiles, you are asked to specify whether you want the DHCP server to allocate an IP address for the wireless LAN card, and whether you want your computer to log on to a domain. By default, these settings are managed automatically as defined in each profile.

When the **Manage TCP/IP properties together with profiles** check box is cleared, profiles will be activated without TCP/IP settings. You can change the settings manually in the **Control Panel**.

Profiles will be activated without domain settings if the **Manage domain settings together with profiles** check box is cleared. You can change the settings manually in the **Control Panel**.

Note: Both of these check boxes must be selected if you want the profiles to be able to log you on to a domain or allocate IP addresses.

By default, the network name is case-sensitive. To change this property, clear the **Case-sensitive network names** check box.

If you want the system to allocate you IP addresses automatically, select the **Renew DHCP automatically when needed** check box. You can also renew your IP address whenever you want by clicking the **Renew DHCP Now** button.

For the changes to take effect, click the **Apply** button. If you have made changes to the settings but wish to restore the previous settings, click **Restore**.

Diagnostics

On the Diagnostics page, you can run a series of fault diagnosis tests to ensure that the Nokia C110/C111 Wireless LAN Card and the software are

operating correctly. If you encounter problems in accessing the wireless LAN, for example, the tests can help to identify the source of the problem.

The tests check that the software files have not been modified, the settings configured both on the Profiles and General settings pages are valid and do not conflict, and the wireless LAN drivers have been installed correctly. If the card does not pass a test, you are given advice on how to proceed.

To start the fault diagnosis test, click **Start**. You can stop the test at any time by clicking **Stop**. The test results are displayed in the **Advice** area.

- The **Repair** button is activated if the software finds a fault which can be corrected automatically by the software.
- The **Help** button opens the troubleshooting section of the online help, where you can find information on how to solve possible problems.
- The **Support** button opens the online help where you get information on how to contact Nokia's technical support.

You are advised to run the diagnosis tests when, for example, the Monitor window reports a failure with the network connection, or when you have problems in accessing a network. A number of possible problem situations are covered in this guide under "Troubleshooting" on page 41.

Update

You can download the latest software version of the Nokia C110/C111 Wireless LAN Card from Nokia's customer support Web site. In order to be able to update your software, you first have to register to Nokia's customer database.

Registering to the customer database

You can register to Nokia's customer database electronically by clicking the **Register** button. Your Web browser opens and you are taken to the Nokia Web site. There you find a link for the Web page where you get further information on registration and where you find the registration form. You are asked to select a user name and a password. You need them when logging into the Web site where the updated software can be downloaded. Note that you will not be able to download the software updates immediately after registering, as it takes a while for your user name and password to become valid.

Tip: Because it takes a while for your user account information to become valid, it is recommended that you register at your earliest convenience. This way you can get the software update as soon as you actually need it.

Note: When registering, you are asked for the serial number of your wireless LAN card. You can find the number both on the card and the outside of the sales package.

Updating software

Once you have registered to Nokia's customer database and your user name and password are valid, you are entitled to download the latest software version of the Nokia C110/C111 from Nokia's Web site.

Note: Before installing the updated software, you must uninstall the older version of the Nokia C110/C111. See "Uninstalling the Nokia C110/C111" on page 17 for details.

Click the **Update** button. Your Web browser opens and you are taken to Nokia's Web site. There you find a link for the Web page where you get the latest software. Install the updated software version for your wireless LAN card. The installation is carried out in the same manner as the original installation from the CD-ROM.

Note: All the existing settings which you have configured on the Profiles and General settings pages - including your personal profiles - will remain unchanged even when the software has been updated.

Note: Make sure that your computer has enough battery power before you start to download the updated software.

Administrator

The Administrator page is meant for system administrators and is not installed as part of the typical installation procedure. On the Administrator page, the system administrator can save important data on a smart card and can create installation disks, which then can be distributed to end users within a corporation, for example, offering quick access to networked resources.

Note: When you have installed the Administrator page, you can configure the Nokia A032 Wireless LAN Access Point using a standard browser interface. Go to the **Status** page of the Manager window and click the browse button there. Your Web browser opens. For details on how to configure the Nokia A032, please refer to the *Nokia A032 Wireless LAN Access Point Advanced User Guide*.

Creating smart cards

The system administrator can store important information such as personal WEP keys and network profiles on a smart card. The administrator can then give users smart cards which contain the necessary network settings and encryption keys for quick network access. The user inserts the smart card into the Nokia C110/C111, inserts the wireless LAN card into a compatible computer, and is then ready to access the wireless LAN.

To store data on a smart card:

1 Slide the smart card into the smart card slot of the Nokia C110/C111. Make sure that the metal contacts of the smart card are facing down and that the bevelled corner is on the right. See Figure 7 on page 42.

2 Insert the wireless LAN card in your computer and start the Nokia C110/C111 program. Go to the Administrator page. In the **Smart card** area click **Add/Remove**.

3 The **Smart Card** dialog box opens. Select the items on the left to be copied to the smart card. Click the arrow button pointing to the right. If you want to remove items from the smart card, select the desired items on the right and click the arrow button pointing to the left.

4 You can type additional information about the smart card in the **Smart card description** text box.

5 Click **OK** to save the selected items on the smart card.

Note: Profiles are copied to a smart card when the **Keep data after storing on smart card** check box is selected. If this check box is cleared, the selected profiles will be removed - instead of being copied - from the system to a smart card.

If you want to empty the contents of a smart card, click **Erase All**. Note that all items on a smart card will be removed, including the smart card description. If you want the program to re-read the contents of a smart card, click **Reload**.

Creating installation disks

The system administrator can create installation disks which contain all the necessary settings needed for accessing a wireless LAN. The custom installation package can also be saved on a hard disk.

