D-Link *Air*Plus*Xtreme G+*™
DWL-2000AP+
High-Speed 2.4 GHz Wireless Access Point

Manual
Version 1.00

D-Link
Building Networks for People

Contents

Package Contents

Contents of Package:

- **D-Link *Air*PlusX*TREME* G+**™ **DWL-2000AP+**
  High-Speed 2.4GHz Wireless Access Point
- Power Adapter-DC 5V, 2.5A
- Manual and Warranty on CD
- Quick Installation Guide
- Ethernet Cable

If any of the above items are missing, please contact your reseller.

Note: Using a power supply with a different voltage rating than the one included with the DWL-2000AP will cause damage and void the warranty for this product.

System Requirements for Configuration:

- Computers with Windows, Macintosh, or Linux-based operating systems with an installed Ethernet adapter

- Internet Explorer Version 6.0 or Netscape Navigator Version 6.0 and Above

Introduction

The D-Link *Air*Plus*X*treme *G*+™ DWL-2000AP+ High-Speed Wireless Access Point is a 802.11g high-performance, wireless access point that supports high-speed wireless networking at home, at work or in public places.

The DWL-2000AP+ is capable of operating in one of 4 different modes to meet your wireless networking needs. The DWL-2000AP+ can operate as an Access Point; in Access Point-to-Access Point Bridging mode; Access Point-to-Multipoint Bridging mode; or Wireless Client mode.

The DWL-2000AP+ is an ideal solution for quickly creating and extending a wireless local area network (WLAN) in offices or other workplaces, trade shows and special events.
Unlike most access points, the DWL-2000AP+ provides data transfers at up to 8X (compared to the standard 11 Mbps) when used with other D-Link *Air*PlusXtreme*G*+ products. The 802.11g standard is backwards compatible with 802.11b products. This means that you do not need to change your entire network to maintain connectivity. You may sacrifice some of 802.11g's speed when you mix 802.11b and 802.11g devices, but you will not lose the ability to communicate when you incorporate the 802.11g standard into your 802.11b network. You may choose to slowly change your network by gradually replacing the 802.11b devices with 802.11g devices .

In addition to offering faster data transfer speeds when used with other 802.11g products, the DWL-2000AP+ has the newest, strongest, most advanced security features available today. When used with other 802.11g WPA (WiFi Protected Access) and 802.1x compatible products in a network with a RADIUS SERVER, the security features include:

WPA:* A new security feature, **Wi-Fi Protected Access** authorizes and identifies users based on a secret key that changes automatically at a regular interval. **WPA** uses **TKIP** (**Temporal Key Integrity Protocol**) to change the temporal key every 10,000 packets (a packet is a kind of message transmitted over a network.) This insures much greater security than the standard WEP security.   (By contrast, the older WEP encryption required the keys to be changed manually.)

802.1x*: **Authentication** is a first line of defense against intrusion. In the Authentication process the server verifies the identity of the client attempting to connect to the network.Unfamiliar clients would be denied access.

* Available Q4 2003 as a free download

Connections

Pressing the **Reset Button** restores the router to its original factory default settings.

Receptor for the **Power Adapter**

The **LAN Port** is Auto-MDI/MDIX. You can insert either a Straight-through or a Cross-over Ethernet cable in this port in order to connect the DWL-2000AP+ to a switch on the local network.
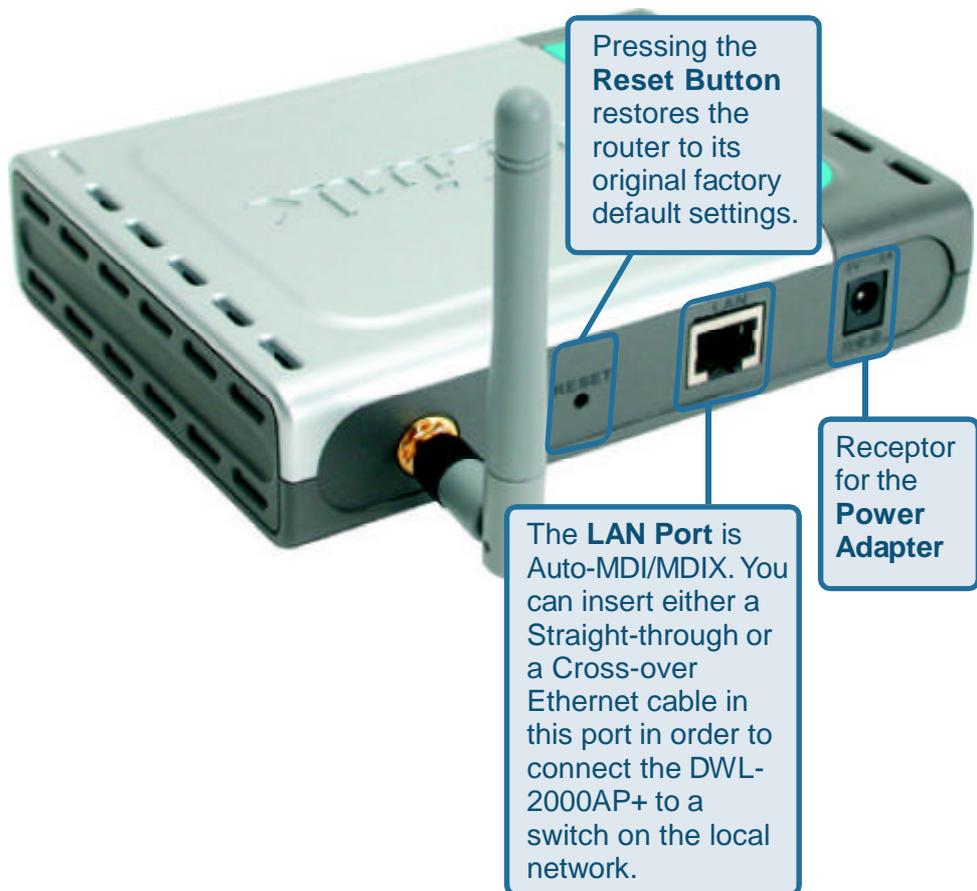
LEDs

LED stands for Light-Emitting Diode. The DWL-2000AP+ Wireless Access Point has 3 LEDs as shown below:

Power: Solid green light indicates connection

LAN: Blinking green light indicates activity on the Ethernet Port; solid green light indicates connection

WLAN: Blinking green light indicates wireless activity; solid green light indicates connection
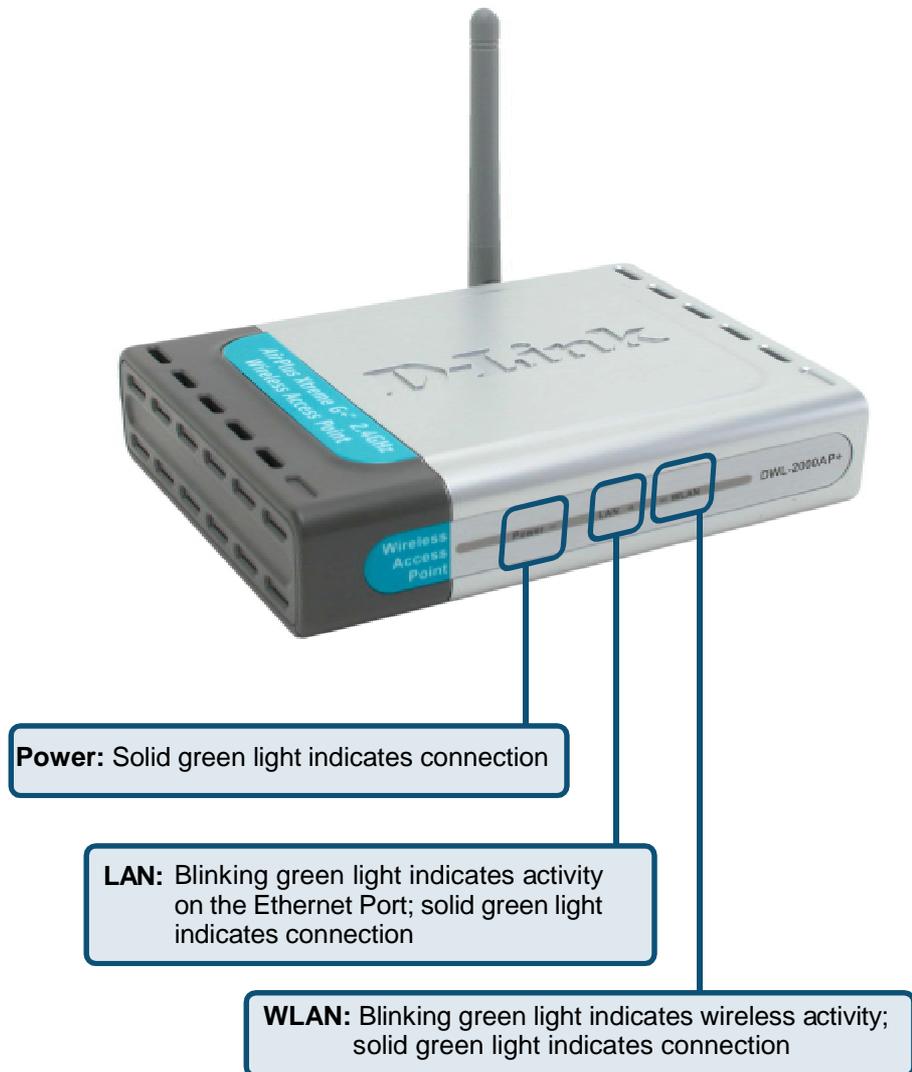
Features

- **4 Different Operation modes -** Capable of operating in one of four different operation modes to meet your wireless networking requirements: Access Point; AP-to-AP Bridging; AP-to-Multipoint Bridging; and Wireless Client.

- **Faster wireless networking** with the 802.11g standard to provide a wireless data rate of up to 54Mbps

- **Compatible with the 802.11b standard** to provide a wireless data rate of up to 11Mbps - that means you can migrate your system to the 802.11g standard on your own schedule without sacrificing connectivity.

- **Better security with WPA* and 802.1x***

  - **WPA*** (Wi Fi Protected Access) authorizes and identifies users based on a secret key that changes automatically at a regular interval

    - **TKIP** (Temporal Key Integrity Protocol), in conjunction with a RADIUS SERVER, changes the temporal key every 10, 000 packets, ensuring greater security

    - **Pre Shared Key** mode means that the home user, without a RADIUS SERVER, will obtain a new security key every time he or she connects to the network, vastly improving the safety of communications on the network.

  - **802.1x* Authentication** in conjunction with the RADIUS SERVER verifies the identity of would be clients

- Utilizes **OFDM** technology (**O**rthogonal **F**requency **D**ivision **M**ultiplexing)

- Operates in the 2.4GHz frequency range

- **Easy Installation** with the Setup Wizard

- **Web-based interface** for Managing and Configuring

Wireless Basics

D-Link wireless products are based on industry standards to provide easy-to-use and compatible high-speed wireless connectivity within your home, business or wherever a wireless network is available. D-Link wireless products will allow you access to the data you want, when and where you want it. You will be able to enjoy the freedom that wireless networking brings.

A wireless local area network (WLAN) is a cellular computer network that transmits and receives data with radio signals instead of wires. WLANs are used increasingly in both home and office environments, and public areas such as airports, coffee shops and universities. Innovative ways to utilize WLAN technology are helping people to work and communicate more efficiently. Increased mobility and the absence of cabling and other fixed infrastructure have proven to be beneficial for many users.

Wireless users can use the same applications they use on a wired network. Wireless adapter cards used on laptop and desktop systems support the same protocols as Ethernet adapter cards.

Under many circumstances, it may be desirable for mobile network devices to link to a conventional Ethernet LAN in order to use servers, printers or an Internet connection supplied through the wired LAN. A Wireless Access Point is a device that can be used to provide this link.

Wireless Basics *(continued)*

People use WLAN technology for many different purposes:

Mobility - Productivity increases when people have access to data in any location within the operating range of the WLAN. Management decisions based on real-time information can significantly improve worker efficiency.

