# NETGEAR

802.11b Wireless PC Card
Reference Guide

MODEL
MA 401
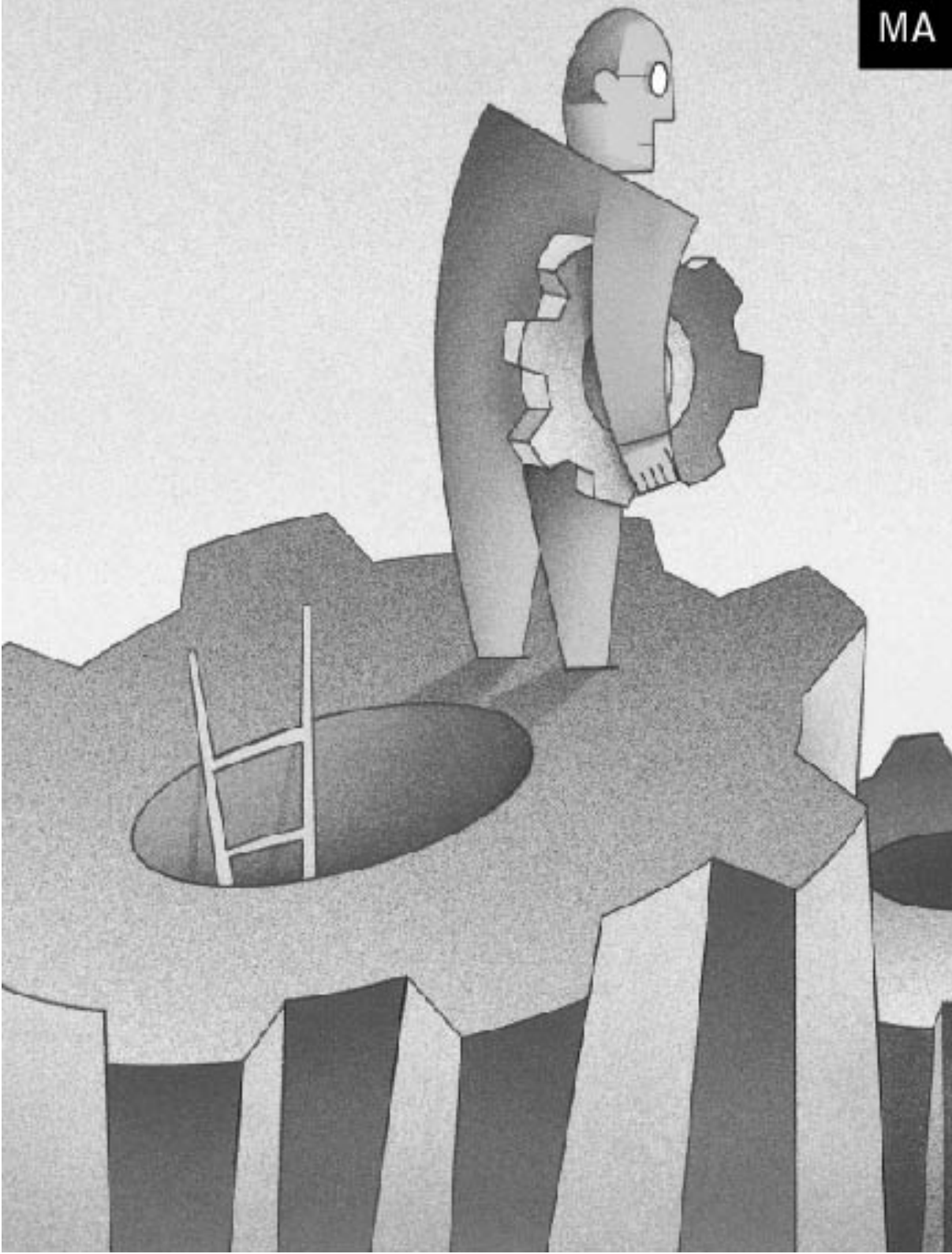
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In the interest of improving internal design, operational function, and/or reliability, NETGEAR reserves the right to make changes to the products described in this document without notice.

NETGEAR does not assume any liability that may occur due to the use or application of the product(s) or circuit layout(s) described herein.

## Certificate of the Manufacturer/Importer

It is hereby certified that the Model MA301 Wireless PCI Adapter has been suppressed in accordance with the conditions set out in the BMPT- AmtsblVfg 243/1991 and Vfg 46/1992. The operation of some equipment (for example, test transmitters) in accordance with the regulations may, however, be subject to certain restrictions. Please refer to the notes in the operating instructions.

Federal Office for Telecommunications Approvals has been notified of the placing of this equipment on the market and has been granted the right to test the series for compliance with the regulations.

## VCCI Statement

This equipment is in the Class B category (information equipment to be used in a residential area or an adjacent area thereto) and conforms to the standards set by the Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines aimed at preventing radio interference in such residential areas.