The installation disk can be used for distributing profiles. All the desired settings and profiles can be copied to the installation disk, which then offers an end user quick access to a wireless LAN. The end user does not have to configure settings in order to be able to connect to a network.

To generate an installation disk:

1 On the Administrator page, in the **Installation disk** area, click **Create**.

2 The **Installation Disk** dialog box opens. The **Profiles available** list contains the names of all the profiles found in the system registry. Select a profile you want to save on the installation disk and click the arrow button pointing to the right.

Note: General settings are automatically copied to a disk, and do not have to be selected separately like profiles.

The name of the selected profile is added to the list on the right. If you want to remove a profile from the list, select it and click the arrow button pointing to the left. Also select the pages you want to include on the disk. If

you select the **Access point configuration button** check box, the browse button on the Status page will be visible and you will be able to configure access point settings in your Web browser. To start creating an installation disk with the selected profiles, click **OK**.

3 Insert a disk into the floppy disk drive of your computer and click **OK**. The selected files are copied to the disk.

4 Click **OK** to finish the creation of an installation disk.

The installation disk can now be used: the user inserts the installation disk into the disk drive of a computer and selects **setup.exe**. The installation starts and when prompted by the system, the user inserts the Nokia C110/C111 Wireless LAN Card into a compatible computer. The installation is carried out without the user having to configure settings. When the installation is completed, the user is ready to access a wireless LAN.

SIM services

On the SIM services page, you can connect to services provided by the network operator or service provider you have subscribed to. Your service provider may, for example, offer you the possibility to check data from your company intranet, send and receive e-mail, and save documents.

Note: Before you can take advantage of the SIM services, you must subscribe to these services from your service provider or network operator and obtain instructions for use.

An access controller acts as a gateway between the Internet and wireless stations that are attached to a wireless LAN. An access controller handles user authentication and controls the data sent to and from the Internet. A SIM card is used as a means for user identification: the data stored on the SIM card is read and if valid, the access controller allows you to connect to the Internet and intranets.

The access controller also monitors usage in real time and gathers accounting information, such as used access time and/or transferred data. This accounting data is then passed on to the service provider for billing purposes. Accounting begins when the wireless station is authenticated and ends when the wireless station logs off.

Note: The actual invoice for services from your service provider may vary, depending upon network features, rounding-off for billing, taxes and so forth.

The SIM services page is not installed as a part of the typical installation procedure.

Connecting to SIM services

Note: Before connecting to SIM services, make sure you are within the coverage area of an access point and connected to a wireless LAN. The **Connect** button is activated only when the wireless device has detected a service in the network, otherwise the button remains inactive.

1 On the SIM services page, Click **Connect**.

2 If a dialog box appears asking for the PIN code, enter the PIN code for your SIM card and click **OK**.

3 Connection to your service provider's network and SIM services is now established. To disconnect from SIM services, click **Disconnect**.

The connection to the SIM services is valid only for a certain length of time. This ensures that you are not accidentally connected to the service for a long period of time. The length of time varies depending on the network. When the set time limit is about to end, you are asked if you want to continue or disconnect. If you do not want to continue, the connection to SIM services is ended when the specified time expires.

Settings tab

Note: You cannot configure these settings when you are connected to SIM services. You must end the connection first.

For the changes to take effect, click the **Apply** button. If you have made changes to the settings but have not clicked **Apply,** and now wish to restore the previous settings, click **Restore**.

Service provider domain

Type the domain name provided by your service provider or network operator, as in *company.com*. You cannot connect to SIM services without specifying the domain name.

Automatic connection

You can get automatically connected to SIM services when such a service is detected and available. If you select the **Prompt when a service is detected** check box, every time a service is detected you are asked whether you want to get connected. Once you have confirmed that you want to get connected, the access controller authenticates you to the service without your having to click the **Connect** button.

Advanced connection controlling

Your wireless device sends keep-alive signals on a periodic basis to the access controller in order to check the validity of the connection. If the wireless device receives no response, the connection is ended automatically.

If you select the **Enable advanced connection controlling** check box, your wireless device and the access controller can exchange additional signals, which enables a quicker detection of lost connection.

Settings on SIM card

Your service provider's domain name and Web address can be stored on a SIM card in SMS (Short Message Service) form. Your service provider may store these settings on the SIM card before issuing you the card, or the service provider may send a text message to your cellular phone when the SIM card is inserted in it.

If you have the **Read settings from SIM card** check box selected and new settings are found on the SIM card, you are asked to confirm whether you want to apply them. To accept the settings from the SIM card, click **Yes**.

History tab

Here you can monitor the status of the connection. The following events can be reported:

Service detected - The wireless device has detected in the network an access controller which authenticates you to the provided services.

Connection opened - Connection to the SIM services has been successfully established.

Connection failed - Connection to the SIM services could not be established.

Connection closed - The connection to the SIM services has ended.

The list of events in the History area is erased when you shut down your computer. If you want to keep track of the events occurred and be able to view them afterwards, you should create a connection log in text file format.

To create the text file, select the **Create connection log** check box. To save the file in a different folder, click **Browse** and select a folder. All events that occur from now on will be listed in a text file. To view this file, click **View Log**.

Tip: The text file contains only the events that have occurred *after* selecting the **Create connection log** check box. Therefore, if you want to be able to view all the events from the very beginning of establishing the connection, you should select the check box before connecting to SIM services.

Update tab

You may need to update the network profile that is used for accessing SIM services. Your service provider can, for example, put the new profile on their Web page where you can download it.

To get an updated network profile from your service provider's Web site, click the **Update** button and type the correct Web address in the text box. Click **OK** and your Web browser opens.

Tip: When you type your service provider's Web address, click the **Set As Default** button. The Web address is stored to the system registry and is displayed in the text box every time you click the **Update** button.