Low Implementation Costs – WLANs are easy to set up, manage, change and relocate. Networks that frequently change, both physically and logically, can benefit from a WLAN's ease of implementation. WLANs can operate in locations where installation of wiring may be impractical.

Installation and Network Expansion - Installing a WLAN system can be fast and easy and can eliminate the need to pull cable through walls and ceilings. Wireless technology allows the network to go where wires cannot go-even outside the home or office.

Scalability – WLANs can be configured in a variety of ways to meet the needs of specific applications and installations. Configurations are easily changed and range from peer-to-peer networks suitable for a small number of users to larger infrastructure networks to accommodate hundreds or thousands of users, depending on the number of wireless devices deployed.

Inexpensive solution– Wireless network devices are as competitively priced as conventional Ethernet network devices.

The DWL-2000AP+ is compatible with the following wireless products:

- ◼ *D-Link Air**Plus** DWL-650+,**D-Link Air**Plus XtremeG+ DWL-G650+** Wireless Cardbus Adapters used with laptop computers

- ◼ *D-Link Air**Plus** DWL-520+, D-Link Air**Plus XtremeG+ DWL-G520+** Wireless PCI cards used with desktop computers

Standards-Based Technology

The DWL-2000AP+ Wireless Access Point utilizes the **802.11g** standard.

The IEEE **802.11g** standard is an extension of the 802.11b standard. It increases the data rate up to 54 Mbps within the 2.4GHz band, utilizing **OFDM technology.**

This means that in most environments, within the specified range of this device, you will be able to transfer large files quickly or even watch a movie in MPEG format over your network without noticeable delays. This technology works by transmitting high-speed digital data over a radio wave utilizing **OFDM** (**O**rthogonal **F**requency **D**ivision **M**ultiplexing) technology. **OFDM** works by splitting the radio signal into multiple smaller sub-signals that are then transmitted simultaneously at different frequencies to the receiver. **OFDM** reduces the amount of **crosstalk** (interference) in signal transmissions. The D-Link *DWL-2000AP+* will automatically sense the best possible connection speed to ensure the greatest speed and range possible.

802.11g offers the most advanced network security features available today, including: *WPA*[1]*, 802.1x,*[2] *TKIP, AES and Pre-Shared Key mode.* These security features are explained in more detail in the *Introduction* and the *Features* section of this manual.

The DWL-2000AP+ is backwards compatible with 802.11b devices. This means that if you have an existing 802.11b network, the devices in that network will be compatible with 802.11g devices at speeds of up to 11Mbps in the 2.4GHz range.

1 *WPA will be available Q4 2003 as a free download*

2 *802.1x will be available Q4 2003 as a free download*

Wireless Basics *(continued)*

Installation Considerations

The D-Link *Air*Plus *X*treme *G+* DWL-2000AP+ lets you access your network, using a wireless connection, from virtually anywhere within its operating range. Keep in mind, however, that the number, thickness and location of walls, ceilings, or other objects that the wireless signals must pass through, may limit the range. Typical ranges vary depending on the types of materials and background RF (radio frequency) noise in your home or business. The key to maximizing wireless range is to follow these basic guidelines:

1. Keep the number of walls and ceilings between the DWL-2000AP+ and your receiving device (e.g., the DWL-G650+ or the DWL-650+) to a minimum -each wall or ceiling can reduce your D-Link Wireless product's range from 3-90 feet (1-30 meters.) Position your receiving devices so that the number of walls or ceilings is minimized.

2. Be aware of the direct line between routers and computers. A wall that is 1.5 feet thick (.5 meters), at a 45-degree angle appears to be almost 3 feet (1 meter) thick. At a 2-degree angle it looks over 42 feet (14 meters) thick! Position devices so that the signal will travel straight through a wall or ceiling (instead of at an angle) for better reception.

3. Building Materials can impede the wireless signal - a solid metal door or aluminum studs may have a negative effect on range. Try to position wireless devices and computers with wireless adapters so that the signal passes through drywall or open doorways and not other materials.

4. Keep your product away (at least 3-6 feet or 1-2 meters) from electrical devices or appliances that generate RF noise.

Getting Started

On the following pages we will show you an example of an **Infrastructure Network** incorporating the DWL-2000AP+.

An **Infrastructure** network contains an Access Point or a Wireless Router. The **Infrastructure Network** example shown on the following page contains the following D-Link network devices (your existing network may be comprised of other devices):

- A wireless Access Point -
  D-Link *Air*PlusXtreme G+ DWL-2000AP+

- A 4-port Ethernet Broadband Router - **D-Link DI-604**

- A laptop computer with a wireless adapter -
  D-Link *Air*PlusXtreme G+ DWL-G650+ or
  ***D-Link Air*Plus DWL-650+**

- A desktop computer with a wireless adapter -
  D-Link *Air*Plus*XtremeG+* DWL-G520+, 510,
  or **D-Link AirPlus DWL-520+**

- A Cable modem - **D-Link DCM-200**

Getting Started (continued)

Setting up a Wireless Infrastructure Network

② ①

Internet

Cable/DSL Modem

③ Router or Switch ④

DWL-2000AP+
2.4GHz Wireless Access Point

⑤

Computer 2
Desktop PC or Laptop
(Wireless Adapter Required)

⑥

Computer 1
Desktop PC or Laptop
(Wireless Adapter Required)
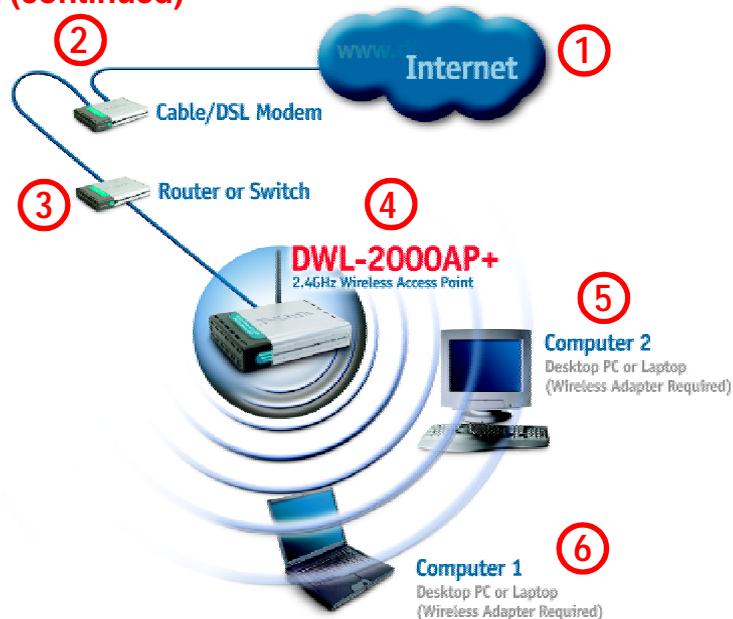
*Please remember that **D-Link AirXtremeG** wireless devices are pre-configured to connect together, right out of the box, with their default settings.*

For a typical wireless setup at home (as shown above), please do the following:

1 You will need broadband Internet access (a Cable or DSL-subscriber line into your home or office)

2 Consult with your Cable or DSL provider for proper installation of the modem

3 Connect the Cable or DSL modem to the DI-604 Ethernet Broadband Router (*see the printed Quick Installation Guide included with your router.*)

4 Connect the Ethernet Broadband Router to the DWL-2000AP+ (*See the printed Quick Installation Guide included with the DWL-2000AP+.*)

5 If you are connecting a desktop computer to your network, install the D-Link *Air*Plus *XtremeG+* DWL-G520+ wireless PCI adapter into an available PCI slot on your desktop computer. You may also install the DWL-520+.
(See the printed Quick Installation Guide included with the network adapter.)

6 Install the drivers for the D-Link DWL-G650+ wireless Cardbus adapter into a laptop computer. You may also install the DWL-650+.
(See the printed Quick Installation Guide included with the network adapter.) 13

Using the Configuration Menu

After you have completed the *Setup Wizard* (please see the *Quick Installation Guide* that came with the product) you can access the *Configuration* menu at any time by opening the web browser and typing in the IP Address of the DWL-2000AP+. The DWL-2000AP+ default IP Address is shown below:

■   Open the web browser
■   Type in the **IP Address** of the Router

Note: if you have changed the default IP Address assigned to the DWL-2000AP+, make sure to enter the correct IP Address.

■   Type **admin** in the **User Name** field

■   Leave the **Password** blank. *(However, if you have changed the password, please enter the correct password.)*

■   Click **OK**
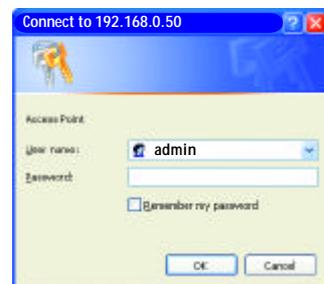
Home > Wizard

The **Home>Wizard** screen will appear. Please refer to the *Quick Installation Guide* for more information regarding the Setup Wizard.

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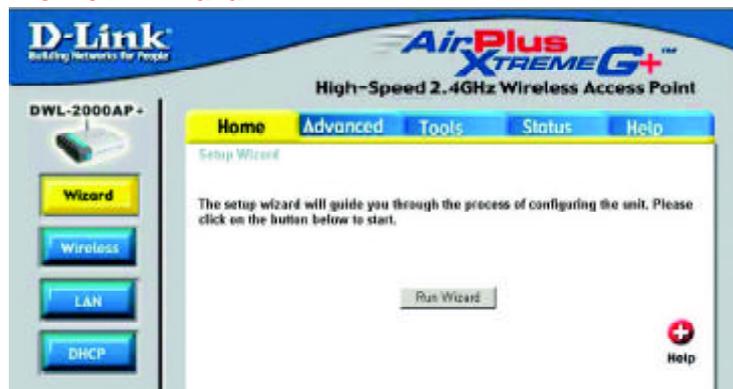
Using the Configuration Menu (continued)

Home > Wireless

SSID-   Service Set Identifier (SSID) is the name designated for a specific wireless local area network (WLAN). The SSID's factory default setting is **default.** The SSID can be easily changed to connect to an existing wireless network or to establish a new wireless network.

Channel-   **6** is the default channel. All devices on the network must share the same channel.

WEP-   Wired Equivalent Privacy (WEP) is a wireless security protocol for Wireless Local Area Networks (WLAN). WEP provides security by encrypting the data that is sent over the WLAN. Select **Enabled** or **Disabled. Disabled** is the default setting. *(Note: If you enable encryption on the DWL-2000AP+ make sure to also enable encryption on all the wireless clients or wireless connection will not be established.)*

WEP Encryption-   Select the level of encryption desired: 64-bit,128-bit, 256-bit

Key Type-   Select **HEX** or **ASCII**

> *Hexadecimal digits consist of the numbers 0-9 and the letters A-F*
>
> *ASCII (American Standard Code for Information Interchange) is a code for representing English letters as numbers from 0-127*

Keys 1-4-   Input up to 4 WEP keys; select the one you wish to use.

Apply-   Click **Apply** to save the changes.

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Using the Configuration Menu (continued)

Home > LAN
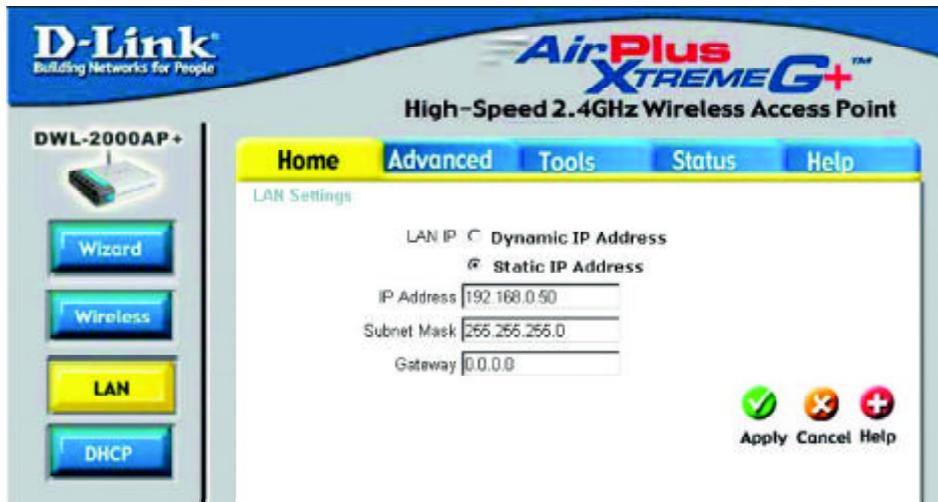
LAN is short for Local Area Network. This is considered your internal network. These are the IP settings of the LAN interface for the DWL-2000AP+. These settings may be referred to as Private settings. You may change the LAN IP address if needed. The LAN IP address is private to your internal network and cannot be seen on the Internet.

