

# Information to the User

## Wireless Interoperability

The Toshiba Wireless LAN Mini PCI Card products are designed to be interoperable with any wireless LAN product that is based on Direct Sequence Spread Spectrum(DSSS) radio technology, and is compliant to:

- ‡ The IEEE 802.11 Standard on Wireless LANs(Revision B), as defined and approved by the Institute of Electrical and Electronics Engineers.
- ‡ The Wireless Fidelity(WiFi) certification as defined by the WECA Wireless Ethernet Compatibility Alliance.

## Wireless LAN and your Health

Wireless LAN products, like other radio devices, emit radio frequency electromagnetic energy. The level of energy emitted by Wireless LAN devices however is far much less than the electromagnetic energy emitted by wireless devices like for example mobile phones.

Because Wireless LAN products operate within the guidelines found in radio frequency safety standards and recommendations, Toshiba believes Wireless LAN is safe for use by consumers. These standards and recommendations reflect the consensus of the scientific community and result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature.

In some situations or environments, the use of Wireless LAN may be restricted by the proprietor of the building or responsible representatives of the organization. These situations may for example include:

- ‡ Using the Wireless LAN equipment on board of airplanes, or
- ‡ In any other environment where the risk of interference to other devices or services is perceived or identified as harmful.

If you are uncertain of the policy that applies on the use of wireless devices in a specific organization or environment (e.g. airports), you are encouraged to ask for authorization to use the Wireless LAN device prior to turning on the equipment.

## Regulatory Information

The **Toshiba Wireless LAN Mini PCI Card** must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. This device complies with the following radio frequency and safety standards.

### Canada – Industry Canada (IC)

This device complies with RSS 210 of Industry Canada.

Operation is subject to the following two conditions: (1) this device may not cause interference ,

and (2) this device must accept any interference, including interference that may cause undesired operation of this device.”

L ' utilisation de ce dispositif est autorisée seulement aux conditions suivantes : (1) il ne doit pas produire de brouillage et (2) l ' utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

### Europe – EU Declaration of Conformity

This device complies with the essential requirements of the R&TTE Directive 1999/5/EC with essential test suites as per standards:

- ‡ EN 60950 Safety of Information Technology equipment
- ‡ ETS 300 328 Technical requirements for radio equipment
- ‡ ETS 300 826 General EMC requirements for radio equipment.

België/ Belgique:	For outdoor usage only channel 10 (2457 MHz) and 11 (2462 MHz) is allowed. For private usage outside buildings across public grounds over less than 300m no special registration with IBPT/BIPT is required. Registration to IBPT/BIPT is required for private usage outside buildings across public grounds over more than 300m. An IBPT/BIPT license is required for public usage outside building. For registration and license please contact IBPT/BIPT. Gebruik buiten gebouw alleen op kanalen 10 (2457 MHz) en 11 (2462 MHz). Voor privé-gebruik buiten gebouw over publieke grond over afstand kleiner dan 300m geen registratie bij BIPT/IBPT nodig; voor gebruik over afstand groter dan 300m is wel registratie bij BIPT/IBPT nodig. Voor publiek gebruik buiten gebouwen is licentie van BIPT/IBPT verplicht. Voor registratie of licentie kunt u contact opnemen met BIPT. L'utilisation en extérieur est autorisée sur le canal 10 (2457 MHz) et 11 (2462 MHz). Dans le cas d'une utilisation privée, à l'extérieur d'un bâtiment, au-dessus d'un espace public, aucun enregistrement n'est nécessaire pour une distance de moins de 300m. Pour une distance supérieure à 300m un enregistrement auprès de l'IBPT est requise. Pour une utilisation publique à l'extérieur de bâtiments, une licence de l'IBPT est requise. Pour les enregistrements et licences, veuillez contacter l'IBPT.
Deutschland :	License required for outdoor installations. Check with reseller for procedure to follow Anmeldung im Outdoor-Bereich notwendig, aber nicht genehmigungspflichtig. Bitte mit Händler die Vorgehensweise abstimmen.
France:	Restricted frequency band: only channels 10 and 11 (2457 MHz and 2462 MHz respectively) may be used in France. License required for every installation, indoor and outdoor installations. Please contact ART for procedure to follow. Bande de fréquence restreinte : seuls les canaux 10 à 11 (2457 et 2462 MHz respectivement) doivent être utilisés en France. Toute utilisation, qu'elle soit intérieure ou extérieure, est soumise à autorisation. Vous pouvez contacter l'Autorité de Régulation des Télécommunications ( <a href="http://www.art-telecom.fr">http://www.art-telecom.fr</a> ) pour la procédure à suivre.
Italia:	License required for indoor use. Use with outdoor installations not allowed E' necessaria la concessione ministeriale anche per l'uso interno. Verificare con i rivenditori la procedura da seguire. L'uso per installazione in esterni non e' permessa.
Nederland	License required for outdoor installations. Check with reseller for procedure to follow Licentie verplicht voor gebruik met buitenantennes. Neem contact op met verkoper voor juiste procedure

## **USA-Federal Communications Commission(FCC)**

This device complies with Part 15 of FCC Rules. Operation of the devices in a Wireless LAN System is subject to the following two conditions:

- ‡ This device may not cause harmful interference.
- ‡ This device must accept any interference that may cause undesired operation.