Security options

WEP security

To provide secure communication over the wireless LAN, the Nokia C110/C111 offers the Wired Equivalent Privacy (WEP) security feature. WEP uses the RC4 algorithm with an up to 128-bit key. The algorithm provides for security via two methods: authentication and encryption. Authentication is the means by which one wireless station is verified to have authorisation to communicate with a second station in a given coverage area.

In the infrastructure mode, authentication is established between an access point and each wireless station. If a wireless station receives a packet that has not been scrambled with a correct key, the packet is discarded. Encrypted messages can be opened by other wireless LAN cards only if they all use the same encryption key. In the ad hoc mode, authentication is established between each wireless station.

The WEP feature offers a security level comparable to that of wired networks. The level of security is dependent on the length of the key: the more bits there are in the key, the longer it takes to decrypt the information sent and the higher the level of security.

WEP keys consist of a secret key and a 24-bit Initialization Vector. For example, the 104-bit WEP key has a 104-bit secret key which the user can set, and a 24-bit Initialization Vector that cannot be controlled by the user. Some manufacturers refer to the 104-bit key as a 104-bit key, whereas others refer to it as a 128-bit key (104+24). Both keys offer the same level of encryption and are therefore interoperable.

Tip: Other manufacturer's 128-bit keys may not be compatible with the 128-bit key (128+24) used with the Nokia C110/C111. Instead, with the Nokia C110/C111 you may need to use the 104-bit key (104+24) to ensure compatibility with other manufacturer's 128-bit keys.

There are two types of WEP keys: *shared keys* and *personal keys*.

Shared keys

Shared WEP keys are shared by all wireless stations using the network or subnetwork; only stations that have the correct key can receive and decrypt data. The same key is loaded into the access point. Shared keys are usually created by system administrators, who distribute them to users. In the ad hoc operating mode, the person who is creating the ad hoc network decides on a password and then distributes it to others. The system uses this password to create a shared WEP key.

Shared keys are network-specific, and each network can have up to 4 different shared keys. The name of a shared key is the same as the name of the

network. An access point only transmits data using the active key, but can receive data from wireless stations using any of the four shared WEP keys.

Because the shared WEP keys are network-specific and user-independent, they can be saved in a file together with profiles. Users can import profiles from a file or a smart card that include shared keys and that have been created by their system administrator.

Shared keys can be used as the only form of WEP security or used together with a personal key.

If a wireless LAN includes a Nokia A032 Wireless LAN Access Point that is configured to use open authentication, you can still use shared WEP keys.

Personal keys

Each wireless station can have an individual, personal WEP key. Personal keys are used for providing additional security for wireless connections. They are usually created by system administrators, who distribute them to users. An access point uses a different key for each wireless station.

There are two types of personal keys, and the difference between the keys is the type of information that is used for identifying the user:

USER-SPECIFIC	Uses an identifier that the users can create themselves.
STATION-SPECIFIC	Uses the MAC address of the wireless LAN card to identify the user.

Unlike shared keys, personal keys are not network specific, and therefore cannot be saved together with profiles. They can, however, be separately saved in a file.

Note: Personal keys can be used only with the infrastructure operating mode. Ad hoc networks use shared keys only.

Creating and editing shared keys

Shared keys are usually created by a system administrator. In the ad hoc operating mode, the person who is creating the ad hoc network decides on a password and then distributes it to others. The system uses this password to create a shared WEP key.

Note: In the infrastructure operating mode, the same key value must be entered both at the access point side of the network and on the wireless station.

1 On the Profiles page, select the profile you want to modify and click **Edit**.

2 Select the **Security** tab, then select **Use WEP security**. If you do not select this check box, WEP encrypted communication will be ignored. Click **Add** if you want to generate a new shared key or **Edit** if you want to edit an existing one.

3 The **Edit Shared WEP Key** dialog box opens. Select the name of the network from the list. The name of a shared key must be the same as the name of the network.

For each wireless LAN network, you may specify four shared keys. In the **Use as** list, select a slot for the key.

Select the appropriate key length. Supported key lengths are 40, 56, 64, 104, and 128 bits. The more bits there are in the key, the higher the level of security. Click **Generate**. The system generates your shared key.

Tip: You can enter and edit the personal WEP key in text format, too. Click **As Text**, and type in the text. Click **OK** and the system converts the text into hexadecimal format. You can copy and paste the text by using the CTRL+ C and CTRL+V key combinations respectively.

4 Click **OK** to save the WEP key and to close the dialog box.

Importing and exporting shared keys

You can import and export shared WEP keys from and to a file. The system administrator can save shared WEP keys on a smart card together with profiles.

1 On the Profiles page, select the profile you want to modify, click **Edit**, and select the **Security** tab.

2 Select **Use WEP security**, and click **Import** or **Export**.

3 Select the source from which you want to import or the destination in which you want to save the shared key.

Creating and editing personal keys

Personal keys can be used only with the infrastructure operating mode.

Note: You must also configure the personal key to the access point in order to be able to communicate with it.

1 On the General settings page, select the **Personal Keys** tab. Click **New** if you want to generate a new personal key or **Edit** if you want to edit an existing one.

2 Give the personal key a name. You can also add in the text box a description of the key, such as the name of the network where the key is used.

3 Select the type of key you want to create: *station-specific* or *user-specific*. If you choose a station-specific key, the MAC address of the wireless LAN card is used as an identifier. If you select a user-specific key, you need to type in an identifier yourself.

4 Select the appropriate key length. Supported key lengths are 40, 56, 64, 104, and 128 bits. Remember that the more bits there are in the key, the

higher the level of security. Click **Generate**. The system generates your personal key.