IP Address-   The IP address of the LAN interface. The default IP address is: **192.168.0.50**

Subnet Mask-   The subnet mask of the LAN interface.
The default subnet mask is **255.255.255.0**

Gateway-   This field is optional. Enter in the IP address of the router on your network.

Apply-   Click **Apply** to save the changes.

Using the Configuration Menu (continued)

Advanced > Mode
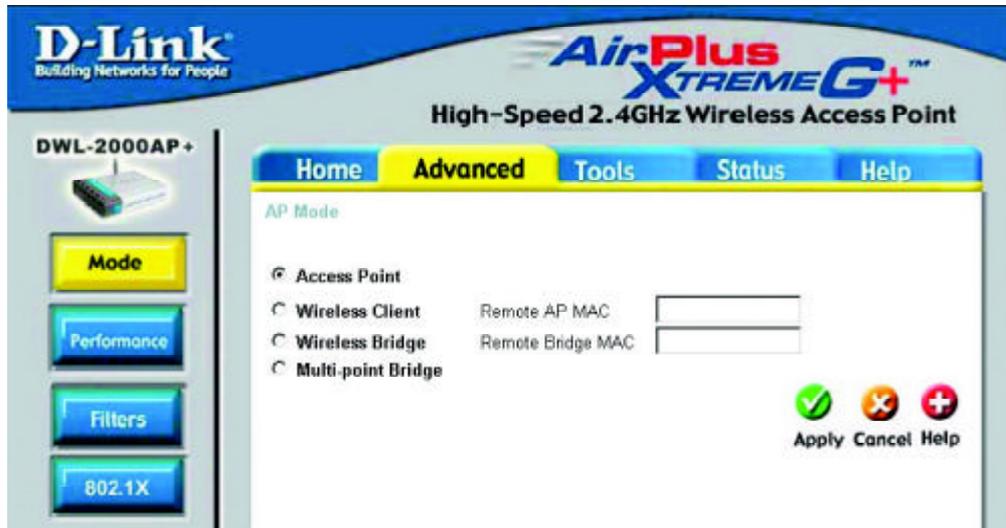
The DWL-2000AP+ can be configured to perform in any of four modes: a Wireless Access Point; a Wireless Client; a Wireless Bridge; or a Multi-Point Bridge.

1 **Access Point mode** is the default setting.
This mode is used to create a wireless LAN.

2 **Wireless Client mode** will transform any IEEE 802.3 Ethernet device (e.g., a computer, printer, etc.) into an 802.11b wireless client, if you are connecting to another DWL-2000AP+ when it is acting as an Access Point.

3 **Wireless Bridge mode** will allow you to connect two LANs together. The wireless bridge will only work with another DWL-2000AP+.

4 **Multi-Point Bridge mode** will allow you to connect multiple wireless LANs together. Other wireless LANs must be using DWL-2000AP+s.

Using the Configuration Menu (continued)

Advanced > Mode (continued)

Enter the *MAC address*
to configure the *Wireless Client* **and the** *Wireless Bridge* **modes**
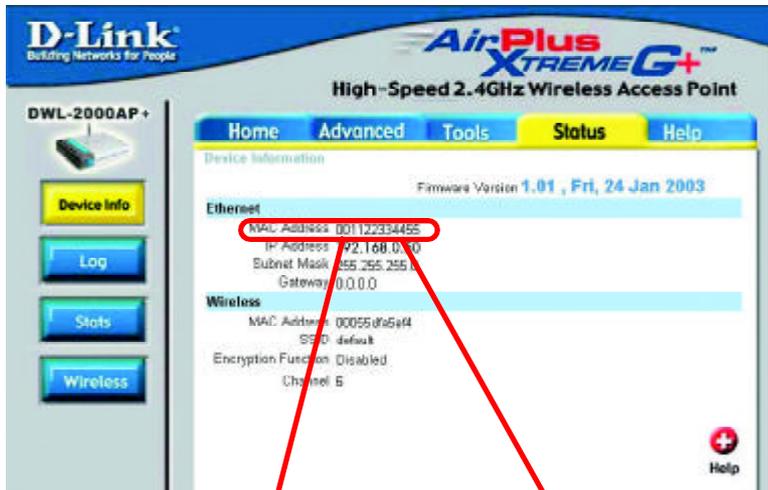
Wireless Client mode
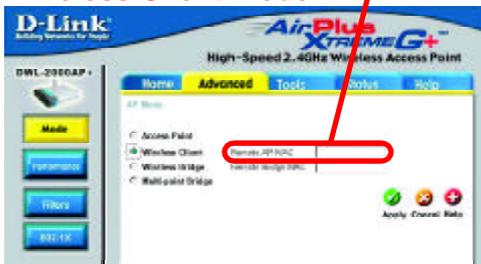
When using the DWL-2000AP+ in **Wireless Client** mode, you will enter the MAC address of the Remote AP.

Wireless Bridge mode
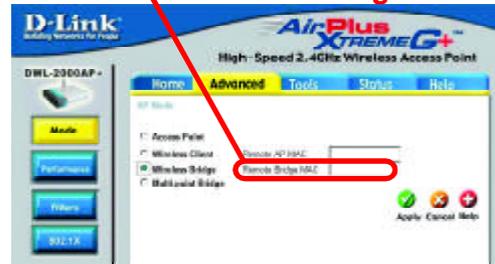
When using the DWL-2000AP+ in **Wireless Bridge** mode, you will enter the MAC address of the Remote Bridge.

Find the **MAC address** of the DWL-2000AP+ that is acting as a **Remote Access Point** or a **Remote Bridge**, by going to **Status > Device Info** in the configuration utility of the remote DWL-2000AP+. There you will find the MAC address as shown above.

MAC Address - Media Access Control Address
A unique hardware address that identifies a device on a network. It is assigned at the factory and cannot be changed. Usually you will find this address on a sticker on the device or packaging.

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Using the Configuration Menu (continued)

Advanced > Performance
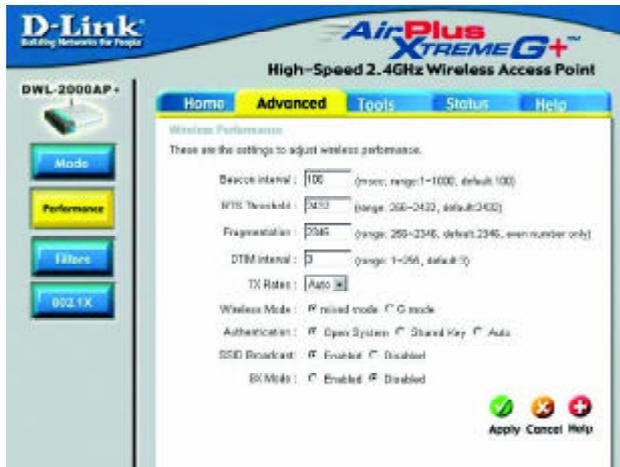
TX Rates- The DWL-2000AP+ will automatically sense the best possible speed when you select **Auto** (the default setting), or you can choose the data transfer rate: 54Mbps,48Mbps, 36Mbps, 24Mbps, 22Mbps18Mbps, 12Mbps, 11Mbps, 9Mbps,6Mbps, 5.5Mbps, 2Mbps, 1Mbps.

Beacon Interval- Beacons are packets sent by an Access Point to synchronize a wireless network. Specify a value. 100 is the default setting and is recommended.

RTS Threshold- This value should remain at its default setting of 2432. If inconsistent data flow is a problem, only a minor modification should be made.

Fragmentation- The fragmentation threshold, which is specified in bytes, determines whether packets will be fragmented. Packets exceeding the 2346 byte setting will be fragmented before transmission. 2346 is the default setting

DTIM interval- *(Delivery Traffic Indication Message)*- **3** is the default setting. DTIM is a countdown informing clients of the next window for listening to broadcast and multicast messages.

8X Mode - By activating this mode, the device can transmit and receive data up to eight (8) times of the 802.11b speed with a similar 8X device.

Mixed Mode - This mode support all range of data transmission and receiving mode, including 802.11b, 802.11b+, 802.11g and 802.11g+ .

Authentication- **Open System** - communicates the key across the network
Shared Key - devices must have identical WEP settings to communicate

Apply- Click **Apply** to save changes

Using the Configuration Menu (continued)

Tools> Admin
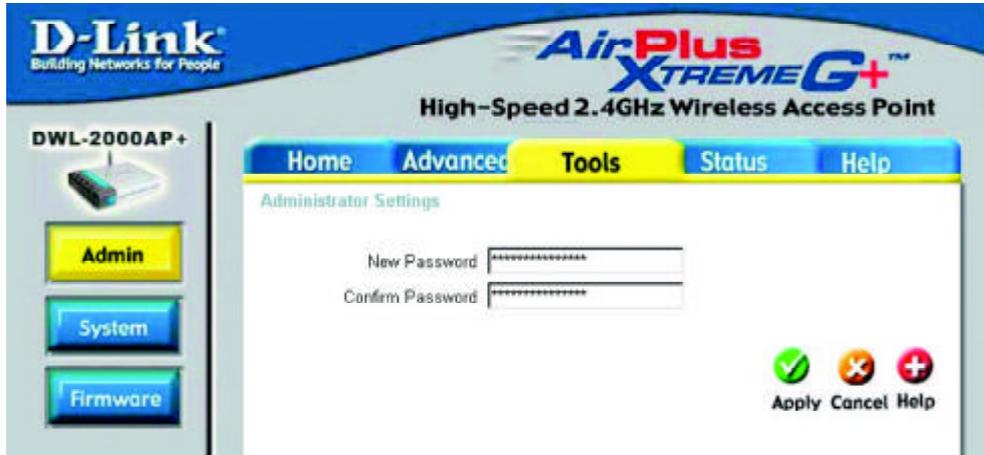
At this page, the DWL-2000AP+ administrator can change the system password.