When used near a radio or TV receiver, it may become the cause of radio interference. Read instructions for correct handling.

## Federal Communications Commission (FCC) Compliance Notice: Radio Frequency Notice

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.
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: (1) Reorient or relocate the receiving antenna, (2) Increase the separation between the equipment and receiver, (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected, (4) Consult the dealer or an experienced radio/TV technician for help.

## Federal Communications Commission (FCC) Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.  In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20 cm (8 inches) during normal operation.

## EN 55 022 Statement

This is to certify that the Model MA301 Wireless PCI Adapter is shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, Article 4a. Conformity is declared by the application of EN 55 022 Class B (CISPR 22).

Compliance is dependent upon the use of shielded data cables.

## Canadian Department of Communications Radio Interference Regulations

This digital apparatus (Model MA301 Wireless PCI Adapter) does not exceed the Class B limits for radio-noise emissions from digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications.

# CONTENTS

# CHAPTER 1: INTRODUCTION

The MA401 802.11b Wireless PC Card gives you ultimate mobility in your office or while you are traveling.  It frees you from traditional Ethernet wiring and helps you create a wireless network for sharing your broadband cable or DSL Internet access among multiple PCs in and around your home. It is designed for notebook computers running Microsoft Windows. It is both 16-bit PCMCIA and 32-bit CardBus compatible and works in any available PCMCIA or CardBus slot.  Its auto-sensing capability allows packet transfer at 11Mbps for maximum throughput, or speed reduction to the lower 1Mbps speed for distance or for operating in a noisy environment.

## Benefits

- Quickly networks your employees without the time or expense of Ethernet cabling.
- Gives you constant access to corporate resources, e-mail and the intranet.
- Supports the vast majority of notebook PCs
- Performs with a wide range of wireless Internet services available in airports and hotels.

## Features

The key features of the MA401 Wireless PC Card are:

- Reliable IEEE 802.11b standard-based wireless technology.
- Supports roaming between access points when configured in Infrastructure mode.
- 11Mbps high rate speed.  Wireless nodes negotiate to operate in the optimal data transfer rate. In a noisy environment or when the distance between the wireless nodes is far, the wireless nodes automatically fall back to operate at the lower transfer rate of two or one Megabit per second.
- Highest level of data encryption using128-bit Shared Key data encryption method.  Lower level of data encryption or no data encryption is available to simplify your network setup or to improve data transfer rate.
- Supports multiple operating system platform including Microsoft Windows 95/B, Windows 98, Windows NT, Windows 2000, and Windows Millennium.

## Related NETGEAR products

- MA301 802.11b Wireless PCI Adapter
- ME102 802.11b Wireless Access Point
- MR314 802.11b Wireless Cable/DSL Router

# CHAPTER 2: WIRELESS NETWORK FUNDAMENTALS

## Wireless Network Configuration

### Ad-hoc Mode (Peer-to-Peer Workgroup)

The Institute of Electrical and Electronics Engineers (IEEE) standard for wireless LANs (WLANs), 802.11, offers two methods for configuring a wireless network — ad hoc and infrastructure. In an ad hoc network, computers are brought together as needed; thus, there is no structure or fixed points to the network — each node can generally communicate with any other node. There is no access point involved in this configuration. It enables you to quickly set up a small wireless workgroup and allows workgroup members to exchange data or share printers as supported by Microsoft Networking in the various Windows operating systems. Some vendors also refer to ad hoc networking as Peer-to-Peer workgroup networking.

In this configuration, network packets are directly sent and received by the intended transmitting and receiving stations. As long as the stations are within range of one another, this is the easiest and least expansive way to set up a wireless network.

To set up an ad hoc workgroup operating with standard protocols, do the following:
*   Set all stations to connect in Ad-hoc mode (or Peer-to-Peer workgroup mode).
*   Set all stations to use the same network name (or SS ID).
*   Set all stations to use no WEP encryption key or an identical WEP encryption key.
*   Set all stations to use the same wireless channel for communication.

### Infrastructure Mode

With a wireless access point, you can put the wireless LAN into the infrastructure mode. It provides wireless connectivity to multiple wireless network devices within a fixed range or area of coverage, interacting with a wireless node via an antenna.

In the infrastructure mode, the wireless access point converts airwave data into wired Ethernet data, acting as a bridge between the wired LAN and wireless clients. Connecting multiple ME102 Access Points via a wired Ethernet backbone can further extend the wireless network coverage. As a mobile computing device moves out of the range of one access point, it moves into the range of another. As a result, wireless clients can freely roam from one Access Point domain to another and still maintain seamless network connection.