Tip: You can enter and edit the personal WEP key in text format, too. Click **As Text**, and type in the text. Click **OK** and the system converts the text into hexadecimal format. You can copy and paste the text by using the CTRL+ C and CTRL+V key combinations respectively.

5 Click **OK** to save the WEP key and to close the dialog box.

Importing and exporting personal keys

You can import personal WEP keys from a file and save them to a file. The system administrator can import personal WEP keys from a smart card and export them to a smart card.

1 On the General settings page, select the **Personal Keys** tab. Select the key you want to import or export and click **Import** or **Export** accordingly.

2 If you are importing a key, select the source from which you want to import and click **Open**. If you are exporting a personal key, select the destination to which you want to save the key, and click **Save**.

Selecting a personal key

1 On the Profiles page, select the profile you want to modify, click **Edit**, and select the **Security** tab.

2 Select **Use WEP security**, then select **Use a personal WEP key**. Click **Select**.

3 A list of personal WEP keys is displayed. Select a personal key from the list and click **OK**.

4 Click **OK** to close the **Edit Profile** dialog box.

Smart cards

A smart card is a miniature SIM-card sized plastic card with an embedded computer chip. Smart cards provide a means of storing vital information such as security keys or network profiles. Smart cards also provide an easy way for users to carry data with them. The Nokia C110/C111 is equipped with an integrated smart card reader that reads the electronic data from a smart card.

The smart card is protected by a PIN code, which provides an additional tool for managing secure user authentication in a wireless LAN. Only a person who knows the PIN code can access the information stored on the smart card. The Nokia Smart Card has the default PIN code *0000*. For security reasons, it is important that you change the PIN code. Keep the new code secret and in a safe place.

Note: The PIN code can be 4 to 8 digits long.

If you enter an incorrect PIN code three times in a row, the smart card is blocked and cannot be used. To change a disabled PIN code, you need a PUK (PIN Unblocking Key) code. The PUK code is unique for each smart card and cannot be changed. You can find the PUK code in the sales package of the Nokia Smart Card.

Caution: The smart card and its contacts can be damaged by scratches or bending, so be careful when you handle, insert, or remove the card.

The system administrator may provide users with smart cards that contain predefined network profiles. Profiles enable quick access to the wireless LAN without having to configure any settings. The smart card may also contain WEP keys, which are used for authentication and encryption.

The integrated smart card reader can only be used with the Nokia C110/C111. If you want other applications to be able to use the smart card reader of the Nokia C110/C111, you need to install separately a PC/SC (Personal Computer Smart Card) compliant smart card driver on your computer. Please consider the following points:

- Install the PC/SC compliant smart card driver only if you want to use other smart card applications with the smart card reader of the Nokia C110/C111.
- You can have only one smart card driver installed on your computer at one time. If you already have a smart card driver installed on your computer and you want to use the smart card driver provided by Nokia, you first have to uninstall the existing driver.

For further information and installation instructions, please see the **readme.txt** file in the **SCard** folder of the CD-ROM.

Inserting a smart card

1 Slide the smart card into the smart card slot of the wireless LAN card. Make sure that the metal contacts of the smart card are facing down and that the bevelled corner is on the right. See Figure 7.

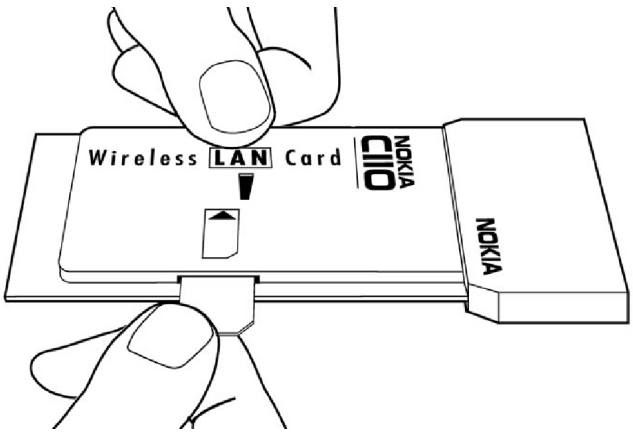

Figure 7 - Inserting the smart card

2 Insert the wireless LAN card in your computer.

3 Enter the PIN code of your smart card and click **OK**. You can now start the Nokia C110/C111 program and access the network.

Warning: Keep all miniature smart cards out of small children's reach.

Changing a PIN code

1 On the Status page, select the **Smart Card** tab.

2 In the **Smart card locking** area, click **Change PIN Code**.

3 Type the old PIN code, then type the new PIN code and confirm it. The PIN code can be 4 to 8 digits long. Click **OK**.

Unblocking a PIN code

If entering the PIN code fails three times successively, the code is blocked. You can unblock it by entering your PUK (PIN Unblocking Key) code.

1 A message box informs you when the PIN code is blocked. Click **OK**.

2 The **Unblock PIN Code** dialog box opens. Type the PUK code, then type a new PIN code and confirm it. Click **OK**.

Setting PIN code request

If you set the PIN code request on, you are asked for the PIN code every time the wireless LAN card is inserted with the smart card.

1 On the Status page, select the **Smart Card** tab.

2 In the **Smart card locking** area, click **Enable PIN Code Request**.

You can turn off the PIN code request by clicking **Disable PIN Code Request**.

Note: Some smart cards do not allow turning off the PIN code request.

Locking and unlocking a smart card

You may want to lock the smart card in order to temporarily deny access to it.

1 On the Status page, select the **Smart Card** tab.

2 In the **Smart card locking** area, click **Lock Smart Card**. The smart card is now locked and cannot be opened without the correct PIN code.

3 To access the smart card again, click **Unlock Smart Card**, type your PIN code, and click **OK**.

Troubleshooting

If you encounter problems when installing and/or using the Nokia C110/ C111 Wireless LAN Card, this chapter will provide assistance. The chapter is organised according to the type of problem.