### **Caution: Exposure to Radio Frequency Radiation.**

The radiated output power of the **Toshiba Wireless LAN Mini PCI Card** is far below the FCC radio frequency exposure limits. Nevertheless, the **Toshiba Wireless LAN Mini PCI Card** shall be used in such a manner that the potential for human contact during normal operation is minimized. When using this device in combination with Wireless LAN Outdoor Antenna products, a certain separation distance between antenna and nearby persons has to be kept to ensure RF exposure compliance. **The distance between the antennas and the user should not be less than 2.5 cm.**

Refer to the Regulatory Statements as identified in the documentation that comes with those products for additional information.

The **Toshiba Wireless LAN Mini PCI Card** is far below the FCC radio frequency exposure limits.

Nevertheless, it is advised to use the **Toshiba Wireless LAN Mini PCI Card** in such a manner that human contact during normal operation is minimized.

### **Interference Statement**

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. If not installed and used in accordance with the instructions, it 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 and correct the interference by one or more of the following measures:

- ‡ Reorient or relocate the receiving antenna.
- ‡ Increase the distance between the equipment and the receiver.
- ‡ Connect the equipment to 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.

Toshiba is not responsible for any radio or television interference caused by unauthorized modification of the devices included with this **Toshiba Wireless LAN Mini PCI Card**, or the substitution or attachment of connecting cables and equipment other than specified by Toshiba .

The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.

(Fig.2)

## Approved Countries for use

This equipment is approved to the radio standard by the countries in Fig.1.

**Caution:** Do not use this equipment except in the countries in Fig.1.

Australia	Austria	Belgium
Canada	Denmark	Finland
Germany	Iceland	Ireland
Japan	Luxembourg	Netherlands
New Zealand	Norway	Sweden
Switzerland	UK	USA
Greece	Italy	France
Poland	Portugal	Spain

Fig.1 Countries that have approved Bluetooth

# Using this equipment in Japan

In Japan, the frequency bandwidth of 2,400~2,483.5MHz for second generation low-power data communication systems such as this equipment overlaps that of mobile object identification systems (premises radio station and specified low-power radio station).

## 1. Sticker

Please put the following sticker on devices incorporating this product.

In the frequency bandwidth of this equipment, industrial device, scientific device, medical device like microwave oven, licensed premises radio station and non-licensed specified low-power radio station for mobile object identification system (RF-ID) that is used in product line of factories, (Other Radio Stations) are used.

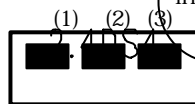
1 Please make sure before using this equipment that no Other Radio Stations are used in the neighborhood.

2 In case that RF interference occurs to Other Radio Stations from this equipment, please change promptly the frequency for use, place to use, or stop emitting Radio.

3 Please contact TOSHIBA PC Dial if you have a problem, such as interference from this equipment to Other Radio Stations

## 2. Indication

The indication shown below appears on this equipment.



(4)

(1) 2.4: this equipment uses a frequency of 2.4GHz.

(2) DS: This equipment uses DS-SS modulation.

(3) 4: The interference range of this equipment is less than 40m.

(4) : This equipment uses a frequency bandwidth from 2,400MHz to 2,483.5MHz.

It is possible to avoid the band of mobile object identification systems.

## 3. TOSHIBA PC Dial (Japanese Language Only)

Weekday : 9:00 – 18:00

Weekend : 9:00 – 17:30

(Except Public Holiday and Dec. 31- Jan. 3)

Tel: 0570 - 00 - 3100

## Wireless LAN Network Scenarios

The Wireless LAN Card Kit enables you to:

- Connect your computer to a Peer-to-Peer workgroup of wireless computing devices.
- Connect your computer to a Local Area Network (LAN) Infrastructure that includes Wireless LAN Access Points, or other IEEE802.11 compliant LAN systems.
- Expand the capabilities of your Wireless LAN Access Points, to support wireless devices that have been equipped with Wireless LAN Card.

### NOTE:

The internal Wireless LAN Card can't be used with the "Toshiba Wireless LAN PC Card".

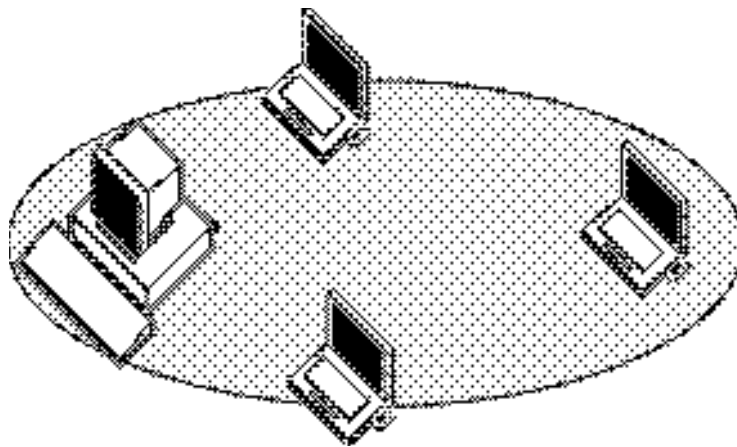
## Peer-to-Peer Workgroup

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The Peer-to-Peer workgroup configuration enables you to quickly set up a small wireless workgroup, where the workgroup participants can exchange files using features like “Files and Printer Sharing” as supported by Microsoft Networking.