To set up an infrastructure network operating with standard protocols, do the following:
*   Set all wireless stations to connect in infrastructure mode
*   Set all stations to use the same network name (or SS ID).
*   Set all wireless access point to use the same network name (or ESS ID).
*   Set all stations to use no WEP encryption key or an identical WEP encryption key.
*   Set up wireless channels used by individual access point. (It is not necessary to set channels on the stations as the stations will automatically scan through all channels for the nearest access point.)

## Service Set Identification (SS ID)

The Service Set Identification (SS ID) is a thirty-two alphanumeric character (maximum) string identifying the wireless local area network. Some vendors refer to the SS ID as network name. For stations to communicate with each other, all stations must be configured with the same SS ID.

A wireless LAN consisting of nodes operating in ad hoc configuration without an access point is called a Basic Service Set (BSS). All nodes in a BSS must use the same Basic Service Set ID (BSS ID).

In an infrastructure configuration with access points, multiple BSS can be configured to form an Extended Service Set (ESS). In this configuration, the access points are configured with the same Extended Service Set ID (ESS ID). Wireless clients configured with the same ESS ID can freely roam from one Access Point domain to another and still maintain seamless connection to the network

## Authentication and WEP Encryption

The absence of a physical connection between nodes makes the wireless links vulnerable to information theft. To provide certain level of security, IEEE 802.11 standard has defined two types of authentication methods, Open System and Shared Key. Open System authentication is a null algorithm. Shared Key authentication is an algorithm where both the transmitting node and the receiving node share an authentication key to perform a checksum on the original message. By default, IEEE 802.11 wireless devices operate in an open system network.

Wired Equivalent Privacy (WEP) data encryption is utilized when the wireless nodes or access points are configured to operate in Shared Key authentication mode. There are two shared key methods implemented in most commercially available products, forty-bit WEP data encryption and 128-bit WEP data encryption.

The forty-bit WEP data encryption method, allows for a five-character (forty-bit) input. Additionally, 24 factory-set bits are added to the forty-bit input to generate a 64-bit encryption key. (The 24 factory-set bits are not user configurable.) This encryption key will be used to encrypt/decrypt all data transmitted via the wireless interface. Some vendors may refer to the forty-bit WEP data encryption as 64-bit WEP data encryption since the actual encryption key used in the encryption process is 64 bits wide.

The 128-bit WEP data encryption method consists of 104 configurable bits. Similar to the forty-bit WEP data encryption method, the remaining 24 bits are factory set and not user configurable. Some vendors allow passphrases to be entered instead of the cryptic hexadecimal characters to ease encryption key entry.

# Wireless Channel Selection

IEEE 802.11 wireless nodes communicate with each other using radio frequency signals in the ISM (Industrial, Scientific, and Medical) band between 2.4Ghz and 2.5Ghz. Neighboring channels are 5Mhz apart. However, due to spread spectrum effect of the signals, a node sending signals using a particular channel will utilize frequency spectrum12.5Mhz above and below the center channel frequency. As a result, two separate wireless networks using neighboring channels (for example, channel 1 and channel 2) in the same general vicinity will interfere with each other. Applying two channels that allow the maximum channel separation will decrease the amount of channel cross-talk, and provide a noticeable performance increase over networks with minimal channel separation.

| Channel | Center Frequency | Frequency Spread |
|---------|------------------|------------------|
| 1 | 2412Mhz | 2399.5Mhz – 2424.5Mhz |
| 2 | 2417Mhz | 2404.5Mhz – 2429.5Mhz |
| 3 | 2422Mhz | 2409.5Mhz –2434.5Mhz |
| 4 | 2427Mhz | 2414.5Mhz –2439.5Mhz |
| 5 | 2432Mhz | 2419.5Mhz – 2444.5Mhz |
| 6 | 2437Mhz | 2424.5Mhz –2449.5Mhz |
| 7 | 2442Mhz | 2429.5Mhz –2454.5Mhz |
| 8 | 2447Mhz | 2434.5Mhz – 2459.5Mhz |
| 9 | 2452Mhz | 2439.5Mhz –2464.5Mhz |
| 10 | 2457Mhz | 2444.5Mhz –2469.5Mhz |
| 11 | 2462Mhz | 2449.5Mhz – 2474.5Mhz |
| 12 | 2467Mhz | 2454.5Mhz – 2479.5Mhz |
| 13 | 2472Mhz | 2459.5Mhz – 2484.5Mhz |

Note: The available channels supported by the wireless products in various countries are different.

The preferred channel separation between the channels in neighboring wireless networks is 25 MHz (5 channels). This means that you can apply up to three different channels within your wireless network. There are only 11 usable wireless channels in the United States. It is recommended that you start using channel 1 and grow to use channel 6, and 11 when necessary.

# CHAPTER 3: HARDWARE INSTALLATION

## Package Contents

The product package should contain:
* Model MA401 802.11b Wireless PC Card
* MA401/MA301 Wireless Network Card Resource CD
* Installation Guide
* Support Information Card

Call your reseller or customer support in your area if there are any wrong, missing, or damaged parts. Refer to the Support Information Card for the telephone number of customer support in your area. Keep the Support Information Card, along with the original packing materials. Use the packing materials to repack the Model MA401 Wireless PC Card if you need to return it for repair.