Tip: When troubleshooting the wireless LAN card, a good starting point is to go through the following questions:

1 Was the installation successful?

2 Is the wireless LAN card connected to an access point? You can check the status of the network connection in the Monitor window.

3 Are the network settings, such as TCP/IP properties, correct? Check with your system administrator if necessary.

4 Are the wireless LAN settings (network name, operating mode, etc.) correct?

5 Are there any IRQ or other resource conflicts?

Installation

The installation program is interrupted.

Make sure you have enough power on your computer.

Make sure you have enough free disk space on your computer.

Check that you have closed all Windows programs before starting the installation, and that you have not inserted the wireless LAN card into your computer until prompted to do so in the installation program.

The CD–ROM drive cannot be opened during the installation.

Some CD-ROM drives cannot be opened when installing software from them. If you think that you might need the operating system files during the installation, it is advisable that you first copy the Nokia C110/C111 installation files to the hard drive and install the program from there.

The wireless LAN card cannot be inserted into the PC card slot.

Check that the wireless LAN card is turned the right side up.

Check the PC card slot for any problems.

After inserting the wireless LAN card, it takes a while before the computer responds.

It is true that there might be a pause while the driver initialises the wireless LAN card. This is normal. Please wait until the next message box appears and tells you what to do. This should not take more than a few minutes.

Installation to a network drive fails.

You cannot install the Nokia C110/C111 Wireless LAN Card software onto a network drive. The software must always be installed on a local hard drive.

After inserting the wireless LAN card, Windows 95 starts installing a network client on my computer.

If there is no network client installed on your computer, Windows automatically starts installing it when you insert the wireless LAN card. When the network client installation is finished, Windows asks you to restart the computer (YES/NO). You must select NO and continue with the wireless LAN card installation. Restart the computer after the card installation is complete.

Windows NT 4.0 starts installing NT Networking on my computer.

You must have NT Networking installed on your computer. If you do not have NT Networking installed, a dialog box opens asking if you want to install it now. Click **Yes** and follow the instructions given in the wizard. Note that you need the Windows NT installation files during this procedure. The order in which the various installation files are used is: first the Nokia C110/C111 installation files, then the Windows NT installation files, and finally the Nokia C110/C111 files again.

The computer was shut down or it stopped responding during installation, and the software cannot be installed or uninstalled.

Go to **Start**, click **Run**, and type **regedit**. Click **OK**. The following registry entries should be deleted in the **Registry Editor** window:

- HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Uninstall\{BFA1B53A-C809-11D3-AABD-0008C79B73DF}
- HKEY_LOCAL_MACHINE\Software\Nokia\C11x WLAN Card\Installation

After deleting these, install the software again. It is recommended that you let your system administrator remove the registry entries.

When installing or uninstalling the software, an error message appears: "Error installing:ikernel.exe."

You must have local administrator rights when installing or uninstalling in Windows NT 4.0 or Windows 2000.

In Windows 2000, I get a message saying that this is not a Microsoft digitally signed software.

The Windows 2000 driver for the Nokia C110/C111 Wireless LAN Card does not have a WHQL certification (Windows Hardware Quality Labs). You can, however, continue with the installation.

The installation directory remains in the system after uninstallation.

When upgrading to a newer version of software, profiles are not deleted. You do not have to configure them again because the installation directory remains in the system. All other settings are restored with their default values.

I do not have a CD-ROM drive on my computer.

Using another computer, copy the installation program on floppy disks. On the CD-ROM there are three folders (Disk1, Disk2, and Disk3) at Setup\Language\Disks. Copy the contents of these folders on floppy disks. It is recommended that you then copy the contents of the disks to the hard drive before installing. If installed directly from the floppy disks, the system will ask you to change the disk several times.

Network

The wireless LAN card seems to be working, but the network connection does not work.

Run the fault diagnosis tests on the Diagnosis page. If all tests are passed successfully, make sure that the network settings are correct. Ask your system administrator for advice.

If you have defined different profiles for different networks, you should also check that you have chosen the correct profile.

You can use *winipcfg* in Windows 95/98/Me and *ipconfig* in Windows NT 4.0 to check that you have a correct IP address.

Network Neighborhood does not show any computers except the host itself.

Check that you have version 2.0 of Microsoft Winsock. If not, download it from the Microsoft Web site and run the installation program. In Windows NT 4.0 it can take up to a couple of minutes for the computer to detect the rest of the network.

In Windows 95/98/Me, Network Neighborhood does not show my computer name at all. Other computers cannot see my computer name in Network Neighborhood either.

Open the **Network** dialog box (click Start, Settings, Control Panel, Network) and click the **File and Print Sharing** button. Make sure that the **I**

want to be able to give others access to my files check box is selected. Other users should now be able to see your computer in Network Neighborhood. If you share folders on your computer, other users can see them too.

In Windows 95/NT 4.0, I cannot browse Network Neighborhood in the ad hoc operating mode.

Open the **Network** dialog box (click Start, Settings, Control Panel, Network) and double-click **File and printer sharing for Microsoft Networks** in the list of network components. Check that the Browse Master has value Enabled or Automatic, not Disabled. Updating Network Neighborhood may take a while.

In Windows NT 4.0, I cannot join the domain.

If you allow the domain settings to be managed by the Nokia C110/C111, you might lose your domain settings if you use a profile without a domain. To avoid being mistakenly locked out, go to the General settings page, select the **Advanced** tab and clear the **Manage domain settings together with profiles** check box.

I cannot access the Internet.

Check that you use a routing protocol such as TCP/IP.

Make sure that the proxy settings in the Web browser are correct.