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**Figure 1-1      Peer-to-Peer Wireless Workgroup**



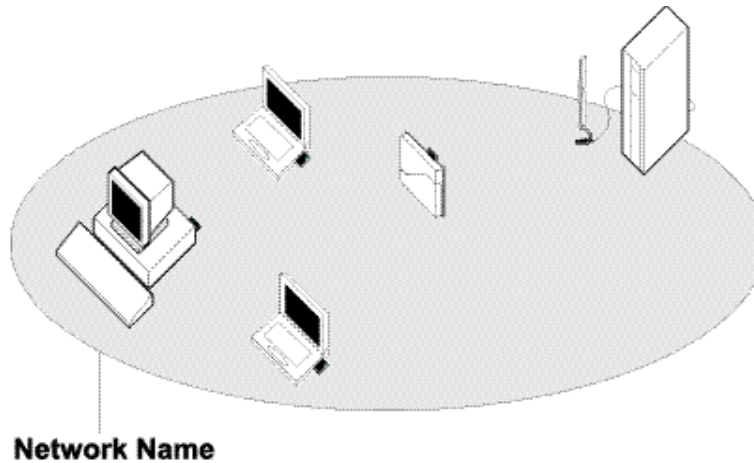
You can use this option to setup a temporary or ad-hoc network in environments where no access points are available (for example in Small Office/Home Office (SOHO) environments).

As long as the stations are within range of one another, this is the easiest and least expensive way to set up a wireless network.

## Enterprise Networking

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**Figure 1-2 Stand Alone Wireless LAN**



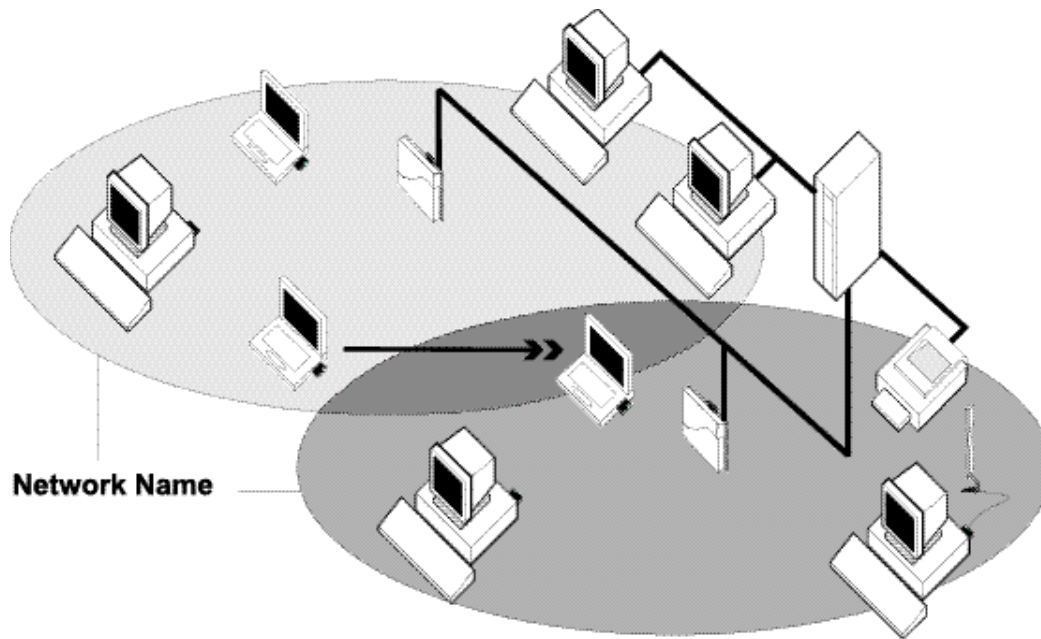
With the Wireless LAN Access Points you can connect to a corporate Local Area Network (LAN) infrastructure to have wireless access to all network facilities. LAN Infrastructures may either be.

- Stand-alone wireless LANs as pictures in Figure 1-2
- Wireless network infrastructures connected to an existing Ethernet network as pictured in Figure 1-3.



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**Figure 1-3 LAN Infrastructure**



## **It's Easy**

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The Wireless LAN Card functions like any standard wired Ethernet card, but Wireless LAN does not need any wires!

Where an Ethernet card requires a cable connection to a hub and/or patch panel, the cable physically ties you down to the location of the wired connection.

Wireless LAN allows you connect your computer to a Local Area Network (LAN) system from anywhere within the wireless coverage area. Expanding or re-designing your network is easy: Add or relocate Wireless LAN Access Points, power-up your (new) Wireless LAN computers, and you're done!