To qualify for product updates and product warranty registrations, register online on the NETGEAR Web page at: http://www.NETGEAR.com.

## Hardware Description

The Model MA401 Wireless PC Card has two interfaces. The 16-bit PCMCIA Type II connector connects to any notebook PC with an available PCMCIA or CardBus slot. The wireless interface of the MA401 Wireless PC Card remains outside of the notebook PC chassis when the wireless PC card is inserted into a notebook. The green LED indicates the wireless link condition of the MA401 Wireless PC Card with another wireless node or the associated access point.

## Wireless PC Card Installation

The MA401 802.11b wireless PC Card is hot swappable, which means that you can insert it into a notebook PC that is either powered on or shut down. You may insert the MA401 wireless PC Card into any available PCMCIA or CardBus slot. Some notebook computers have two PCMCIA or CardBus slots, the MA401 wireless PC Card can be inserted into either slot. Since the MA401 Wireless PC Card transmits and receives radio frequency signals through its antenna, there is no cable needed in the installation.

# CHAPTER 4: DRIVER INSTALLATION

## Windows 95/B Driver Software

The MA401 LAN driver in the release driver CD-ROM only supports Windows 95/B and above. The LAN drivers for the original versions of Windows 95 or Windows 95A are not provided.

### Installing Driver Software

To install the NETGEAR MA401 Wireless PC Card LAN driver for the first time in Windows 95/B:

1. Follow the procedure described in the hardware installation chapter to install the MA401 Wireless PC Card into your notebook system. Power up the system if the PC Card is inserted when the power is off.
2. Upon power up, Windows 95/B automatically detects the existence of the wireless PC card. An Update Device Driver Wizard window opens and asks to install the corresponding driver. Click on "Next" to continue.
3. Windows will notify you that it is unable to locate the driver and ask you to specify where the driver is located. Insert the MA401/MA301 Network Card Resource CD into the CD-ROM drive. Click on the "Other Locations…" button.
4. The Select Other Location window opens. Click on "Browse".
5. Double-click on the CD-ROM drive letter to look into the content of the CD-ROM.
6. Double-click on the "MA401" folder.
7. Double-click on the "WIN95B" folder selection in the "MA401" folder.
8. Click on "OK".
9. After returning to the Select Other Location window, the folder you selected for the driver will be shown under the "Location" entry field. Make sure that the entry shows "D:\MA401\WIN95B" assuming that D: is the driver letter for the CD-ROM drive. Click on "OK".
10. Windows is now ready to copy the driver from the network card resource CD. Click on "Finish".
11. Click on "Yes" when asked if you want to reboot the system.
.
The MA401 PC Card driver is now installed into your Windows 95B system.

### Verifying Driver Installation

1. From the Windows 95/B desktop, double-click on My Computer.
2. Double-click on Control Panel. Double-click on the System icon.
3. Click on the Device Manager folder tab.
4. Double-click on Network Adapter. There should be no yellow exclamation mark or red cross-sign on the MA401 Wireless PC Card selection.
5. Double-click on the MA401 Wireless PC Card. The Device Status windows should indicate that the PC card is working properly.

The installation of the MA401 Wireless PC Card driver in Windows 95/B is now completed. Proceed to configuring the wireless parameters.

# Windows 98 Driver Software

## Installing Driver Software

To install the NETGEAR MA401 Wireless PC Card LAN driver for the first time in Windows 98:

1. Follow the procedure described in the hardware installation chapter to install the MA401 Wireless PC Card into your system. Power up the system if the PC Card is inserted with the power off.
2. Upon power up, Windows 98 automatically detects the existence of the MA401 Wireless PC card. An Add New Hardware Wizard window opens. Click on "Next" to continue.
3. In the next Add new Hardware Wizard window, select "Search for the best driver for your device (Recommended)." Click on "Next".
4. The next Add New Hardware Wizard window opens prompting for the location of the driver. Insert the MA401/MA301 Network Card Resource CD into the CD-ROM drive. Click on "Browse".
5. Double-click on the CD-ROM drive letter to look into the content of the CD-ROM.
6. Double-click on the "MA401" folder.
7. Double-click on the "WIN98" folder selection in the *MA401* folder.
8. Click on "OK".
9. After returning to the original Add New Hardware Wizard window, make sure that the Specify a location:" entry field shows "D:\MA401\WIN98" assuming that D: is the driver letter for the CD-ROM drive. Click on "Next".
10. In the next window, Windows indicates that a Windows driver file is found and is ready to install the best driver for this device. Click on "Next".
11. Click on "Finish" when informed that the driver installation is complete.
12. Click on "Yes" when asked if you want to reboot the system.