Also make sure that there is a connection from your network to the Internet.

In Windows 95, when roaming between networks, the system crashes and the computer displays a blue screen.

You should update Microsoft Winsock 2.0. Download it from the Microsoft Web site at www.microsoft.com, and run the installation program. Note that you should always re-install the Winsock 2.0 update after adding or removing new protocols.

Changes made to general settings do not become effective immediately.

General settings are enabled only after the network connection is ended. A changed country setting, however, becomes effective immediately after clicking the **Apply** button on the General settings page.

Wireless LAN

The wireless LAN card is detected by the PC card controller, but the user interface is not displayed and there is no network connection.

Check that the Nokia C110/C111 Wireless LAN Card software is properly installed by running the fault diagnosis tests. If necessary, uninstall the software and then reinstall it.

The wireless LAN card cannot connect to an access point or the connection is very poor.

Check that the computer is within the coverage area of the access point. It must not be too far away or too close to the access point.

Make sure that the access point is powered on and connected to the wireless LAN.

Ensure that you have entered the correct network name. The access point and the wireless LAN card must have the same network name. Note that when selecting a network name for an infrastructure network, names of ad hoc networks are also shown in the list of networks.

Check that you have access rights to the access point, and that the access point is connected to a network to which you have access rights.

Check that the external antenna is properly connected and that no part of the cable is broken.

If you have selected the power saving option on the General settings page, there may be interoperability problems with some access points that are not Wi-Fi™ (Wireless Fidelity) compatible.

The wireless LAN card is connected to a Nokia A020/A021 Wireless LAN Access Point but there is no data flow.

The Nokia A020/A021 Wireless LAN Access Point does not support the power saving mode of the Nokia C110/C111. Power saving should be disabled on the General settings page of the Manager window.

The ad hoc operating mode does not work.

Make sure that all computers are on the same channel and have the same network name.

Make sure that all computers are using the same data rate, either 2 Mbit/s or 11 Mbit/s.

Make sure that all computers use the same network protocol, such as TCP/IP.

Make sure that you have given the correct password if you are using WEP keys.

When you are asked to log on to the network, click **OK**.

If two wireless stations cannot see each other in the **Wireless stations in the ad hoc network** list on the Status page, one of the stations should rejoin the ad hoc network by selecting the profile again and clicking **Apply**.

In Windows 95 (OSR2 = 4.00.950B), 11 Mbit/s ad hoc networks may be unstable if you are using battery power on your laptop computer.

The wireless LAN card is working but the capacity is decreasing.

There might be interference from an outside source. Typical sources of electromagnetic interference at this frequency level are, for example, microwave ovens, access control systems, and cordless telephone systems.

The Quick Ad Hoc profile does not work with the peer-to-peer mode of the Nokia C020/C021.

Quick Ad Hoc is not compatible with peer-to-peer networking. Wireless stations can communicate, but TCP/IP addresses cannot be set automatically. Create a new ad hoc network profile with the Profile Wizard and set the TCP/IP address manually.

No wireless stations with the Nokia C020/C021 Wireless LAN Card are shown on the list of ad hoc network stations in the Manager window.

Only wireless stations using the Nokia C110/C111 Wireless LAN Card can be shown on the list of stations. If stations with the Nokia C110/C111 Wireless LAN Card are not shown on the list, join the ad hoc network again.

Roaming from one access point to another is slow.

If you want roaming to be faster and to tolerate faster moving of the wireless station, you should change the **Hidden scan period** value to a smaller value. To change the value:

1 Go to Profiles page and click **Edit**.

2 Select the **Advanced** tab and clear the **Automatic configuration** check box.

3 Click **Advanced Properties** and select Hidden scan period from the list.

4 Clear the **Automatic** check box and give the hidden scan period a new value. Click **OK**.

No access point management page opens with Internet Explorer.

When you click the browse button on the Status page, a Web page showing the access point management window should open. Some versions of Internet Explorer, however, may not show the page. Try opening the Web page with another browser.

Resources

The wireless LAN card does not work and this is probably caused by another installed device.

Check that the wireless LAN card is not trying to use an I/O, IRQ, or memory address used by another device in your computer.

To check the status of resources:

Windows 95/98/ Me	Click Start - Settings - Control Panel - System - Device Manager - Network Adapters. If there is a conflict, a yellow symbol is shown in front of the name of the device.
Windows NT 4.0	Click Start - Programs - Administrative tools (Common) - Windows NT Diagnostics - Resources.

In Windows 2000, when inserting the wireless LAN card, I get a warning saying that there are not enough free resources.

Restart the computer. Windows 2000 allocates resources dynamically and, if possible, rearranges devices to free an IRQ.

Hardware

I am not sure if the wireless LAN card is working.

Check in the Monitor window that the wireless LAN card is working. You can also check the Status page for the status of the connection.

There are no resource conflicts, but the wireless LAN card still does not work.

Check that the operating environment does not cause damage or interference to the wireless LAN card. Detailed information on the operating environment can be found in the chapter “Important safety information” on page 47.

Check that the wireless LAN card is properly inserted.

Run fault diagnosis tests on the Diagnostics page.

You can try to determine whether the problem lies with the computer or the wireless LAN card by using the card in another available PC card slot, by installing the card in another computer, or by using another wireless LAN card in the first computer.

The wireless LAN card does not work in another PC card slot, but works in another computer.

Try to insert another PC card in the slot to determine if there is a compatibility problem between the Nokia C110/C111 Wireless LAN Card and the PC card slot, or if there is a general fault with the slot.

Smart card

I cannot install the smart card components.

Smart card installation files should not be copied to a directory with a long file name; preferably, they should be installed from the CD-ROM.

The smart card is not detected by the wireless LAN card.

Make sure you are using a correct type of smart card.