Password-   Enter the password and enter again to confirm

Apply-   Click **Apply** to save the changes

Using the Configuration Menu (continued)

Tools > System
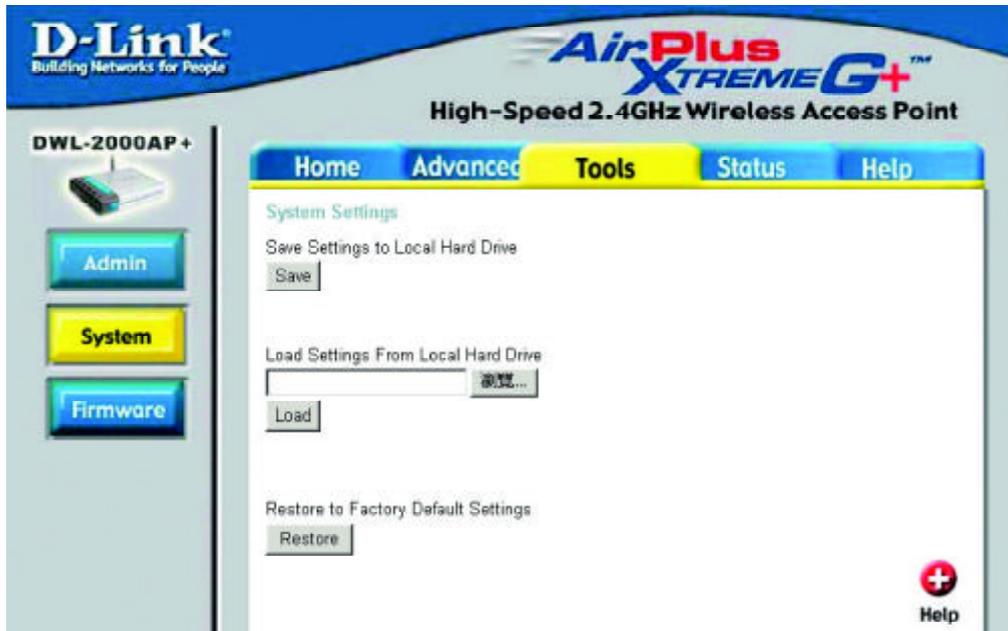
The current system settings can be saved as a file onto the local hard drive. The saved file or any other saved setting file can be loaded back on the DWL-2000AP+. To reload a system settings file, click on **Browse** to browse the local hard drive and locate the system file to be used. You may also reset the *Wireless Access Point* back to factory settings by clicking on **Restore.**

Save Settings to
Local Hard Drive-   Click **Save** to save the current settings to the local Hard Drive

Load Settings from
Local Hard Drive-   Click **Browse** to find the settings, then click **Load**

Restore to Factory
Default Settings-   Click **Restore** to restore the factory default settings

Using the Configuration Menu (continued)

You can upgrade the firmware of the Access Point here. Make sure the firmware you want to use is on the local hard drive of the computer. Click on **Browse** to browse the local hard drive and locate the firmware to be used for the update. Please check the D-Link support site for firmware updates at http://support.dlink.com. You can download firmware upgrades to your hard drive from the D-Link support site.

Firmware Upgrade- Click on the link in this screen to find out if there is an updated firmware; if so, download the new firmware to your hard drive.

Browse- After you have downloaded the new firmware, click **Browse** in this window to locate the firmware update on your hard drive. Click **Apply** to complete the firmware upgrade.

Using the Configuration Menu (continued)

Status > Device Info

This page displays the current information about the DWL-2000AP+, such as the as-signed IP Address and the wireless settings.

Status > Log
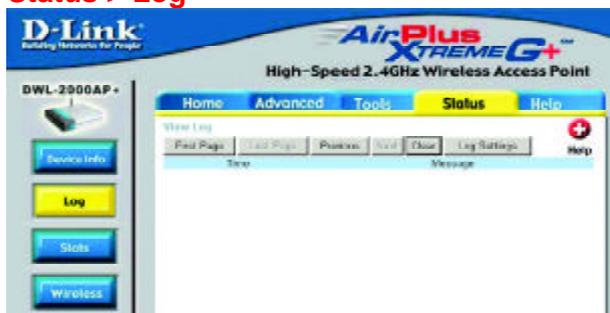
The Log keeps a running log of events and activities occurring on the Access Point. If the device is rebooted, the logs are automatically cleared. You may save the log files under Log Settings.

View Log-

> **First Page -** The first page of the log
> **Last Page -** The last page of the log
> **Previous -** Moves back one log page
> **Next -** Moves forward one log page
> **Clear -** Clears the logs completely
> **Log Settings -** Brings up the page to configure the log
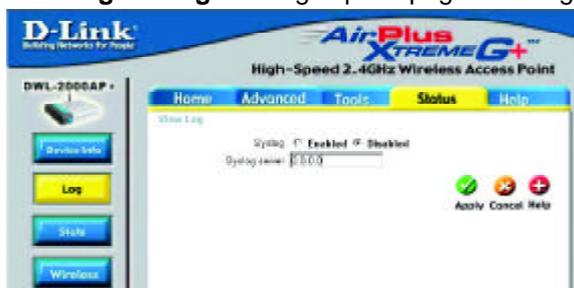
When you click on **Log Settings** in the previous window, the window at left appears. Select **Enabled** to save the log. In the **Syslog Server** field, input the IP Address of the computer on the network to which you wish to save the log settings. Click **Apply** to save the changes.

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Using the Configuration Menu (continued)

Status > Stats

The screen above displays theTraffic Statistics. Here you can view the amount of pack-ets that pass through the DWL-2000AP+. The traffic counter will reset if the device is rebooted.

Help

At the **Help** screen you can select from **Help** files displayed above.

Networking Basics

Using the Network Setup Wizard in Windows XP

In this section you will learn how to establish a network at home or work, using **Microsoft Windows XP.**

Note: Please refer to websites such as http://www.homenethelp.com and http://www.microsoft.com/windows2000 for information about networking computers using Windows 2000, ME or 98.

Go to **Start>Control Panel>Network Connections**
Select **Set up a home or small office network**

When this screen appears, Click **Next.**

Networking Basics (continued)

Please follow all the instructions in this window:

Network Setup Wizard

Before you continue...

Before you continue, review the checklist for creating a network.

Then, complete the following steps:

- Install the network cards, modems, and cables.
- Turn on all computers, printers, and external modems.
- Connect to the Internet.

When you click Next, the wizard will search for a shared Internet connection on your network.

`< Back`   `Next >`   `Cancel`

Click **Next**

In the following window, select the best description of your computer. If your computer connects to the internet through a gateway/router, select the second option as shown.

Network Setup Wizard

Select a connection method.

Select the statement that best describes this computer:

○ This computer connects directly to the Internet. The other computers on my network connect to the Internet through this computer.
  View an example.

◉ This computer connects to the Internet through another computer on my network or through a residential gateway.
  View an example.

○ Other

Learn more about home or small office network configurations.

`< Back`   `Next >`   `Cancel`

Click **Next**

Networking Basics (continued)

Enter a **Computer description** and a **Computer name** (optional.)
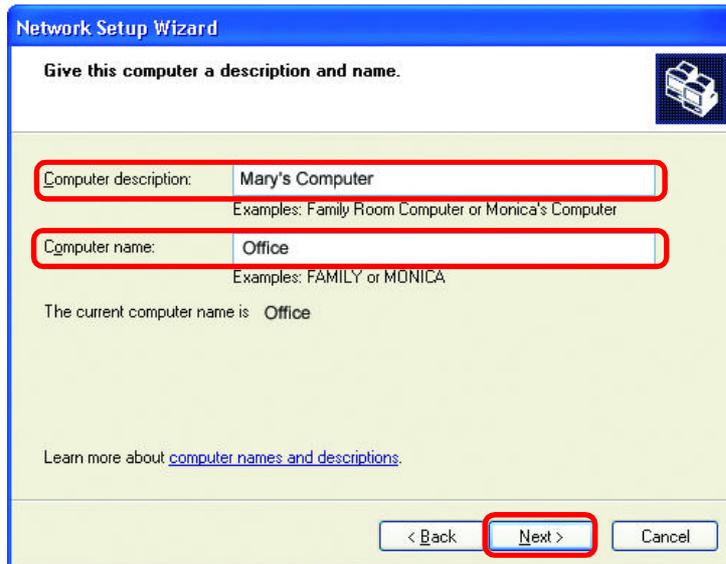
Click **Next**

Enter a **Workgroup** name. All computers on your network should have the same **Workgroup name.**
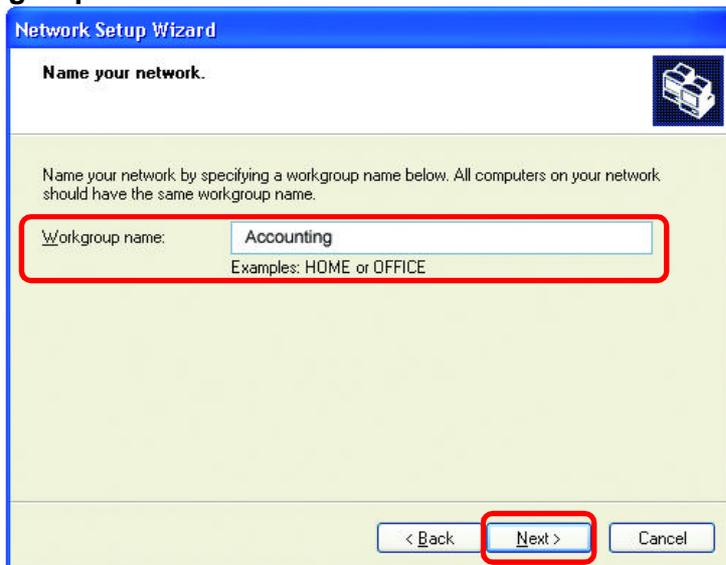

Click **Next**

Networking Basics (continued)

Please wait while the **Network Setup Wizard** applies the changes.
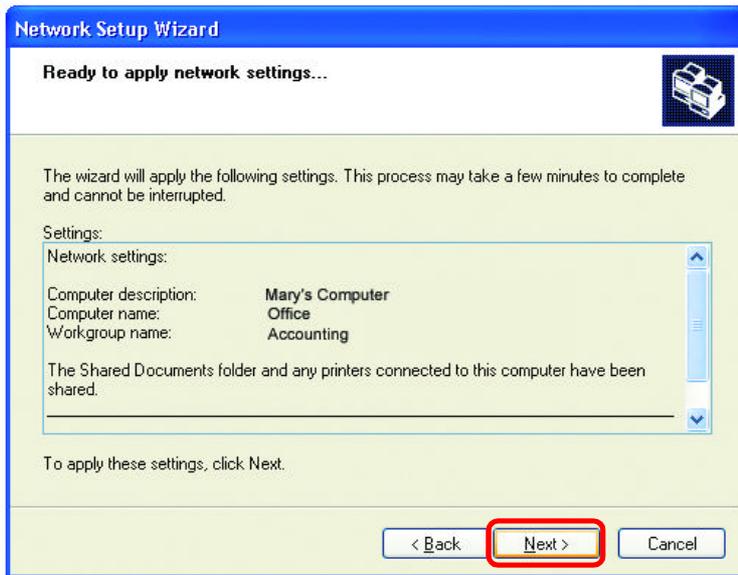
When the changes are complete, Click **Next**.

Please wait while the **Network Setup Wizard** configures the computer. This may take a few minutes.
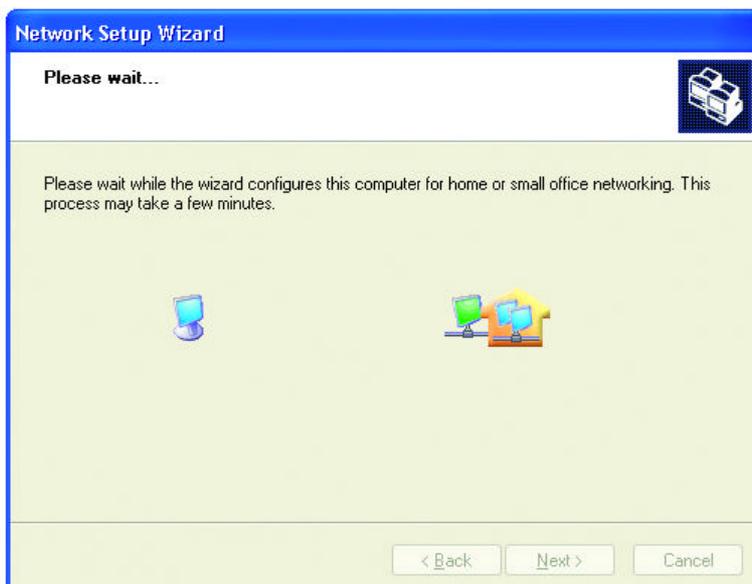
Networking Basics (continued)

In the window below, select the option that fits your needs. In this example, **Create a Network Setup Disk** has been selected. You will run this disk on each of the computers on your network. Click **Next**.