The MA401 Wireless PC Card driver is now installed into your Windows 98 system.

## Verifying Driver Installation

1. From the Windows 98 desktop, double-click on My Computer.
2. Double-click on Control Panel. Double-click on the System icon.
3. Click on the Device Manager folder tab.
4. Double-click on Network Adapter. There should be no yellow exclamation mark or red cross-sign on the MA401 Wireless PC Card selection.
5. Double-click on the MA401 Wireless PC Card. The Device Status windows should indicate that the PC card is working properly.

The installation of the MA401 Wireless PC Card driver in Windows 98 is now completed. Proceed to configuring the wireless parameters.

# Windows Millennium Driver Software

## Installing Driver Software

To install the NETGEAR MA401 Wireless PC Card LAN driver for the first time in Windows Millennium:

1.  Follow the procedure described in the hardware installation chapter to install the MA401 Wireless PC Card into your notebook system.  Power up the system if the PC Card is inserted when the power is off.
2.  Upon power up, Windows Millennium automatically detects the existence of the MA401 PC card.  An Add New Hardware Wizard window opens and indicates that new hardware has been found.  Insert the MA401/MA301 Network Card Resource CD into the CD-ROM drive.  Make sure that "Automatic search for a better driver (Recommended)" is selected.  Click on "Next" to continue.
3.  Windows Millennium looks into the floppy disk drive and the CD-ROM drive for the appropriate driver.  Windows Millennium automatically installs the appropriate driver from the CD for the MA401 PC card.  Click on "Finish".
4.  Click on "Yes" when asked if you want to reboot the system.

The MA401 Wireless PC Card driver is now installed into your Windows Millennium system.

## Verifying Driver Installation

1.  From the Windows Millennium desktop, double-click on My Computer.
2.  Double-click on Control Panel.  Double-click on the System icon.
3.  Click on the Device Manager folder tab.
4.  Double-click on Network Adapter.  There should be no yellow exclamation mark or red cross-sign on the NETGEAR MA401 Wireless PC Card selection.
5.  Double-click on the MA401 Wireless PC Card.  The Device Status windows should indicate that the PC Card is working properly.

The installation of the MA401 Wireless PC Card driver in Windows Millennium is now completed.  Proceed to configuring the wireless parameters.

# Windows NT 4.0 Driver Software

Microsoft Windows NT 4.0 is not a plug-and-play operating system and does not automatically detect and prompt you for installation of the PC Card driver. The driver installation has to be initiated manually.

## Installing Driver Software

1. Follow the procedure in the hardware installation chapter to install the MA401 Wireless PC card into your notebook system. Power on the system if the PC card is inserted with the power off.
2. From the Windows NT desktop, double-click on My Computer.
3. Double-click on Control Panel. Double-click on the Network icon.
4. Click on the "Adapter" tab and click on the "Add" button to continue.
5. The Select Network Adapter window opens listing a number of network adapter cards. Insert the MA401/MA301 Network Card Resource CD into the CD-ROM drive. Click on "Have Disk..."
6. In the Insert Disk window, enter "D:\MA401\WINNT" in the field provided assuming that D: is the driver letter for the CD-ROM drive. Click on "OK".
7. The Select OEM Option window opens listing the drivers from which to choose. Select "NETGEAR MA401 Wireless PC Card" and click on "OK".
8. The resources and Properties window opens. Refer to the Wireless parameter configuration chapter and modify any entry if necessary. Click on "OK".
9. The system returns back to the Network window. Click on "Close".
10. If TCP/IP is enabled, the system will prompt you for an IP address or use DHCP. Answer accordingly.
11. Click on "Yes" when prompted if you want to reboot the system.

## Verifying Driver Installation

1. From the Windows NT desktop, double-click on My Computer.
2. Double-click on Control Panel. Double-click on the Devices icon.
3. A list of devices installed in the system will be shown. Scroll down the list to locate the *NETGEAR MA401 / MA301 driver* entry. The PC Card entry should indicate that the PC card is started.

The installation of the MA401 Wireless PC Card driver in Windows NT is now completed. Proceed to the configuring the wireless parameters.

# Windows 2000 Driver Software

## Installing Driver Software

1.  Follow the procedure described in the hardware installation chapter to install the MA410 Wireless PC Card.  Power up the system if the PC Card is inserted with the power off.
2.  Upon power up, Windows 2000 automatically detects the existence of the MA401 PC card.  A Found New Hardware Wizard window opens and indicates that new hardware has been found.  Click on Next.
3.  In the next Found New Hardware Wizard window, click to select "Search for a suitable driver for my device (recommended)".  Click on "Next" to continue.
4.  The next Found New Hardware Wizard window opens prompting for the location of the driver.  Insert the MA401/MA301 Network Card Resource CD into the CD-ROM drive.  Select "CD-ROM drives" and click on "Next".
5.  Windows searches into the driver CD and locate the driver for the MA401 Wireless PC Card.  Verify that the Windows has found the driver in the "D:\MA401\WIN2000" directory.  Click on "Next".
6.  Click on "Yes" to continue when Windows indicates that the Digital Signature is not found.
7.  Windows indicates that the software for the MA401 Wireless PC Card is now installed.  Click on "Finish".