Make sure that the smart card is inserted correctly: the connectors on the smart card and the wireless LAN card must meet.

A dialog box asking for smart card's PIN code appears before the log on dialog box.

You can enter the PIN code before logging on to a network.

I cannot open the Monitor window or enter the PIN code for the smart card when using a smart card in Windows 2000/NT 4.0.

Press CTRL+ALT+DELETE to enter the PIN code.

In Windows 2000, disable the Administrator Autologon: click **Start**, **Settings**, **Control Panel**, **Users and Passwords**. Select the **Users must enter a user name and password to use this computer** check box.

Note: You can find the latest troubleshooting information in the readme.txt file on the product CD-ROM. You can also find further information at *www.forum.nokia.com*.

Card specifications

Physical specifications

TYPE	PC card (extended type II)
DIMENSIONS	116 mm x 54 mm x 5/10 mm
WEIGHT	43 g/45 g
STANDARDS	IEEE 802.11b
ANTENNAS	Integrated antennas (The Nokia C111 also has external antenna connectors.)
SECURITY	Wired equivalent privacy (WEP) with up to 128-bit secret key. For other security solutions, check the product CD-ROM and Nokia's Web site at *www.forum.nokia.com*.
SMART CARD SUPPORT	PC/SC compliant integrated smart card reader for security key (WEP) storage, profile storage, and other applications.
POWER CONSUMPTION (3.3 V/5 V)	Sleep: 10 mA/10 mA Receive: 240 mA/180 mA Transmit: 360 mA/310 mA
OPERATING TEMPERATURE	-5°C...+55°C

Radio specifications

CHANNELS	13 channels (depending on local regulations)
DATA RATE	Up to 11 Mbit/s
MODULATION TECHNIQUE	Direct sequence spread spectrum
OUTPUT POWER	35 mW (with the internal antennas)
RECEIVER SENSITIVITY	Min. -84 dBm
COVERAGE AREA	Outdoor: Max. 400 m radius Office environment: 20 m-100 m radius (depending on the building)

Important safety information

Important information

Traffic safety

Do not use the wireless LAN card while driving a vehicle. If using the wireless LAN card, park the vehicle first. Do not place the wireless LAN card on the passenger seat or where it can break loose in a collision or sudden stop.

Remember: road safety always comes first!

Operating environment

Remember to follow any special regulations in force in any area and always power off your wireless LAN card whenever it is forbidden to use it, or when it may cause interference or danger. Note that the wireless LAN card may cause similar interference as a cellular terminal and must not be used in areas where the use of a cellular terminal is prohibited.

When connecting the wireless LAN card or any accessory to another device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

As with other mobile radio transmitting equipment, users are advised that for the satisfactory operation of the equipment and for the safety of personnel, it is recommended that the wireless LAN card should only be used in the normal operating position.

Electronic devices

Most modern electronic equipment is shielded from radio frequency (RF) signals. However, certain electronic equipment may not be shielded against the RF signals from your wireless LAN card.

Pacemakers

Pacemaker manufacturers recommend that a minimum separation of 20 cm (6 inches) be maintained between a wireless LAN card and a pacemaker to avoid potential interference with the pacemaker. These recommendations are consistent with the independent research by and recommendations of Wireless Technology Research. Persons with pacemakers should always keep the wireless LAN card more than 20 cm (6 inches) from their pacemaker when the wireless LAN card is powered on. If you have any reason to suspect that interference is taking place, power off your wireless LAN card immediately.

Hearing aids

Some digital wireless devices may interfere with some hearing aids. In the event of such interference, you may want to consult your service provider.

Other medical devices

Operation of any radio transmitting equipment, including wireless LAN cards, can cause interference. Observe restrictions for use. Power off your wireless LAN card in health care facilities when any regulations posted in these areas instruct you to do so.

Vehicles

RF signals may affect improperly installed or inadequately shielded electronic systems in motor vehicles (e.g. electronic fuel injection systems, electronic anti-skid (anti-lock) braking systems, electronic speed control systems, air bag systems). Check with the manufacturer or its representative regarding your vehicle. You should also consult the manufacturer of any equipment that has been added to your vehicle.

Do not store or carry flammable liquids, gases, or explosive materials in the same compartment as the wireless LAN card, its parts, or accessories.

For vehicles equipped with an air bag, remember that an air bag inflates with great force. Do not place objects in the area over the air bag or in the air bag deployment area. If the in-vehicle wireless LAN card is improperly placed and the air bag inflates, serious injury could result.

Remove your wireless LAN card from the PC card slot before boarding an aircraft. The use of wireless LAN cards in an aircraft may be dangerous to the operation of the aircraft and may be illegal.

Failure to observe these instructions may be illegal and lead to legal action.

Posted facilities

Power off your wireless LAN card in any facility where posted notices so require.

Potentially explosive atmospheres

Power off your wireless LAN card when located in any area with a potentially explosive atmosphere and obey all signs and instructions. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Users are advised to power off the wireless LAN card when at a refuelling point (service station). Users are reminded of the need to observe restrictions on the use of radio equipment in fuel depots (fuel storage and distribution areas), chemical plants, or where blasting operations are in progress.

Areas with a potentially explosive atmosphere are often but not always clearly marked. These include the area below deck on boats; chemical transfer or storage facilities; vehicles using liquefied petroleum gas (such as propane or butane); areas where the air contains chemicals or particles, such as grain, dust, or metal powders; and any other area where you would normally be advised to turn off your vehicle engine.

FCC Declaration of Conformity Statement

Name: Nokia C110 Wireless LAN Card and Nokia C111 Wireless LAN Card

Responsible party: Nokia Mobile Phones Ltd.
P.O. Box 100
FIN-00045 Nokia Group
Finland

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

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, 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.