Unlike Ethernet, Wireless LAN will enable you to roam throughout the network while remaining connected to the LAN.

### **NOTE:**

The Wireless LAN Card is a radio product. Refer to the flyer "Information to the User" for regulatory information that may apply in your country.

## **Wireless LAN Card Features**

Toshiba Wireless LAN mini-PCI Card is a wireless network card that fits into Mini PCI TypeIIA.

## Wireless LAN Card Types

The Wireless LAN Card is a wireless network card that complies with the IEEE 802.11 standard on wireless LANs (Revision B). The Wireless LAN Card supports data rates up to 11 Mbit/s.

- Wi-Fi (Wireless Fidelity) certified by the Wireless Ethernet Compatibility Alliance (WECA). This means that your Wireless hardware will communicate with other vendors' IEEE 802.11 compliant wireless LAN product.
- Fully compatible with any other wireless LAN system based on Direct Sequence Spread Spectrum (DSSS) radio technology that complies with the "IEEE 802.11 standard on wireless LANs (Revision B).



## **Wireless LAN Cards**

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The Wireless LAN Card supports the following wireless LAN features:

- Automatic Transmit Rate Select mechanism in the transmit range of 11, 5.5, 2 and 1 Mbit/s.
- Frequency Channel Selection (2.4GHz).
- Roaming over multiple channels.
- Card Power Management.
- Wired Equivalent Privacy (WEP) data encryption, based on the 64 bit RC4 encryption algorithm as defined in the IEEE 802.11 standard on wireless LANs.

## **Finding Information**

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This document was designed to give you a brief introduction about the Wireless LAN Card.

- In this document you will find the most important information to get your Wireless LAN network up and running, with a minimum set of parameters.

Alternatively you can consult the on-line help documentation for the Wireless LAN drivers and/or tools by:

- Clicking the [Help] button on your screen, or
- Pressing the [F1] function key on your keyboard.

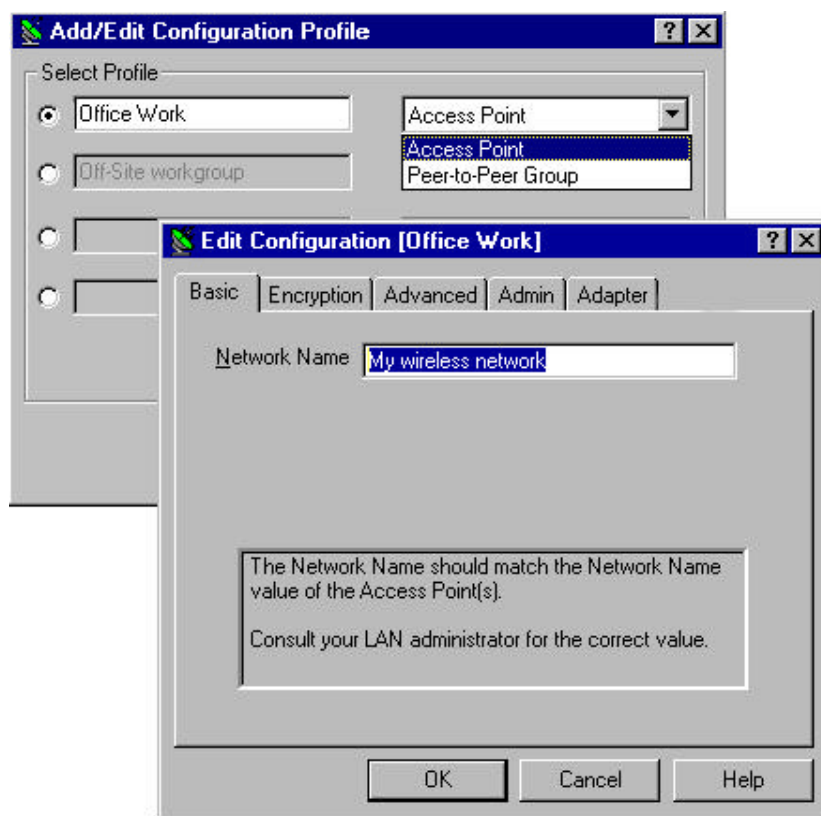
## Basic Settings for Enterprise Networks

If you wish to connect to an Enterprise Network, use the Add/Edit Configuration Profile window to:

- Click the **start** button from the Windows task bar.
- Click on **Settings**, and then on **Control Panel**.
- In the Control Panel window, double-click the **Wireless Network** icon.
- Select to connect to an **Access Point**.
- Set the correct **Network Name**.

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**Figure 1-4**      **Edit Configuration window**



1. In the field **Network Name** define the name of the wireless network to which you want to connect. You can either use:
  - **The value “ANY”**  
To connect to any wireless LAN network in the vicinity of your computer.
  - **An “exact” value to connect to**  
Consult your LAN Administrator for the value that applies to your network.  
The Network Name can be any alphanumeric string in the range of “a” to “z”, “A” to “Z” and “0” to “9” with a maximum of 32 characters (case-sensitive).
2. Click **OK** to confirm and return to the Add/Edit Configuration Profile window.
3. Click **OK** again to finish.