## Verifying Driver Installation

1.  From the Windows 2000 desktop, double-click on My Computer.
2.  Double-click on Control Panel.  Double-click on the System icon.
3.  Click on the Hardware folder tab.  Double-click on the Device Manager button.
4.  Double-click on Network Adapter.  There should be no yellow exclamation mark or red cross-sign on the NETGEAR MA401 Wireless PC Card selection.
5.  Double-click on the MA401 Wireless PC Card.  The Device Status windows should indicate that the PC card is working properly.

The installation of the MA401 Wireless PC Card driver in Windows 2000 is now completed.  Proceed to configuring the wireless parameters.

# CHAPTER 5: WIRELESS LAN CONFIGURATION

## Adapter Properties Configuration

### Device Properties Page

#### When running Windows 95/B, 98 or Millennium

Wireless parameters for the MA401 Wireless PC Card can be modified from the Network control window.
1.  From the Windows desktop, right-click on the Network Neighborhood icon.  When a pop-up menu opens, move to select the Properties selection.
2.  The Network window opens.  Click on the "NETGEAR MA401 Wireless PC Card" selection in the component window.  Click on the "Properties" button.
3.  A window pops up displaying three folder tabs.  Click on the *Advanced* folder tab.  The property screen opens displaying a number of configurable parameters.  These parameters are shown in the Wireless LAN Configuration Chapter.

#### When running Windows NT 4.0

Since Windows NT is not a plug-and-play operating system, you may need to modify some system parameters such as I/O Base address and IRQ level to enable the wireless PC Card.
1.  From the Windows desktop, right-click on the Network Neighborhood icon.  When a pop-up menu opens, move to select the Properties selection.
2.  The Network windows opens, Click on the Adapter folder tab.
3.  Click on NETGEAR MA401 Wireless PC Card in the window. Click on Properties to modify any wireless parameters.

#### When running Windows 2000

Configuring the network adapter properties for Windows 2000 is different from all other Windows operating systems.
1.  From the Windows desktop, right-click on "My Computer".  Click on the "Hardware" folder tab.  Click on "Device Manager".
2.  In the Device Manager window, double-click on "Network adapters" to show all network adapters.  Double-click on "NETGEAR MA401 Wireless PC Card".
3.  The NETGEAR MA401 Wireless PC Card Properties window opens.  Click on the *Advanced* folder tab.  The list of configurable parameters is shown.

## Device Properties Modification

Table 5-1. Device Properties Parameters

| General Specifications | Model MA401 Wireless PC Card |
|---|---|
| Network Type | Configurable between 802.11 ad hoc, ad hoc, and infrastructure modes. In 802.11 ad hoc mode, the wireless nodes form their own local network where the end nodes communicate peer-to-peer without an access point.  Ad hoc mode offers higher data throughput than 802.11 ad hoc mode; but it does not use beacon or authentication. In infrastructure mode, the wireless searches all available wireless channels to associate with an access point.  The default value for Network Type is Infrastructure. |
| SSID | Enter a 32-character (maximum) service set ID in this field.  The characters are case sensitive.  When the wireless node is operating in ad hoc mode, this field operates as the basic service set ID (BSS ID).  All wireless nodes in the same network should use the same BSS ID. When in infrastructure mode, this field defines the extended service set ID (ESS ID).  The ESS ID assigned to the wireless node is required to match the access point ESS ID for the wireless node to communicate with the access point.  The default SS ID is "Wireless". |
| Channel | Only valid in ad-hoc mode, this field defines the wireless channel to use. In infrastructure mode, the wireless node automatically searches through all available wireless channels for an access point to be associated with.  It is not necessary to select the wireless channel when operating in infrastructure mode.  The default wireless channel is 6. |
| Use WEP | Set the data encryption level for the wireless node.  The data encryption level must be the same between all wireless nodes and access points in the same network.  The possible values for the data encryption level are Disable, 64 bits and 128 bits.  64-bit data encryption is also called 40-bit data encryption by some vendors.  For more explanation on data encryption, please refer to the wireless network fundamental chapter at the beginning of this reference guide. Setting the data encryption level to Disable is to not use any encryption; this is also called Open System data encryption.  Setting the data encryption level to 64-bit configures the wireless node to use the 40-bit (also called 64-bit) Shared Key data encryption method.  128-bit encryption is another possible Shared Key data encryption method. |
| WEP Passphrase | A 32-character (maximum) passphrase can be used to generate the encryption key when using the Shared Key (64-bit or 128-bit) data encryption method.  Make a note of the passphrase when providing it to the wireless node, as this information is needed for all other wireless nodes on the same network. |
| Preamble Mode | A long transmit preamble allows the receiver to lock into the received bit patterns more easily.  A short transmit preamble provides better performance.  The default value is Long Tx Preamble. |