Insert a disk into the Floppy Disk Drive, in this case drive **A.**

Click **Next**
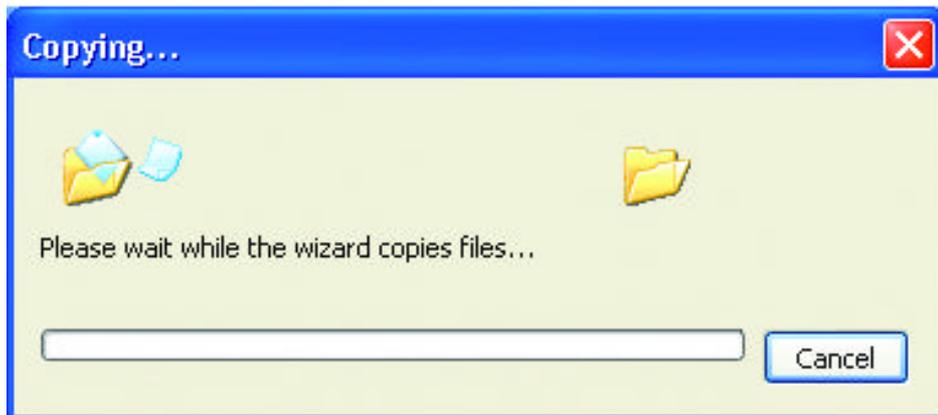
Please read the information under **Here's how** in the screen below. After you complete the **Network Setup Wizard** you will use the **Network Setup Disk** to run the **Network Setup Wizard** once on each of the computers on your network. Click **Next.**
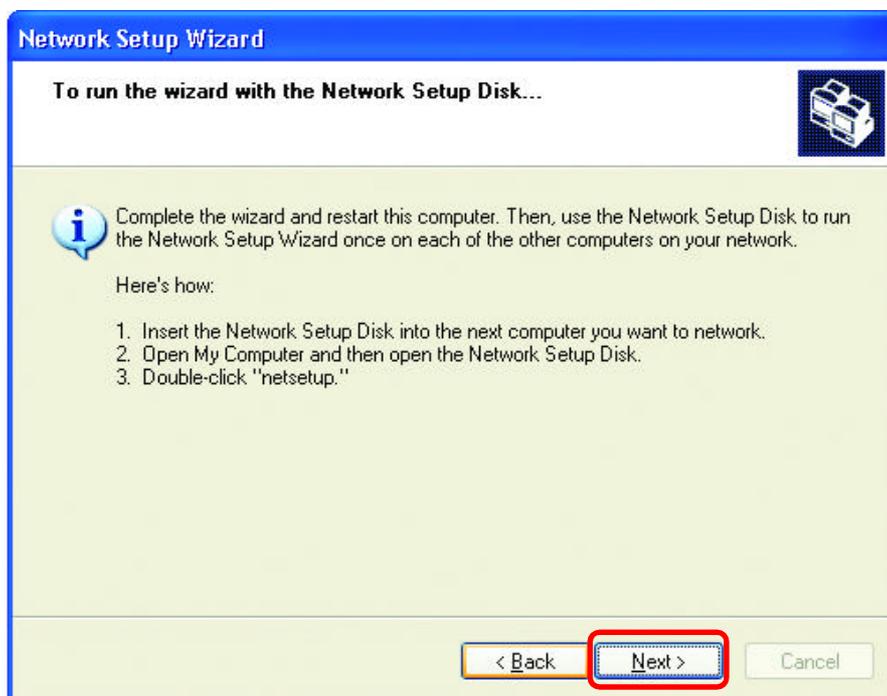
Networking Basics (continued)

Please read the information on this screen, then click **Finish** to complete the **Network Setup Wizard**.
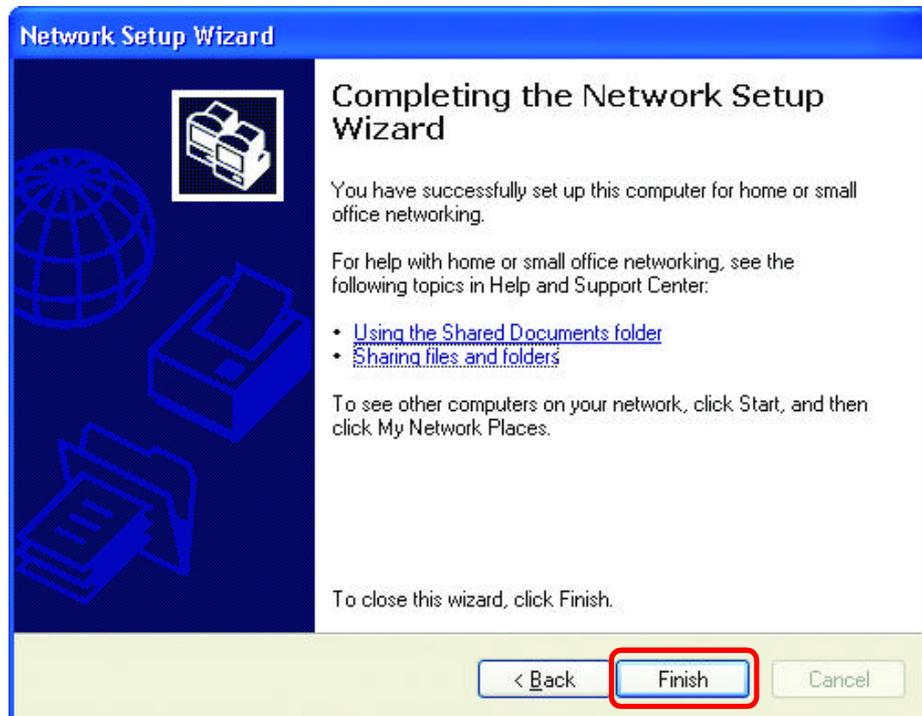
The new settings will take effect when you restart the computer. Click **Yes** to restart the computer.

You have completed configuring this computer. Next, you will need to run the **Network Setup Disk** on all the other computers on your network. After running the **Network Setup Disk** on all your computers, your new wireless network will be ready to use.

Naming your Computer

To name your computer, please follow these directions:(In **Windows XP**)

- ■ Click **Start** (in the lower left corner of the screen)

- ■ **Right-click** on **My Computer**

- ■ Select **Properties** and Click
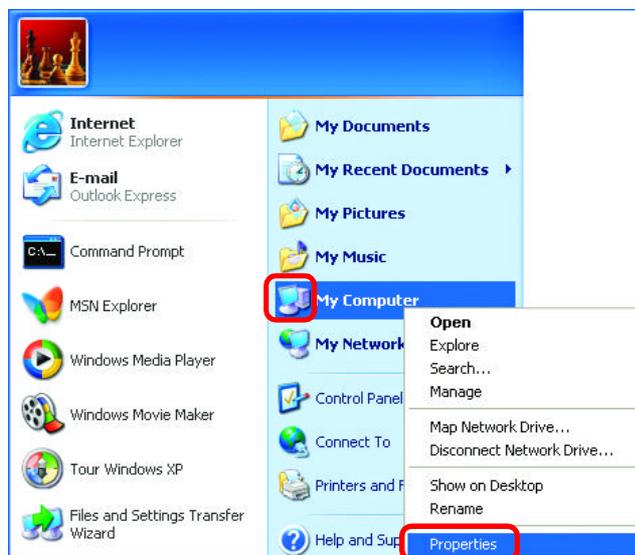
- ■ Select the **Computer Name Tab** in the System Properties window.

- ■ You may enter a **Computer Description** if you wish; this field is optional.

- ■ To rename the computer and join a domain, Click **Change**.

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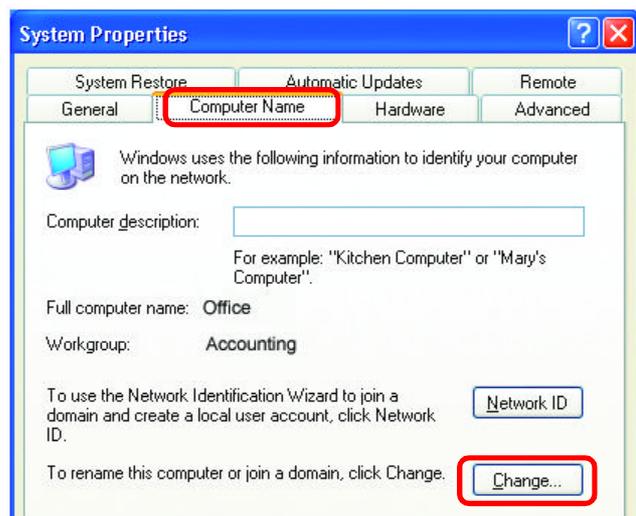
Networking Basics (continued)
Naming your Computer

- In this window, enter the **Computer name**

- Select **Workgroup** and enter the name of the **Workgroup**

- All computers on your network must have the same **Workgroup** name.

- Click **OK**

Computer Name Changes

You can change the name and the membership of this computer. Changes may affect access to network resources.

Computer name:
Office

Full computer name:
Office

More...

Member of
- ○ Domain:
- ⦿ Workgroup:
  Accounting

OK   Cancel
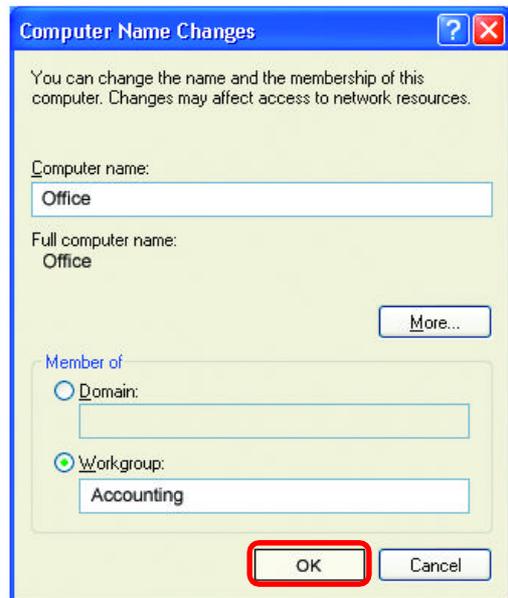
Checking the IP Address in Windows XP

The adapter-equipped computers in your network must be in the same IP Address range (see *Getting Started* in this manual for a definition of IP Address Range.) To check on the IP Address of the adapter, please do the following:

- Right-click on the *Local Area Connection icon* in the task bar

- Click on **Status**

Disable
Status
Repair

View Available Wireless Networks

Open Network Connections

3:05 PM

Networking Basics (continued)
Checking the IP Address in Windows XP

This window will appear.

- Click the **Support tab**

- Click **Close**
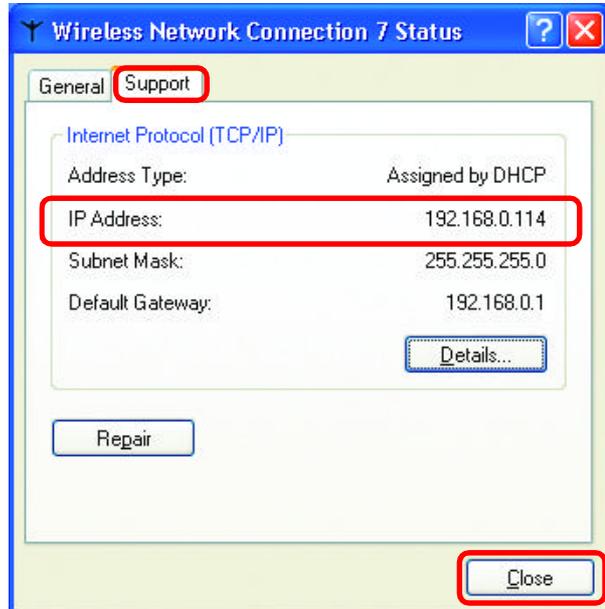
Assigning a Static IP Address in Windows XP/2000

Note: Residential Gateways/Broadband Routers will automatically assign IP Addresses to the computers on the network, using DHCP (Dynamic Host Configuration Protocol) technology. If you are using a DHCP-capable Gateway/Router you will not need to assign Static IP Addresses.