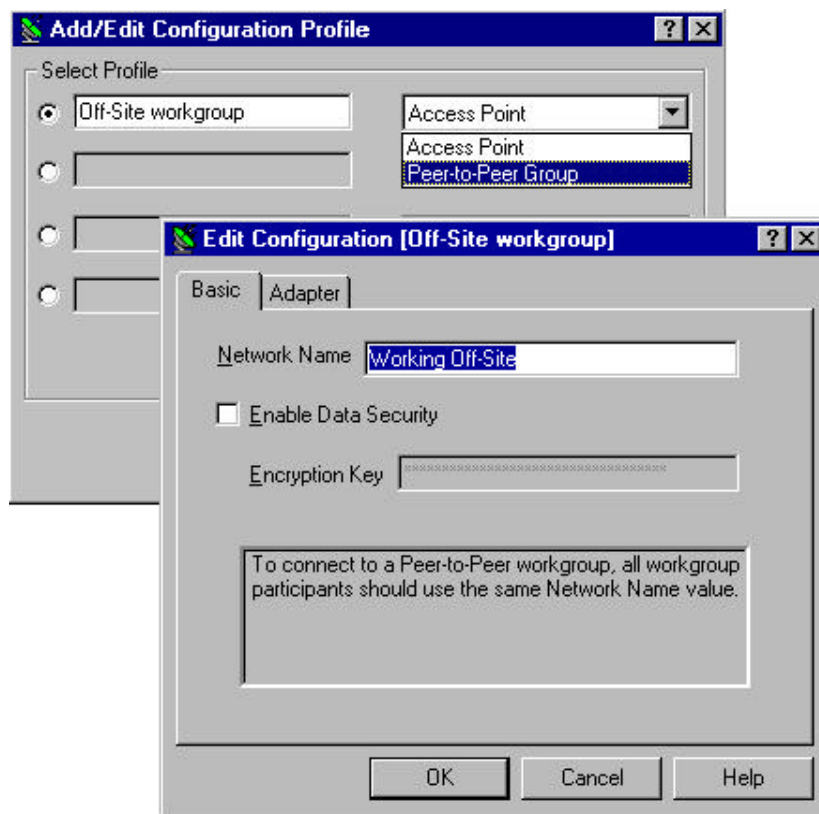


## Basic Settings for Peer-to-Peer Workgroups

If you wish to connect to a Peer-to-Peer workgroup, use the Add/Edit Configuration Profile window to:

- Click the **start** button from the Windows task bar.
- Click on **Settings**, and then on **Control Panel**.
- In the Control Panel window, double-click the **Wireless Network** icon.
- Select to connect to a **Peer-to-Peer Workgroup**.
- Set the correct **Network Name** and **Encryption Key**.

**Figure 1-5** Edit Configuration window : Peer-to-Peer



1. In the field **Network Name** define the name of the wireless network to which you want to connect.  
The Network Name can be any alphanumeric string in the range of "a" to "z", "A" to "Z" and "0" to "9" with a maximum of 32 characters (case-sensitive).
- If there is already a Peer-to-Peer group with this name available your computer will automatically connect to this workgroup.

- If there is not yet such a group available, your computer will automatically start one with this name.
2. Click **OK** to confirm and return to the Add/Edit Configuration Profile window.
  3. Click **OK** again to finish.

## Introduction

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This chapter provides general information about:

- Using your Wireless LAN Card
- View Other Computers
- View Wireless Link Quality
- View/Modify Wireless LAN Card Settings
- Finding More Information

## Using your Wireless LAN Card

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### Radio Antennas

The radio and antennas of your Wireless LAN Card perform best in an open environment with as few obstacles as possible.

- To achieve the maximum range for wireless communications do not close the top panel and cover the top panel objects such as books or thick stacks of paper.

## View Other Computers

When multiple Wireless LAN stations are up-and-running in your wireless network, you can use the procedure described below to display the other computers:

1. Start Windows Explorer.
2. Scroll down the list of files and folders to look for the item **Network Neighborhood**.
3. Double-click the **Network Neighborhood** item to display all stations in your Microsoft Networking Group.
4. To display other workgroups in the network environment, double-click the **Entire Network** icon.

If you cannot find other (Wireless LAN) networked computers, verify whether the other Wireless LAN computers are:

- Powered up and logged on to the network.
- Configured to operate with identical Microsoft Network settings concerning:
  - Networking Protocol
  - Wireless Network Name
  - Workgroup Name

To view or modify the **Station Name** or **Workgroup** of your computer, proceed as follows:

1. Click the **Start** button from the Windows task bar.
2. Click on **Settings**, and then on **Control Panel**.
3. In the Control Panel window, double-click the **Network** icon.
4. In the Network Settings window, select the **Identification** tab.

You can verify and change the **Station Name** or **Workgroup** parameters.

### NOTE:

You have to restart your computer before changes to the Network Settings will be effected.

To verify the radio connection with other stations refer to "View Wireless Link Quality".