Caution: Any changes or modifications not expressly approved by Nokia Mobile Phones Ltd. could void the user's authority to operate this device.

Care and maintenance

Your wireless LAN card is a product of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfill any warranty obligations and to enjoy this product for many years. When using your wireless LAN card or any accessory:

- Keep it and all its parts and accessories out of small children's reach.
- Keep it dry. Precipitation, humidity, and liquids contain minerals that will corrode electronic circuits.
- Do not use or store it in dusty, dirty areas.
- Do not store it in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store it in cold areas. When the wireless LAN card warms up (to its normal temperature), moisture can form inside the wireless LAN card, which may damage electronic circuit boards.
- Do not attempt to open it. Non-expert handling of the wireless LAN card may damage it.
- Do not drop, knock, or shake it. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean it. Wipe it with a soft, dry cloth.
- Do not paint it. Paint can prevent proper operation.
- Use only the supplied or an approved external antenna. Unauthorised antennas, modifications, or attachments could damage the wireless LAN card and may violate regulations governing radio frequency devices.

If the wireless LAN card or any accessory is not working properly, contact your dealer.

Glossary

Access controller

Device that manages permission and restrictions for logging onto a computer or network.

Access point

Physical device that connects wired and wireless networks together.

Access zone

Office, campus, hotel, airport, etc. where wireless LAN connections are provided to employees, students, or visitors. Often specified as *public access zones* and *corporate* or *enterprise access zones*.

Ad hoc

One of the two operating modes that can be selected when using the Nokia C110/C111. With this configuration option, users can set up a wireless network where wireless stations can send and receive data directly with each other without access points. This type of network is sometimes called a *peer-to-peer network*.

Bandwidth

Size (in Hertz) of the operating or transmission channel of a system that a signal transmission occupies.

Channel

A specified frequency band for the transmission and reception of signals.

Coverage area

Geographical area within which service from a radio communications facility can be received.

DHCP

Dynamic Host Configuration Protocol. A protocol which automatically issues IP addresses to devices on the network. The system administrator assigns a range of IP addresses to DHCP, and each client computer on the LAN has its own TCP/IP software configured to request an IP address from the DHCP server.

Direct sequence spread spectrum (DSSS)

Radio transmission technology that spreads the signal over a wide frequency band.

Domain name

Name of a group of computers connected to the Internet. For example, in www.nokia.com, *nokia.com* is the domain name.

DTIM period

(1-1024, default 50). The Delivery Traffic Indication Message period indicates the number of beacon intervals between successive DTIMs. If all traffic indication messages are DTIMs, the period has the value 1.

Fragmentation threshold

This parameter defines a threshold above which the Radio Frequency packet will be split up, or fragmented.

IP address

Internet Protocol address. A 32-bit number in dotted-decimal notation. Identifies the sender or the receiver of information sent in packets across the Internet.

Infrastructure

One of the two operating modes that can be selected when using the Nokia C110/C111. With this configuration option users can setup a network where wireless stations communicate with wired and wireless stations through an access point. Sometimes called StructureNet.

IRQ

Interrupt request. One of a set of possible hardware interrupts, identified by a number. The number determines which interrupt handler will be used.

Listen interval

(0-1024, default 20). The listen interval indicates to the access point how often a wireless station wakes to listen to beacon management frames.

Local area network (LAN)

Group of interconnected devices that share common processing and file management resources usually within a specific physical area, such as a building, floor, or office.

Wired LAN

A local area network in which cables are used to connect devices.

Wireless LAN

A local area network in which radio, microwave, or infrared links are used to connect devices instead of physical cables.

MAC

Media Access Control. A protocol that governs access to a shared transmission medium, such as a wireless LAN. In a local area network, *MAC address* is the computer's unique hardware address.

Memory address

Each memory location on a computer has its own memory address. All the information on a computer's memory can be accessed based on its memory address.

Network name

String of up to 32 alphanumeric characters comprising the name of the logical group to which the wireless station belongs.

Operating mode

Type of communication that must be selected when using a wireless LAN card. The two operating modes available for the Nokia C110/C111 are *ad hoc* and *infrastructure*.

PIN code

Personal Identification Number code. PIN code (4 to 8 digits) is an access code for protecting a smart card against unauthorised use.

Profile

Feature unique to the Nokia C110/C111. A profile is a collection of settings needed for connecting to a wireless LAN. You can easily switch between networks by selecting an appropriate profile.

PUK code

PIN Unblocking Key code. PUK is a eight-digit code supplied with a smart card. The code is needed when you want to change a blocked PIN code.

Range

The distance that a radio signal travels from a radio transmitter before becoming too weak for a radio receiver to identify it.

Roaming

Moving from one access point to another without having to re-establish the connection.

RTS threshold

Request To Send threshold parameter, which controls for what size data packet the low level RF protocol issues an RTS packet.

Service provider

Company that offers its users telecommunication services. A service provider may be a network operator or possibly a separate body.

SIM card

Subscriber Identity Module card. A small plastic card with an embedded integrated circuit. The SIM card is inserted into a wireless LAN card for subscriber identification and other security related information.

Smart card

Small plastic card with an embedded integrated circuit. Provides a secure medium for storing and transporting information.

TCP/IP

Transmission Control Protocol/Internet Protocol. A protocol for interconnecting disparate networks to get data from one network device to another.

WEP

Wired Equivalent Privacy. A security feature using the RC4 algorithm that performs wireless data encryption. The WEP algorithm uses a 40-bit or 128-bit key.

Wireless LAN card

PC card conforming to the PC card type II specification. The card provides the functions necessary for sending and receiving data across the air.

Wireless station

Any device with a PC card slot, into which the wireless LAN card can be inserted in order to send and receive data.

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