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Table 5-1. Device Properties Parameters (continued)

| General Specifications | Model MA401 Wireless PC Card |
|---|---|
| Fragment Threshold | This is the packet length used for fragmentation.  Packets larger than the size programmed in this field will be fragmented.  The Fragment Threshold value must be larger than RTS Threshold value. The default value for Fragment Threshold is 2346. |
| RTS Threshold | The packet size that the wireless node uses to determine if it should use the CSMA/CD mechanism or the CSMA/CA mechanism for packet transmission.  With the CSMA/CD transmission mechanism, the transmitting station sends out the actual packet as soon as it has waited for the silence period.  With the CSMA/CA transmission mechanism, the transmitting station sends out a RTS packet to the receiving station, waits for the receiving station to send back a CTS packet before sending the actual packet data. |
| Power save mode | Power saving mode.  This enables the wireless node to control its wireless power consumption.  The default setting for Power Save mode is Disabled. |

# WLAN Configuration Utility

A wireless LAN configuration utility program is provided to give you information on your wireless network such as signal quality and link conditions, and to let you modify the various configurable wireless parameters.

## WLAN Configuration Utility Installation

1.    Insert the MA401/MA301 Network Card Resource CD into the CD-ROM drive.  From the Windows desktop, double-click on *My Computer*.  Double-click on the CD-ROM drive letter to look into the content of the CD.  Double-click on the *MA401* folder and then double-click on the *UTILITY* folder.  The \*MA401*\*UTILITY* directory of the CD is now open.
2.    Double-click on the *SETUP* application icon to start the installation procedure.  The InstallShields Wizard opens.  Click on "Next" to continue.
3.    Click "Yes" on the Software License Agreement window to accept the agreement.
4.    Click on "Browse" to change the destination location where the wireless LAN configuration utility is installed.  Otherwise, click on "Next" to continue.
5.    Modify the "Program Folders" field, if desired.  Click on "Next" to continue.  InstallShields starts copying files into your system.
6.    Click on the "Yes, I want to restart my computer now." button selection to restart the computer. And click on "Finish" to complete the installation.

## System Tray Applications

Note: The SysTray (System Tray) resides on one end of the taskbar in the Microsoft Windows desktop. It displays interface icons for memory-resident applications that execute in the background continuously, such as the clock, speaker volume, and virus detection.
The wireless LAN configuration utility installation for the MA401 Wireless PC Card adds a status reporting and configuration utility icon in the SysTray.  Once you have completed the installation, the Windows SysTray should show the following icon in different colors.  This icon indicates different status condition depending on the operating mode of the MA401 Wireless PC Card.

| Icon color | Ad-hoc mode | Infrastructure mode |
|---|---|---|
| Red | The wireless adapter has not initiated communication with any other wireless node. | The wireless adapter is not able to link to any access point or the link between the wireless adapter and the access point is lost. |
| Yellow | Not applicable | The link condition between the wireless adapter and the associated access point is weak. |
| Green | The wireless adapter has successfully communicated with another wireless node. | The wireless adapter has established good communication with an access point and the signal quality is strong. |

## WLAN Parameter Modification

Double-clicking on the wireless SysTray icon activates the wireless LAN configuration utility for the MA401 Wireless PC Card.  You can click on any of the folder tab in the Wireless LAN configuration utility window to modify the operational parameters.
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| Link Info | |
|---|---|
| State | This field show the MAC address of the associated access point when the MA401 Wireless PC Card is configured in infrastructure mode, |
| Current Channel | The wireless channel in use, between 1 and 13.  The number of wireless channels supported by the different countries may vary.  Click on the Configuration folder tab if you want to fix the wireless node to use a particular wireless channel. |
| Current Tx Rate | The current transmit data rate of the wireless node.  The possible configurations are 1Mbps, 2Mbps, 5.5Mbps and 11Mbps.  In ad hoc mode, this field shows what the wireless node is configured to use. When in infrastructure mode, it shows the result of the transfer rate negotiated between the access point and the wireless node. |

| | |
|---|---|
| Rescan | Only used in infrastructure mode, click on this button to allow the wireless node to start scanning the wireless channels for an access point again. |
| Throughput (Bytes/sec) Tx | The current transmit data transfer rate of the wireless node. |
| Throughput (Bytes/sec) Rx | The current receive data transfer rate of the wireless node. |
| Link Quality | Link Quality indicates how well that the wireless node is communicating with the associated access point or another wireless node. |
| Signal Strength | Signal Strength indicates the signal strength of the radio frequency signal received by the wireless node. |