## Using the Client Manager

If you installed the Wireless LAN Client Manager you can use the Client Manager to:

- Verify the quality of your wireless connection to the network.
- View/Modify the configuration settings of your Wireless LAN Card.

The Client Manager will start automatically every time you power up your computer.

The Client Manager icon is displayed in the “System Tray” of your Windows task bar at the right-side on the bottom of your screen, indicating that the Client Manager programs is running.



- Click the icon once with your **left** mouse button to retrieve a more detailed status overview.
- Click the icon once with your **right** mouse button to display a menu with more options.

### NOTE:







If running the Client Manager, The function of “System Standby ” on Toshiba Power Saver can’t be effective under Windows 98SecondEdition. You have to exit the Client Manager, when you want use the function of “System Standby.

## View Wireless Link Quality

You can use Client Manager icon on the Windows task bar to verify the link quality of your network connection.

An overview of all possible icons is given in Table2-1. When the Client Manager icon is not indicating excellent or good radio connection, act as described in Table2-1.

**Table 2-1 Client Manager Icon**

Icon	Description	Color
	Excellent radio connection	Green
	Good radio connection	Green
	Marginal radio connection: The radio signal is weak. Move closer to the Wireless LAN Access Point.	Yellow
	Poor radio connection: The radio signal is very weak. Save your files and move closer to the Wireless LAN Access Point.	Red
	No radio connection because: ■ Looking for initial connection, or ■ You have moved out of range of the network.	Red
	Peer-to Peer network connection	Blank

## View/Modify Wireless LAN Card Settings

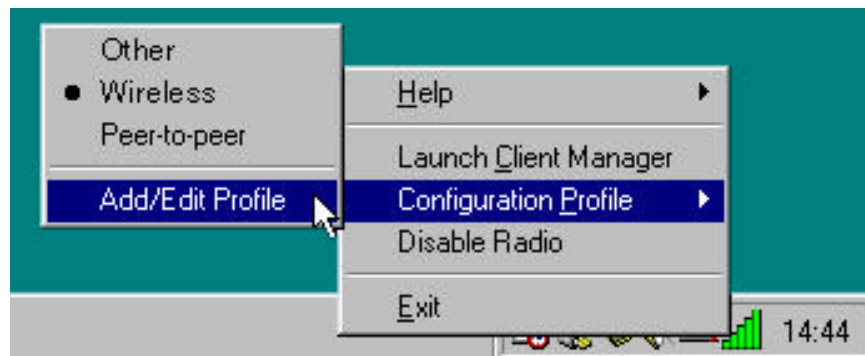
If you would like to view or modify Wireless LAN parameters, for example because you would like to connect to another network or type of network, proceed as follows:

1. Right-click on the Client Manager icon on the Windows task bar.
2. From the menu, select **Configuration Profile** (see Figure 2-1) and select:
  - **Add/Edit Profile** to add a new profile or to modify an existing profile.
  - **One of the existing profiles** (if present) to select a profile without viewing or modifying the settings.

After selecting and another profile, the Card will use the selected profile to connect to the wireless network.

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Figure 2-1      Edit Wireless Configuration Settings





If your Client Manager icon is not visible, you have to start the Client Manager program again:

1. Click the **start** button from the Windows task bar.
2. Select **Programs**, and then select the **Toshiba Wireless Solution** workgroup.
3. Next select **Client Manager** to start the Client Manager program.

Alternatively you can to change the Card configuration via the Control Panel:

1. Click the **start** button from the Windows task bar.
2. Click on **Settings**, and then on **Control Panel**.
3. In the Control Panel window, double-click the Wireless Network icon.
4. (Optional) Change the parameters you would like to modify, and click
  - the **OK** button to confirm your changes , or
  - the **Cancel** button to ignore your modifications.

## Finding More Information

If you are looking for more information than contained in this Wireless LAN Card – please consult one of the following options:

- The on-line help system of your Wireless LAN system – for information about software and driver functionality. To View the on-line help system click the **Help** button or press [F1] function key on your keyboard in any Wireless window.

### Introduction

Although your Wireless LAN Card will work fine in most network environment with the Basic Parameters, you may wish to explore the advanced parameters options as displayed on the Wireless LAN Card's Edit Configuration windows.

Only if connected to an existing network advanced parameters can be specified for an Wireless LAN Card. Consult your LAN Administrator for information about whether these parameters apply to your situation.

### Encryption Parameters Tab

The encryption tab enables you to define the encryption keys that your Wireless LAN Card should use to:

- Decrypt wireless messages received via its wireless interface.
- Encrypt data that will be transmitted via the wireless interface.