If you are not using a DHCP capable Gateway/Router, or you need to assign a Static IP Address, please follow these instructions:

- Go to **Start**

- Double-click on **Control Panel**
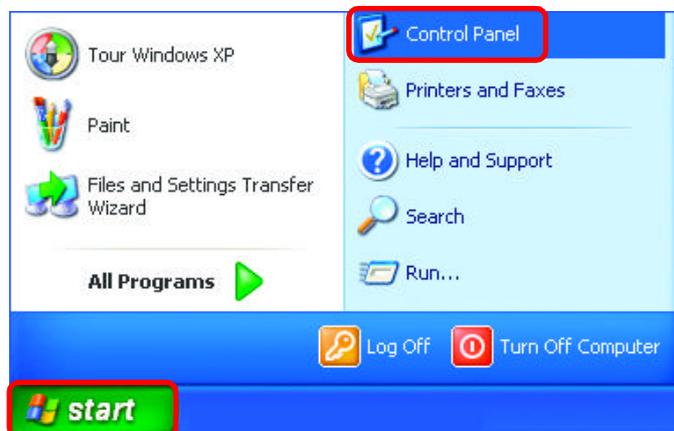
- ■ Double-click on **Network Connections**
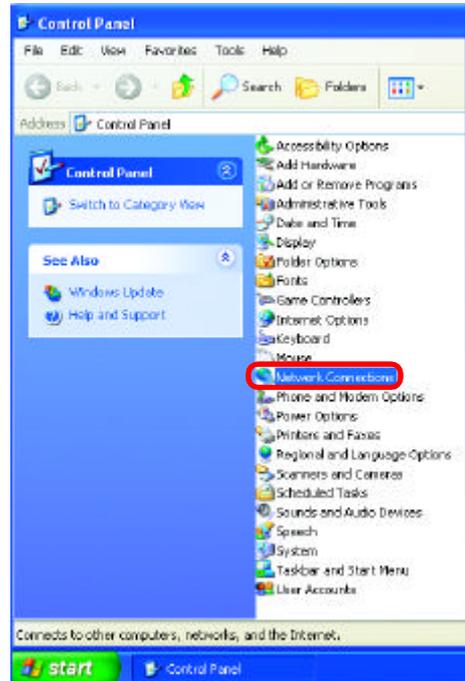
- ■ Right-click on **Local Area Connections**

- ■ Double-click on **Properties**
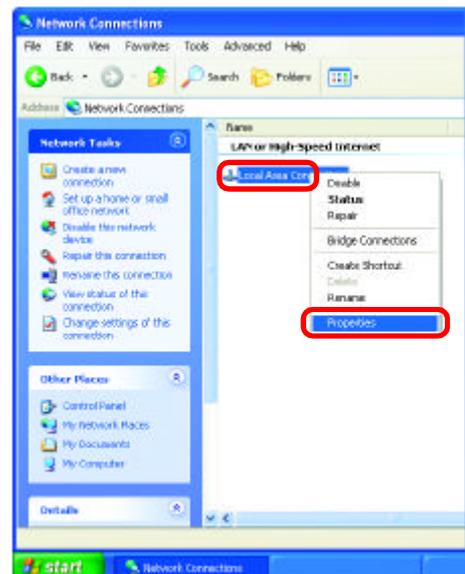
Networking Basics (continued)
Assigning a Static IP Address in <u>Windows XP/2000</u>

- Click on **Internet Protocol (TCP/IP)**

- Click **Properties**

- Input your **IP Address and subnet mask.** (The IP Addresses on your network must be within the same range. For example, if one computer has an IP Address of 192. 168.0.2, the other computers should have IP Addresses that are sequential, like 192.168.0. 3 and 192.168.0.4. The subnet mask must be the same for all the computers on the network.)

- Input your **DNS server addresses. (Note: If you are entering a DNS server, you must enter the IP Address of the Default Gateway.)**

The DNS server information will be supplied by your ISP (Internet Service Provider.)

- Click **OK**
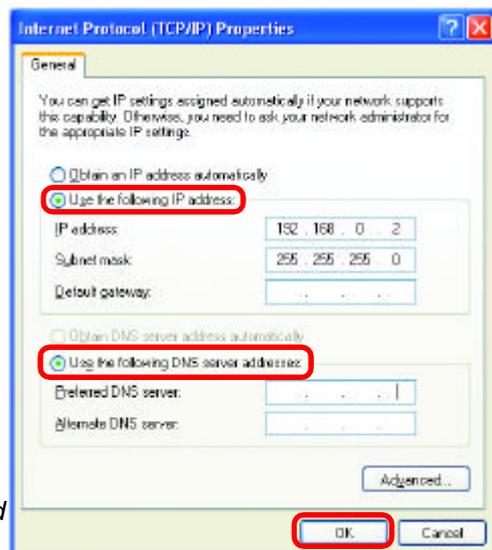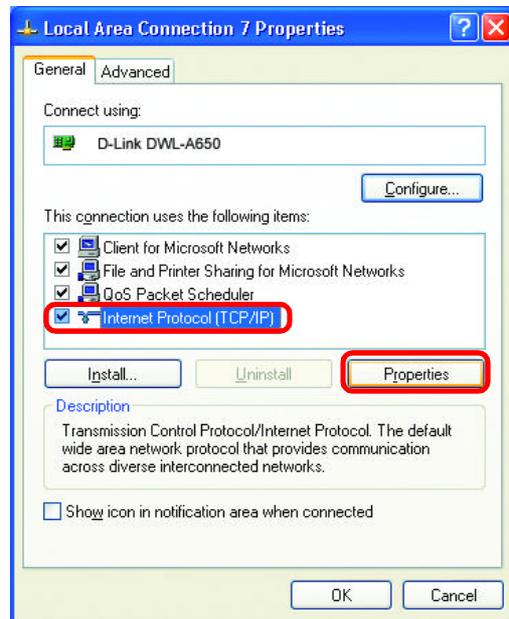
Networking Basics (continued)
Assigning a Static IP Address with <u>Macintosh OSX</u>

■ Go to the **Apple Menu** and se-
   lect **System Preferences**

■ Click on **Network**

■ Select **Built-in Ethernet** in
   the **Show** pull-down menu

■ Select **Manually** in the
   Configure pull-down
   menu
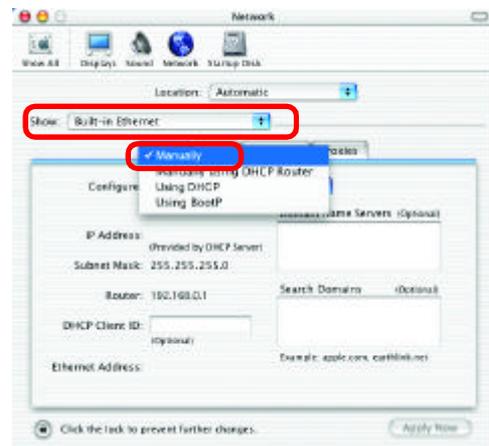
■ Input the **Static IP
   Address**, the **Subnet
   Mask** and the **Router IP
   Address** in the appropri-
   ate fields
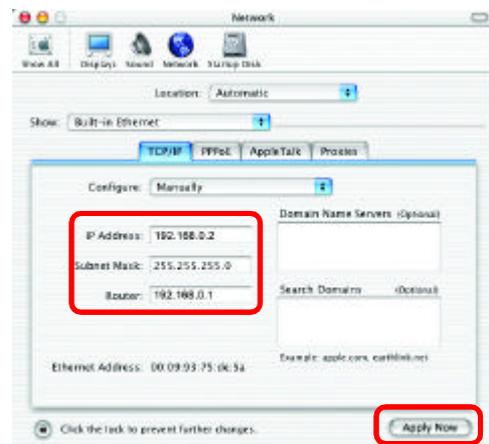
■ Click **Apply Now**

Networking Basics (continued)
Selecting a Dynamic IP Address with <u>Macintosh OSX</u>

- Go to the **Apple Menu** and se-lect **System Preferences**

- Click on **Network**
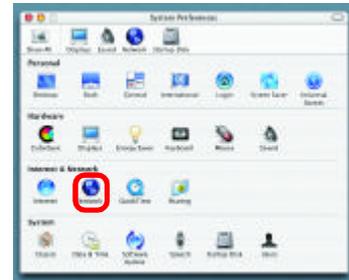
- Select **Built-in Ethernet** in the **Show** pull-down menu

- Select **Using DHCP** in the **Configure** pull-down menu
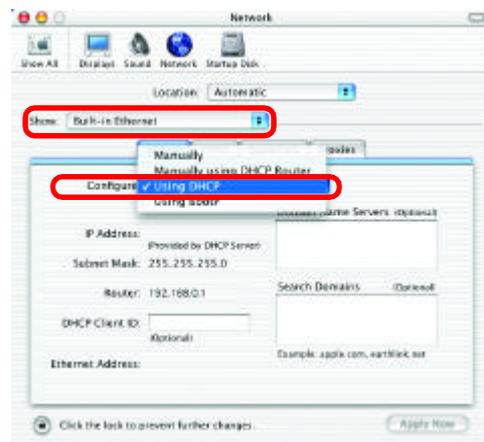
- Click **Apply Now**

- The **IP Address, Subnet mask**, and the **Router's IP Address** will appear in a few seconds
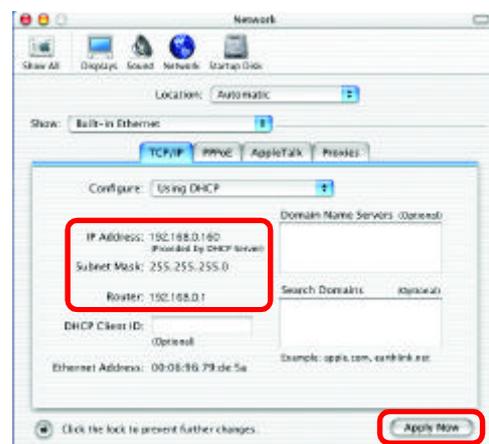
Checking the Wireless Connection by Pinging in Windows XP and 2000

- Go to **Start** > **Run** > type **cmd**. A window similar to this one will appear. Type **ping xxx.xxx.xxx.xxx**, where **xxx** is the **IP Address** of the Wireless Router or Access Point. A good wireless connection will show four replies from the Wireless Router or Acess Point, as shown.

Checking the Wireless Connection by Pinging in Windows Me and 98

- Go to **Start** > **Run** > type **command**. A window similar to this will appear. Type **ping xxx.xxx.xxx.xxx** where **xxx** is the **IP Address** of the Wireless Router or Access Point. A good wireless connection will show four replies from the wireless router or access point, as shown.
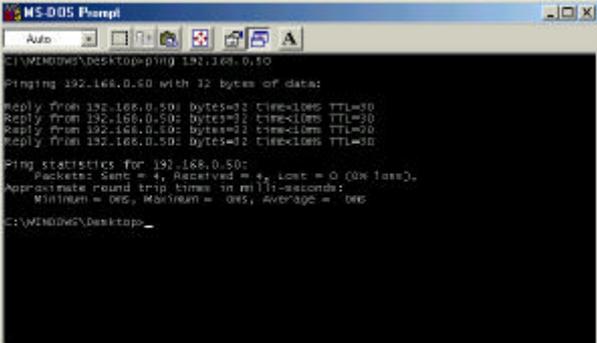
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Troubleshooting

This Chapter provides solutions to problems that can occur during the installation and operation of the DWL-2000AP+ Wireless Access Point. We cover various aspects of the network setup, including the network adapters. Please read the following if you are having problems.

> *Note: It is recommended that you use an Ethernet connection to configure the DWL-2000AP Wireless Access Point.*

1. The computer used to configure the DWL-2000AP+ cannot access the Configuration menu.

- Check that the **Ethernet LED** on the DWL-2000AP+ is **ON**. If the **LED** is not **ON**, check that the cable for the Ethernet connection is securely inserted.

- Check that the Ethernet Adapter is working properly. Please see item 3 (***Check that the drivers for the network adapters are installed properly***) in this **Troubleshooting** section to check that the drivers are loaded properly.