| Configuration | |
|---|---|
| Mode | Configurable between 802.11 ad-hoc, ad-hoc, and infrastructure modes.  In 802.11 ad hoc mode, the wireless nodes form their own local network where the end nodes communicate peer-to-peer without an access point.  Ad-hoc mode offers higher data throughput than 802.11 ad hoc mode; but it does not use beacon or authentication. In infrastructure mode, the wireless searches all available wireless channels to associate with an access point. |
| SSID | Enter a 32-character (maximum) service set ID in this field.  The characters are case sensitive.  When the wireless node is operating in ad hoc mode, this field operates as the basic service set ID (BSS ID).  All wireless nodes in the same network should use the same BSS ID. When in infrastructure mode, this field defines the extended service set ID (ESS ID).  The ESS ID assigned to the wireless node is required to match the access point ESS ID for the wireless node to communicate with the access point. |
| Tx Rate | The Tx Rate field allows you to define the data transfer rate.  The default value is Fully Automatic.  In this case, the best transfer rate is negotiated between the wireless node and the device it is communicating with.  This could be another wireless node or an access point.  Other possible values for this field are 1Mbps, 2Mbps, 5.5Mbps, and 11Mbps. |
| PS Mode | Power saving mode.  This enables the wireless node to control its wireless power consumption.  The two possible settings are Enable and Disable. |
| Channel | Only valid in ad-hoc mode, this field defines the wireless channel to use.  In infrastructure mode, the wireless node automatically searches through all available wireless channels for an access point to be associated with.  It is not necessary to select the wireless channel when operating in infrastructure mode. |

| Encryption | |
|---|---|
| Encryption | Set the data encryption level for the wireless node.  The data encryption level must be the same between all wireless nodes and access points in the same network.  The possible values for the data encryption level are Disable, 64 bits and 128 bits.  64-bit data encryption is also called 40-bit data encryption by some vendors.  For more explanation on data encryption, please refer to the wireless network fundamental chapter at the beginning of this reference guide.<br>Setting the data encryption level to Disable is to not use any encryption; this is also called Open System data encryption.  Setting the data encryption level to 64-bit configures the wireless node to use the 40-bit (also called 64-bit) Shared Key data encryption method.  128-bit encryption is another possible Shared Key data encryption method. |
| WEP Key Entry/Passphrase | A 32-character (maximum) passphrase can be used to generate the encryption key when using the Shared Key (64-bit or 128-bit) data encryption method.  However, this field is only visible when entering the passphrase for the first time.  When the encryption folder tab is open for the second time, the passphrase will not be visible.  Make a note of the passphrase when providing it to the wireless node, as this information is needed for all other wireless nodes on the same network. |
| WEP Key Entry/Manual Entry | The encryption key used to encrypt/decrypt wireless data.  When set to 64-bit (also called 40-bit) data encryption mode, you may specify up to four different keys to encrypt wireless data.  However, only one key is allowed in the 128-bit data encryption mode. |
| Default Tx | When the encryption level is set to 64-bit (also called 40-bit by some other vendors), the wireless LAN configuration utility allows you to specify up to four different keys to encrypt wireless data.  The Default Tx field allows you to specify which one of the four keys to activate. |

**About**
The About screen shows the release information of the wireless LAN configuration utility software and the wireless nodes firmware.

# APPENDIX A: HARDWARE SPECIFICATIONS

| General Specifications | Model MA401 802.11 Wireless PC Card |
|---|---|
| Radio Data Rate | 1, 2, 5.5, 11Mbps (Auto Rate Sensing) |
| Frequency | 2.4Ghz to 2.5Ghz Direct Sequence Spread Spectrum (DSSS) |
| Range | Outdoor environment        Indoor environment<br>1Mbps - 1650 ft (503 m)     1Mbps - 500 ft (152 m)<br>2Mbps - 1320 ft (402 m)     2Mbps - 400 ft (122 m)<br>5.5Mbps - 1155 ft (352 m)    5.5Mbps - 270 ft (82 m)<br>11Mbps – 835 ft (255 m)     11Mbps – 175 ft (53 m) |
| Encryption | 40-bit (also called 64-bit) WEP data encryption<br>128-bit WEP data encryption |
| Maximum computers per network | Limited by the amount of wireless network traffic generated by each node; typically 30 to 70 nodes. |
| Bus interface | PCMCIA type II PC Card |
| Provided drivers | Microsoft Windows 95/B, 98, NT, 2000, Millennium |
| Dimensions | L: 145 mm (5.7 in.)<br>W: 97 mm (3.8 in.)<br>H: 14 mm (0.56 in.) |
| Weight | 44.5 g (1.5 oz) |
| Status LED | Wireless Link |
| Environment Specifications | Operating temperature: 0 to 55 degree C |
| Warranty | Limited 5-year warranty |