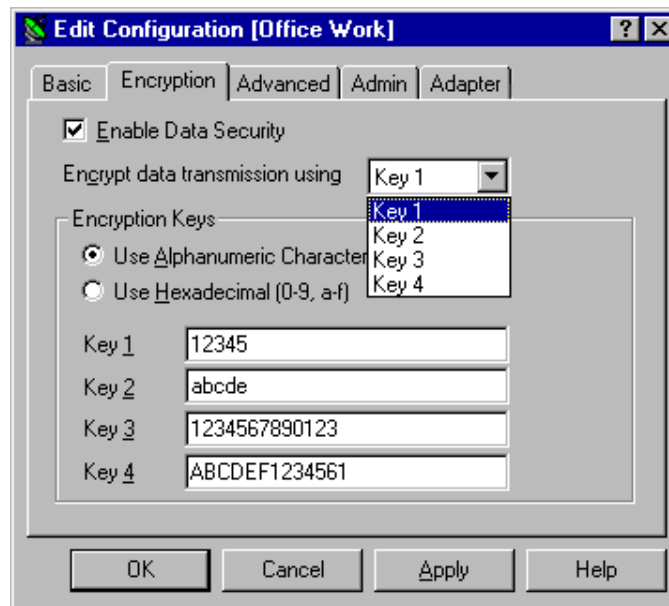
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### CAUTION:

*Encryption needs to be the same for all Wireless LAN stations.*

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**Figure 3-1      Setup Encryption Parameters**

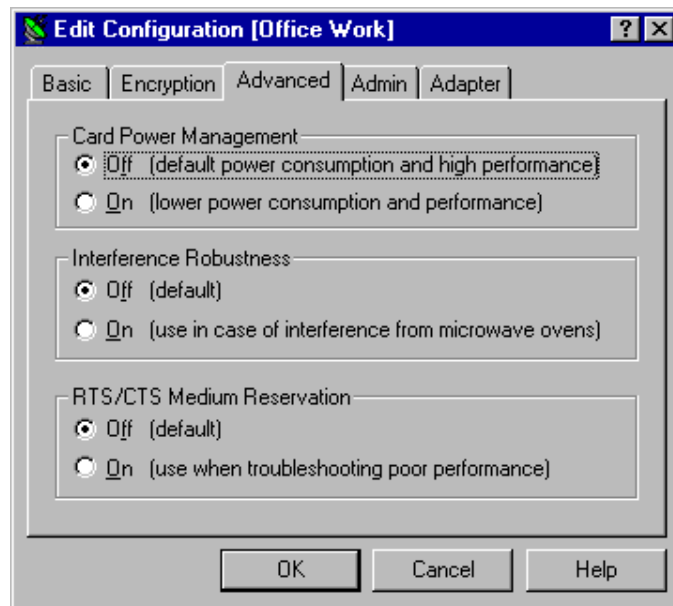


You can identify up to 4 different key values to decrypt wireless data, and select one of these keys to encrypt wireless data transmissions.

### Advanced parameters Tab

One the Advanced parameters tab of the Edit Configuration window you can adjust a number of parameters.

**Figure 3-2 Setup Advanced Parameters**



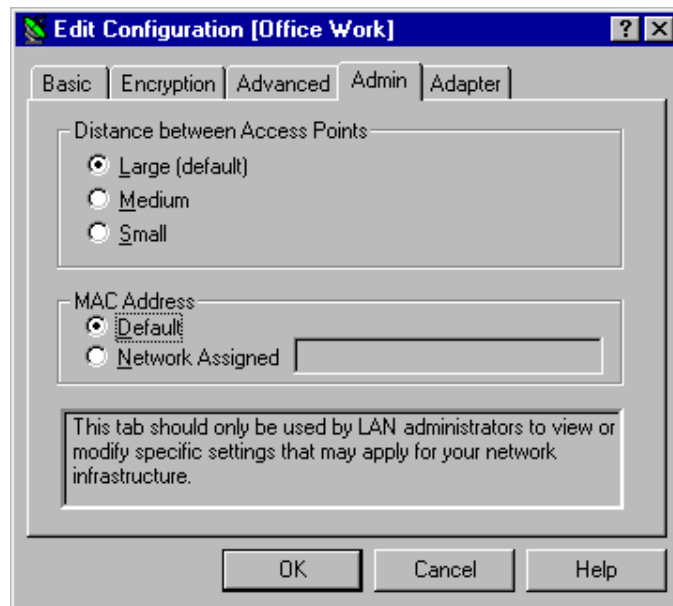
- Card Power Management To extend the battery life of (mobile) wireless devices.
- Interference Robustness Can be activated in exceptional cases when troubleshooting slow performance of the Wireless LAN network that could be related to in-band interference from e.g. microwave ovens.
- RTS/CTS Medium Reservation This parameter can be activated:
  - if density of Wireless LAN stations and access points is very low
  - as a result of poor network performance due to excessive frame collisions at the access points

## **Admin Parameters Tab**

On the Admin parameters tab of the Edit Configuration window the following parameters can be specified.

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**Figure 3-3      Setup Admin Parameters**



- Distance between Access Points      Depending on the number of access points in a Wireless LAN network this parameter controls the network performance.
- MAC Address      Can be activated in exceptional cases when troubleshooting slow performance of the Wireless LAN network that could be related to in-band interference from e.g. microwave ovens.

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# Card Specifications

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# A

## Physical Specifications

**Table A-1      Physical Specifications**

Form Factor	Mini PCI TypeIIIA	
Color	Black for Wireless LAN Card	
Dimensions		
Weight		
Temperature & Humidity		
Operation	0 to 55 C	Maximum humidity 95%
Transit	-20 to 70 C	15 to 95% (no condensation allowed)
Storage	-10 to 60 C	10 to 90% (no condensation allowed)

Although the Card may still operate in the range of –20 to 70 C, operation outside the range of 0 to 55 C may no longer be according to specifications.