- Check that the **IP Address** is in the same range and subnet as the DWL-2000AP+. Please see ***Checking the IP Address in Windows XP*** in the **Networking Basics** section of this manual.

Note: The IP Address of the DWL-2000AP+ is 192.168.0.50. All the computers on the network must have a unique IP Address in the same range, e.g., 192.168.0.x. Any computers that have identical IP Addresses will not be visible on the network. They must all have the same subnet mask, e.g., 255.255.255.0

- Do a **Ping test** to make sure that the DWL-2000AP+ is responding. Go to **Start**>**Run**>Type **Command**>Type **ping 192.168.0.50.** A successful ping will show four replies.
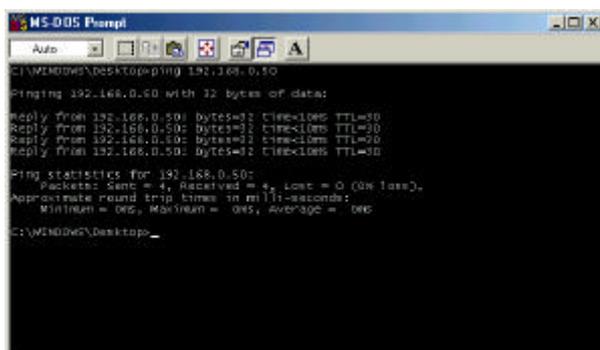
Note: If you have changed the default IP Address, make sure to ping the correct IP Address assigned to the DWL-2000AP+.

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Troubleshooting (continued)

2. The wireless client cannot access the Internet in the Infrastructure mode.

Make sure the wireless client is associated and joined with the correct Access Point. To check this connection: **Right-click** on the **Local Area Connection icon** in the taskbar> select **View Available Wireless Networks**. The **Connect to Wireless Network** screen will appear. Please make sure you have selected the correct available network, as shown in the illustration below.
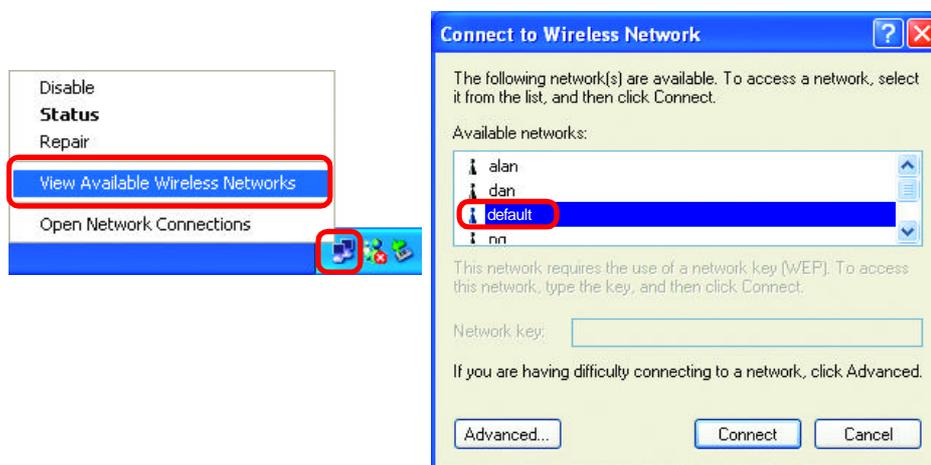
- Check that the **IP Address** assigned to the wireless adapter is within the same **IP Address range** as the access point and gateway. *(Since the DWL-2000AP has an IP Address of 192.168.0.50, wireless adapters must have an IP Address in the same range, e.g., 192.168.0.x. Each device must have a unique IP Address; no two devices may have the same IP Address. The subnet mask must be the same for all the computers on the network.)* To check the **IP Address** assigned to the wireless adapter, **double-click** on the **Local Area Connection icon** in the taskbar > select the **Support tab** and the **IP Address** will be displayed. *(Please refer to Checking the IP Address in the Networking Basics section of this manual.)*

- If it is necessary to assign a **Static IP Address** to the wireless adapter, please refer to the appropriate section in **Networking Basics**. If you are entering a **DNS Server address** you must also enter the **Default Gateway Address.** *(Remember that if you have a DHCP-capable router, you will not need to assign a Static IP Address. See Networking Basics: Assigning a Static IP Address.)*

Troubleshooting (continued)

2. The wireless client cannot access the Internet in the Infrastructure mode. *(continued)*

- Check to make sure that the Router in your network is functioning properly by pinging it. If the router is not functioning properly, it will not connect to the Internet. If you need to find out how to ping network devices, please refer to "Checking the Wireless Connection by pinging" in the *Networking Basics* section of this manual.

- Check to make sure that the DNS server in your network is functioning properly by pinging it. If the DNS server is not functioning properly, you may be unable to access the Internet. Typically, your ISP (Internet Service Provider) will be able to give you the DNS server information. If you need to find out how to ping network devices, please refer to "Checking the Wireless Connection by pinging" in the *Networking Basics* section of this manual.

3. Check that the drivers for the network adapters are installed properly.

You may be using different network adapters than those illustrated here, but this procedure will remain the same, regardless of the type of network adapters you are using.

- Go to **Start > My Computer > Properties**

- **Select** the **Hardware Tab**

- Click **Device Manager**

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Troubleshooting (continued)

- Double-click on **Network Adapters**

- Right-click on **D-Link *Air*Plus DWL-G650+ Wireless Cardbus Adapter** (In this example we use the DWL-G650+; you may be using other network adapters, but the procedure will remain the same.)

- Select **Properties** to check that the drivers are installed properly

- Look under **Device Status** to check that the device is working properly

- Click **OK**
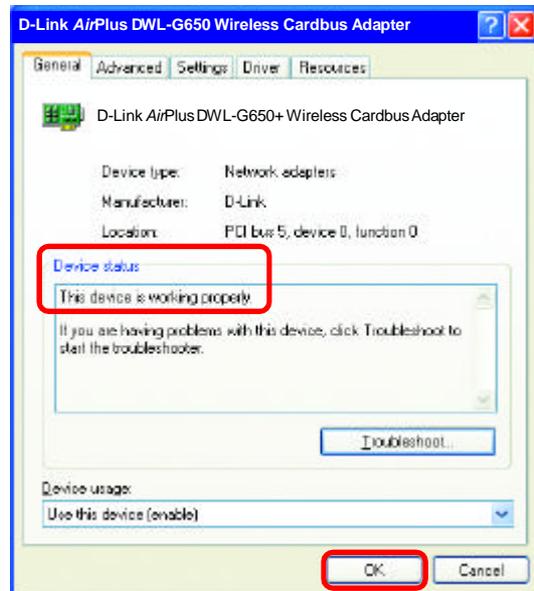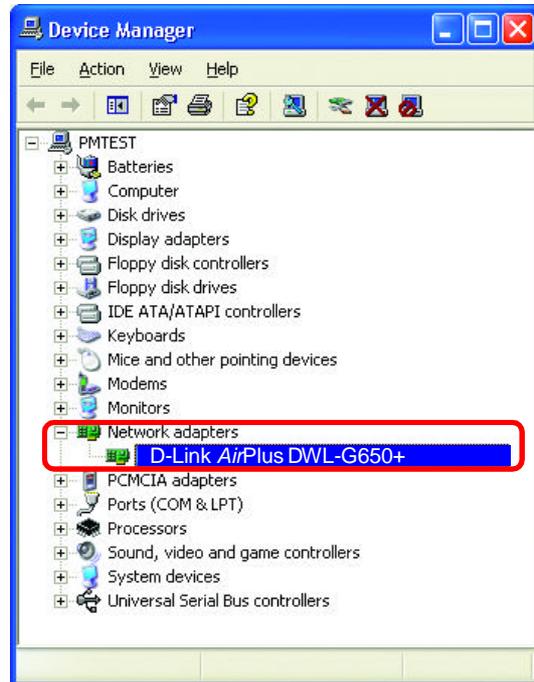
Troubleshooting (continued)

4. What variables may cause my wireless products to lose reception?

D-Link products let you access your network from virtually anywhere you want. However, the positioning of the products within your environment will affect the wireless range. Please refer to **Installation Considerations** in the **Wireless Basics** section of this manual for further information about the most advantageous placement of your D-Link wireless products.

5. Why does my wireless connection keep dropping?

- Antenna Orientation- Try different antenna orientations for the DWL-2000AP+. Try to keep the antenna at least 6 inches away from the wall or other objects.

- If you are using 2.4GHz cordless phones, X-10 equipment or other home security systems, ceiling fans, and lights, your wireless connection will degrade dramatically or drop altogether. Try changing the Channel on your Router, Access Point and Wireless adapter to a different Channel to avoid interference.

- Keep your product away (at least 3-6 feet) from electrical devices that generate RF noise, like microwaves, Monitors, electric motors, etc.

- When deploying several access points and wireless devices, please make sure that access points in close proximity do not have overlapping channels. Nearby access points should be assigned channels that are at least 4 channels apart to prevent interference. For example, with a group of 3 access points you could assign the first to channel 1, the second to channel 6, and the third to channel 11.

6. Why can't I get a wireless connection?

If you have enabled Encryption on the DWL-2000AP+, you must also enable encryption on all wireless clients in order to establish a wireless connection.

- The Encryption settings are: 64 or 128bit or 256bit. Make sure that the encryption bit level is the same on the Access Point and the Wireless Client.

- Make sure that the SSID on the Access Point and the Wireless Client are exactly the same. If they are not, wireless connection will not be established.

- Move the DWL-2000AP+ and the wireless client into the same room and then test the wireless connection.

- Disable all security settings. (WEP, MAC Address Control)

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Troubleshooting (continued)

6. Why can't I get a wireless connection? (continued)

■ Turn off your DWL-2000AP+ and the client. Turn the DWL-2000AP+ back on again, and then turn on the client.

■ Make sure that all devices are set to **Infrastructure** mode.

■ Check that the LED indicators are indicating normal activity. If not, check that the AC power and Ethernet cables are firmly connected.

■ Check that the IP Address, subnet mask, and gateway settings are correctly entered for the network.

■ If you are using 2.4GHz cordless phones, X-10 equipment or other home security systems, ceiling fans, and lights, your wireless connection will degrade dramatically or drop altogether. Try changing the Channel on your DWL-2000AP+, and on all the devices in your network to avoid interference.

■ Keep your product away (at least 3-6 feet) from electrical devices that generate RF noise, like microwaves, Monitors, electric motors, etc.

7. I forgot my encryption key.

■ Reset the DWL-2000AP+ to its factory default settings and restore the other devices on your network to their default settings. You may do this by pressing the Reset button on the back of the unit. You will lose the current configuration settings.