**Table A-2      Power Characteristic**

Doze Mode	45mA
Receive Mode	250mA
Transmit Mode	350mA
Power Supply	3.3V



## Networking Characteristics

**Table A-3      Networking Characteristics**

Compatibility	<ul style="list-style-type: none"><li>■ IEEE 802.11 Standard for Wireless LANS (DSSS)</li><li>■ Wi-Fi (Wireless Fidelity) certified by the Wireless Ethernet Compatibility Alliance (WECA)</li></ul>	
Network Operating System	<ul style="list-style-type: none"><li>■ Microsoft Windows® Networking</li></ul>	
Host Operating System	Microsoft Windows® 95: <ul style="list-style-type: none"><li>■ NDIS3 Miniport Driver</li></ul>	
	Microsoft Windows® NT v4.0: <ul style="list-style-type: none"><li>■ NDIS4 Miniport Driver</li></ul> Microsoft Windows® 98/Me/2000 <ul style="list-style-type: none"><li>■ NDIS5 Miniport Driver</li></ul>	
Media Access Protocol	CSMA/CA (Collision Avoidance) with Acknowledgment (ACK)	
Data Rate	<ul style="list-style-type: none"><li>■ High</li></ul>	11 Mb/s
	<ul style="list-style-type: none"><li>■ Medium</li></ul>	5.5 Mb/s
	<ul style="list-style-type: none"><li>■ Standard</li></ul>	2 Mb/s
	<ul style="list-style-type: none"><li>■ Low</li></ul>	1 Mb/s
The cards use an automatic Transmit Rate Select mechanism.		

## **Radio Characteristics**

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Radio Characteristics of Wireless LAN Cards may vary:

- According to the country where the product was purchased.
- According to the type of product that was purchased.

Wireless communication is often subject to local radio regulations. Although Wireless LAN Wireless networking products have been designed for operation in the license-free 2.4GHz band, local radio regulations may impose a number of limitations to the use of wireless communication equipment.

### **NOTE:**

Refer to the flyer "Information to the User" for regulatory information that may apply in your country.

**Table A-4      Radio Characteristics**

R-F Frequency Band	2.4GHz (2400-2483.5MHz)			
Modulation Technique	Direct Sequence Spread Spectrum ■ CCK for High & Medium Transmit Rate ■ DQPSK for Standard Transmit Rate ■ DBPSK for Low Transmit Rate			
Spreading	11-chip Barker Sequence			
Bit Error Rate (BER)	Better than $10^{-5}$			
Nominal Output Power	15 dBm			
Receiver Sensitivity	-83 dBm	-87 dBm	-91 dBm	-94 dBm
Delay Spread (at FER of <1%)	65 ns	225 ns	400 ns	500 ns

The range of the wireless signal is related to the Transmit Rate of the wireless communication. Communications at lower Transmit range may travel larger distances.

#### NOTE:

The range values listed in Table A-4 are typical distance as measured at the Toshiba Wireless LAN laboratories. These values may provide a rule of thumb and may vary according to the actual radio conditions at the location where the Wireless LAN product will be installed.

- The range of your wireless devices can be affected when the antennas are placed near metal surfaces and solid high-density materials.
- Range is also impacted due to “obstacles” in the signal path of the radio that may either absorb or reflect the radio signal.

Table A-4 lists the typical ranges when used indoors in “office environments” that can be described as follows:

- In **Open Office environments**, antennas can “see” each other, i.e. there are no physical obstructions between them.
- In **Semi-open Office environments**, work space is divided by shoulder-height, hollow wall elements; antennas are at desktop level.
- In **Closed Office environments**, work space is separated by floor-to-ceiling brick walls.

## Supported Frequency Sub-bands

Subject to the radio regulations that apply in your country, your Wireless LAN Card may support a different set of 2.4 GHz channels (see Table A-5).

Consult your Authorized Wireless LAN or Toshiba Sales office for information about the radio regulations that apply in your country.

**Table A-5 Wireless IEEE 802.11 Channels Sets**

Frequency Range	2400-2483.5 MHz <sup>1</sup>
Channel ID	
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
<b>10</b>	<b>2457</b>
11	2462

<sup>1</sup> printed in bold are the factory -set default channels

When installing Wireless LAN Cards the channel configuration is managed as follows:

- For wireless clients that operate in a Wireless LAN Infrastructure, the Wireless LAN Card will automatically start operation at the channel identified by the Wireless LAN Access Point, When roaming between different access points the station can dynamically switch to another channel if required.
- For Wireless LAN Cards installed into wireless clients that operate in an “Peer-to-Peer” mode, the card will use the default channel 10.
- When inserted into a Wireless LAN Access Point, the Wireless LAN Card will use the factory-set default channel (printed in bold), unless the LAN Administrator selected a different channel when configuring the Wireless LAN Access Point device.