Troubleshooting (continued)

8. Resetting the DWL-2000AP+ to Factory Default Settings

After you have tried other methods for troubleshooting your network, you may choose to **Reset** the DWL-2000AP+ to the factory default settings.
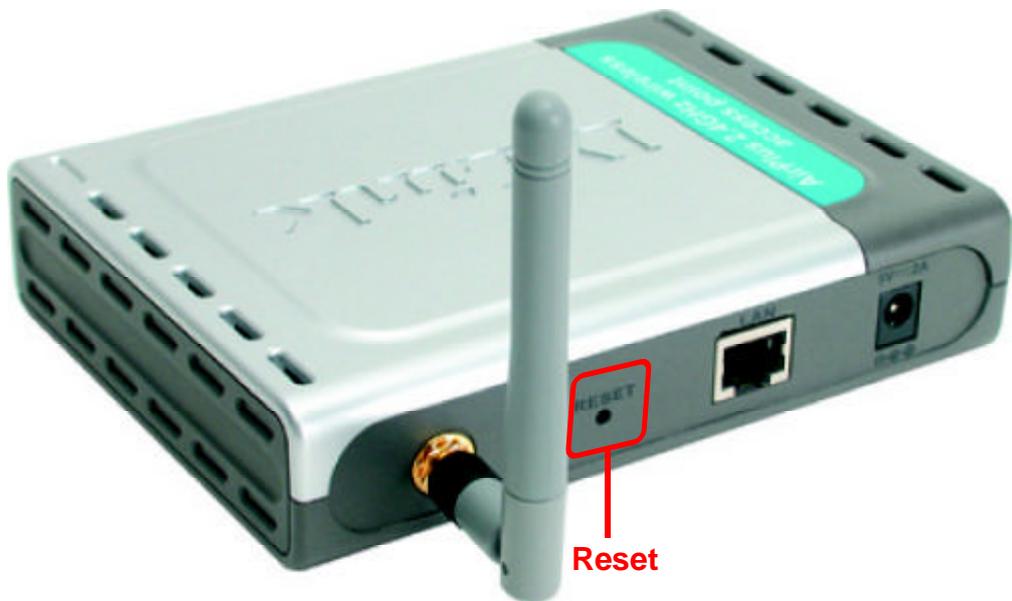
Reset

To hard-reset the D-Link DWL-2000AP+ to the Factory Default Settings, please do the following:

- Locate the **Reset** button on the back of the DWL-2000AP+

- Use a paper clip to press the **Reset** button

- Hold for about 5 seconds and then release

- After the DWL-2000AP+ reboots (this may take a few minutes) it will be reset to the factory **Default** settings

Technical Specifications

Standards

- IEEE 802.11g
- IEEE 802.11
- IEEE 802.11b
- IEEE 802.3
- IEEE 802.3u

Device Management

- Web-Based- Internet Explorer v6 or later; Netscape Navigator v6 or later; or other Java-enabled browsers
- DHCP Server and Client

Wireless Operating Range

- Indoors – up to 328 feet (100 meters)
- Outdoors – up to 1312 feet (400 meters)

Temperature

- Operating: 32ºF to 149ºF (0ºC to 55ºC)
- Storing: 4ºF to 167ºF (-20ºC to 75ºC)

Humidity:

- 95% maximum (non-condensing)

Safety and Emissions:

- FCC
- UL

Wireless Frequency Range:

- 2.4GHz to 2.4835GHz

Wireless Data Rates with Automatic Fallback:

- 54 Mbps
- 48 Mbps
- 36 Mbps
- 24 Mbps
- 22 Mbps
- 18 Mbps
- 12 Mbps
- 11 Mbps
- 9 Mbps
- 6 Mbps
- 5.5 Mbps
- 2 Mbps
- 1 Mbps

Technical Specifications (continued)

Receiver Sensitivity:

- 54Mbps OFDM, 10% PER, -68dBm
- 48Mbps OFDM, 10% PER, -68dBm
- 36Mbps OFDM, 10% PER, -75dBm
- 24Mbps OFDM, 10% PER, -79dBm
- 22Mbps PBCC, 8% PER, -80dBm
- 18Mbps OFDM, 10% PER, -82dBm
- 12Mbps OFDM, 10% PER, -84dBm
- 11Mbps CCK, 8% PER, -82dBm
- 9Mbps OFDM, 10% PER, -87dBm
- 6Mbps OFDM, 10% PER, -88dBm
- 5.5Mbps CCK, 8% PER, -85dBm
- 2Mbps QPSK, 8% PER, -86dBm
- 1Mbps BPSK, 8% PER, -89dBm

Physical Dimensions:

- L = 5.6 inches (142mm)
- W = 4.3 inches (109mm)
- H = 1.2 inches (31mm)

Wireless Transmit Power:

- 11g: 14dBm typical
- 11b: 16dBm typical

Security:

- 802.1x
- WPA*-WiFi Protected Access
  (64-,128-,256-WEP with TKIP, MIC, IV Expansion, Shared Key
   Authentication)

External Antenna Type:

- 2.0dBm gain with reverse SMA connector

Modulation Technology:

- Orthogonal Frequency Division Multiplexing (OFDM)

- Complementary Code Keying (CCK)

- Complementary Code Keying (PBCC)

WPA will be available Q4 2003

Technical Specifications (continued)

Media Access Control:

- CSMA/CA with ACK

Power Input:

- Ext. Power Supply DC 5V, 2.5A

Weight:

- .44 lbs. (200 g)

Technical Support

You can find software updates and user documentation on the D-Link website.

D-Link provides free technical support for customers within the United States and within Canada for the duration of the warranty period on this product.

U.S. and Canadian customers can contact D-Link technical support through our web site, or by phone.

Tech Support for customers within the United States:

D-Link Technical Support over the Telephone:
(877) 453-5465
24 hours a day, seven days a week.

D-Link Technical Support over the Internet:
http://support.dlink.com
email:support@dlink.com

Tech Support for customers within Canada:

D-Link Technical Support over the Telephone:
(800) 361-5265
Monday to Friday 8:30am to 9:00pm EST

D-Link Technical Support over the Internet:
http://support.dlink.ca
email:support@dlink.ca

Warranty and Registration

Subject to the terms and conditions set forth herein, D-Link Systems, Inc. ("D-Link") provides this Limited warranty for its product only to the person or entity that originally purchased the product from:

- D-Link or its authorized reseller or distributor and
- Products purchased and delivered within the fifty states of the United States, the District of Columbia, U.S. Possessions or Protectorates, U.S. Military Installations, addresses with an APO or FPO.

Limited Warranty: D-Link warrants that the hardware portion of the D-Link products described below will be free from material defects in workmanship and materials from the date of original retail purchase of the product, for the period set forth below applicable to the product type ("Warranty Period"), except as otherwise stated herein.

3-Year Limited Warranty for the Product(s) is defined as follows:

- Hardware (excluding power supplies and fans) Three (3) Years
- Power Supplies and Fans One (1) Year
- Spare parts and spare kits Ninety (90) days

D-Link's sole obligation shall be to repair or replace the defective Hardware during the Warranty Period at no charge to the original owner or to refund at D-Link's sole discretion. Such repair or replacement will be rendered by D-Link at an Authorized D-Link Service Office. The replacement Hardware need not be new or have an identical make, model or part. D-Link may in its sole discretion replace the defective Hardware (or any part thereof) with any reconditioned product that D-Link reasonably determines is substantially equivalent (or superior) in all material respects to the defective Hardware. Repaired or replacement Hardware will be warranted for the remainder of the original Warranty Period from the date of original retail purchase. If a material defect is incapable of correction, or if D-Link determines in its sole discretion that it is not practical to repair or replace the defective Hardware, the price paid by the original purchaser for the defective Hardware will be refunded by D-Link upon return to D-Link of the defective Hardware. All Hardware (or part thereof) that is replaced by D-Link, or for which the purchase price is refunded, shall become the property of D-Link upon replacement or refund.

Limited Software Warranty: D-Link warrants that the software portion of the product ("Software") will substantially conform to D-Link's then current functional specifications for the Software, as set forth in the applicable documentation, from the date of original retail purchase of the Software for a period of ninety (90) days ("Warranty Period"), provided that the Software is properly installed on approved hardware and operated as contemplated in its documentation. D-Link further warrants that, during the Warranty Period, the magnetic media on which D-Link delivers the Software will be free of physical defects. D-Link's sole obligation shall be to replace the non-conforming Software (or defective media) with software that substantially conforms to D-Link's functional specifications for the Software or to refund at D-Link's sole discretion. Except as otherwise agreed by D-Link in writing, the replacement Software is provided only to the original licensee, and is subject to the terms and conditions of the license granted by D-Link for the Software. Software will be warranted for the remainder of the original Warranty Period from the date or original retail purchase. If a material non-conformance is incapable of correction, or if D-Link determines in its sole discretion that it is not practical to replace the non-conforming Software, the price paid by the original licensee for the non-conforming Software will be refunded by D-Link; provided that the non-conforming Software (and all copies thereof) is first returned to D-Link. The license granted respecting any Software for which a refund is given automatically terminates.

Non-Applicability of Warranty: The Limited Warranty provided hereunder for hardware and software of D-Link's products will not be applied to and does not cover any refurbished product and any product purchased through the inventory clearance or liquidation sale or other sales in which D-Link, the sellers, or the liquidators expressly disclaim their warranty obligation pertaining to the product and in that case, the product is being sold "As-Is" without any warranty whatsoever including, without limitation, the Limited Warranty as described herein, notwithstanding anything stated herein to the contrary.

Submitting A Claim: The customer shall return the product to the original purchase point based on its return policy. In case the return policy period has expired and the product is within warranty, the customer shall submit a claim to D-Link as outlined below:

- The customer must submit with the product as part of the claim a written description of the Hardware defect or Software nonconformance in sufficient detail to allow D-Link to confirm the same.

■ The original product owner must obtain a Return Material Authorization ("RMA") number from the Authorized D-Link Service Office and, if requested, provide written proof of purchase of the product (such as a copy of the dated purchase invoice for the product) before the warranty service is provided.

■ After an RMA number is issued, the defective product must be packaged securely in the original or other suitable shipping package to ensure that it will not be damaged in transit, and the RMA number must be prominently marked on the outside of the package. Do not include any manuals or accessories in the shipping package. D-Link will only replace the defective portion of the Product and will not ship back any accessories.

■ The customer is responsible for all in-bound shipping charges to D-Link. No Cash on Delivery ("COD") is allowed. Products sent COD will either be rejected by D-Link or become the property of D-Link. Products shall be fully insured by the customer and shipped to **D-Link Systems, Inc., 53 Discovery Drive, Irvine, CA 92618**. D-Link will not be held responsible for any packages that are lost in transit to D-Link. The repaired or replaced packages will be shipped to the customer via UPS Ground or any common carrier selected by D-Link, with shipping charges prepaid. Expedited shipping is available if shipping charges are prepaid by the customer and upon request.

D-Link may reject or return any product that is not packaged and shipped in strict compliance with the foregoing requirements, or for which an RMA number is not visible from the outside of the package. The product owner agrees to pay D-Link's reasonable handling and return shipping charges for any product that is not packaged and shipped in accordance with the foregoing requirements, or that is determined by D-Link not to be defective or non-conforming.

What Is Not Covered: This limited warranty provided by D-Link does not cover: Products, if in D-Link's judgment, have been subjected to abuse, accident, alteration, modification, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product, or if the model or serial number has been altered, tampered with, defaced or removed; Initial installation, installation and removal of the product for repair, and shipping costs; Operational adjustments covered in the operating manual for the product, and normal maintenance; Damage that occurs in shipment, due to act of God, failures due to power surge, and cosmetic damage; Any hardware, software, firmware or other products or services provided by anyone other than D-Link; Products that have been purchased from inventory clearance or liquidation sales or other sales in which D-Link, the sellers, or the liquidators expressly disclaim their warranty obligation pertaining to the product. Repair by anyone other than D-Link or an Authorized D-Link Service Office will void this Warranty.

Disclaimer of Other Warranties: EXCEPT FOR THE LIMITED WARRANTY SPECIFIED HEREIN, THE PRODUCT IS PROVIDED "AS-IS" WITHOUT ANY WARRANTY OF ANY KIND WHATSOEVER INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. IF ANY IMPLIED WARRANTY CANNOT BE DISCLAIMED IN ANY TERRITORY WHERE A PRODUCT IS SOLD, THE DURATION OF SUCH IMPLIED WARRANTY SHALL BE LIMITED TO NINETY (90) DAYS. EXCEPT AS EXPRESSLY COVERED UNDER THE LIMITED WARRANTY PROVIDED HEREIN, THE ENTIRE RISK AS TO THE QUALITY, SELECTION AND PERFORMANCE OF THE PRODUCT IS WITH THE PURCHASER OF THE PRODUCT.

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CE Mark Warning: This is a Class B product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

FCC 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 and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures**:**

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

FCC Caution:

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment; such modifications could void the user's authority to operate the equipment.

(1) The devices are restricted to indoor operations within the 5.15 to 5.25GHz range. (2) For this device to operate in the 5.15 to 5.25GHz range, the devices must use integral antennas.

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.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this equipment must be installed to provide a separation distance of at least eight inches (20 cm) from all persons.

This equipment must not be operated in conjunction with any other antenna.

Register your D-Link product online at http://support.dlink.com/register/