



DSL-500
ADSL Router
User's Guide

(March 2002)

651DSL500055

Wichtige Sicherheitshinweise

1. Bitte lesen Sie sich diese Hinweise sorgfältig durch.
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4. Um eine Beschädigung des Gerätes zu vermeiden sollten Sie nur Zubehörteile verwenden, die vom Hersteller zugelassen sind.
5. Das Gerät ist vor Feuchtigkeit zu schützen.
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FCC Warning

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.

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 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 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.

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.

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About This User's Guide

This user's guide provides instructions on how to install the DSL-500 ADSL Router and use it to connect a computer or Ethernet LAN to the Internet.

If you are using a computer with a functioning Ethernet port, you can use the Quick Installation Guide to quickly establish your ADSL connection and access the Internet.

Terminology

This document uses the terms "Router" (first letter upper case) to refer specifically to the DSL-500 ADSL Router, and "router" (first letter lower case) to refer to all such devices including the DSL-500. ADSL service is provided by different types of businesses including telephone service providers, Internet service providers and other businesses that provide computer network and telecommunications services. The term "service provider" is used in this guide to refer to any service that sells or leases DSL services and equipment.

Overview of the User's Guide

Chapter 1 Introduction to Router – Describes the Router and its key features. Provides an introduction to ADSL. Lists standards to which the Router complies. Contains a packing list.

Chapter 2 Prepare for Installation – Lists everything needed for the installation of the Router, including specific information needed for configuration. Provides space for recording all the necessary information.

Chapter 3 Hardware Installation – Discusses how to connect the Router to an Ethernet LAN.

Chapter 4 First Time Set Up – Provides information on how to configure the Router and establish the ADSL connection using the web-based manager.

Chapter 5 Web-based Management – Describes how to use the web-based manager and discusses the management options available.

Appendix A Technical Specifications – Lists the technical specifications of the Router, including standards compliance.

Appendix B LAN Setup – Discusses different options for IP addressing on your LAN.

Appendix C IP Concepts – A discussion of IP address assignment and subnets for a private network.

Appendix D DSL-500 Firmware Upgrade Utility – Describes how to install and use the firmware upgrade utility used with the Router.

Appendix E Microfilters and Splitters – Contains illustrated examples of how to use low pass filters.

Before You Start

Please read and make sure you understand all the prerequisites for proper installation of your new Router. Have all the necessary information and equipment on hand before beginning the installation.

Low Pass Filters

ADSL and telephone services share the same copper wire to carry their respective signals, a filtering mechanism may be necessary to avoid mutual interference. It may be necessary to install a low pass filter device (also called micro-filter or splitter) for each telephone that shares the line with the ADSL line. Micro-filters are easy to install passive devices that connect to the ADSL device and/or telephone using standard telephone cable. Ask your service provider for more information about the use of low pass filters with your installation. Appendix E provides illustrated examples of how to install two common types of filters.

Requirements for Installation

You will need a PC (referred to in this guide as the Manager PC) to set up and use the Router. In addition, it will be necessary to configure the device using information provided by your ADSL service provider. This information is used to establish the parameters of the ADSL connection and identify the Router on the WAN. The requirements for the PCs on your LAN are summarized below.

PC Workstation Requirements

You can use the Router with PCs that meet the conditions discussed here.

Operating System

The DSL-500 uses an HTML-based web interface for managing and monitoring the system. This web manager may be accessed using any operating system capable of running web browser software. The firmware upgrade utility however must be installed and used on a computer running a Microsoft® Windows operating system.

Web Browser

Any common web browser such as Microsoft Internet Explorer or Netscape Navigator can be used to configure the Router using the embedded web-based management software.

Ethernet Adapter (NIC)

All PCs using the Router for Internet access, including the Manager PC, must have an Ethernet NIC (Network Interface Card) installed. Each computer on the internal network must have TCP/IP Protocol enabled. If you have an existing Ethernet set up, the PCs should already meet this requirement.

If you are using the Router in the role of a simple bridge (RFC 1483), additional software may be needed for the computer or server connected to the Router (on the LAN side). You may be instructed by your service provider to configure the NIC card for DHCP or PPP connection. Your network service provider will give you more information.

Connection Method

It is necessary to know the connection method used for the ADSL connection. The connection method is also known as the ADSL Protocol, Encapsulation Protocol or Encapsulation Method. These protocols are defined by "RFCs" which are internationally recognized standards for networking protocols. You will be required to configure the Router to use the correct method. PPP connections require account information to be entered and stored in the device. Bridged Ethernet connections require that the IP settings be set manually.

The Router supports three connection methods:

- ◆ PPP over ATM (RFC 2364) used by default
- ◆ PPP over Ethernet (RFC 2516)
- ◆ IP over ATM (RFC 1577)
- ◆ Ethernet over ATM (RFC 1483)

PPP Connections (RFC 2516 & RFC 2364)

For PPPoA or PPPoE connections, a verification process is required before the network connection can be established. Use this section to record the information used for authentication.

Account Information (User Name and Password)

For PPP connections, a User Name and Password for the user account are needed to connect to the service provider's network.

ACCOUNT INFORMATION (PPP Connections Only)
User Name:
Password:

Bridged Ethernet Connections (RFC 1483)

Using this method, the DSL-500 acts as a transparent bridge, and is invisible to other devices on both the WAN and LAN side of the bridge. It is therefore necessary to provide some means of acquiring global IP settings for your account.

All connections to the Internet require a unique global IP address. For bridged connections, the global IP settings must reside in a TCP/IP enabled device on the LAN side of the bridge, such as a PC, server or firewall hardware. The IP address can be assigned in a number of ways. Your network service provider will give you instructions about any additional connection software or NIC configuration that may be required.

IPoA Connections (RFC 1577)

IP over ATM connections may require global IP settings for the device. Your service provider will give you IP settings information if needed. Some IPoA connections function like peer-to-peer connections and therefore do not require IP settings on the WAN interface.

PVC Settings

Some subscribers may be instructed to change the VPI and VCI values for the device. These numbers define a unique route used on the ATM backbone of the WAN. If your service provider asks you to configure these values for your network connection, follow the instructions in the *Connection Profile* section of Chapter 5.

Introduction

This section provides a brief description of the Router, its associated technologies and a list of Router features.

What is ADSL?

Asymmetric Digital Subscriber Line (ADSL) is an access technology that utilizes ordinary copper telephone lines to enable broadband high-speed digital data transmission and interactive multimedia applications for business and residential customers. For ADSL services, it is not necessary expensive new cabling or condition the line in any way.

ADSL greatly increases the signal carrying capacity of copper telephone lines without interfering with regular telephone services. For the ADSL user, this means faster downloads and more reliable connectivity. ADSL devices make it possible to enjoy benefits such as high-speed Internet access without experiencing any loss of quality or disruption of voice/fax telephone capabilities.

ADSL provides a dedicated service over a single telephone line operating at speeds of up to 8 Mbps downstream and up to 640 Kbps upstream, depending on local telephone line conditions. A secure point-to-point connection is established between the user and the central office of the service provider.

D-Link ADSL devices incorporate the recommendations of the ADSL Forum regarding framing, data format, and upper layer protocols.

Router Description and Operation

The DSL-500 ADSL Router is designed to provide a simple, cost-effective and secure ADSL Internet connection for your small- to medium-sized private network. The DSL-500 combines the benefits of high-speed ADSL connection technology and TCP/IP routing with a conventional Ethernet interface in one compact and convenient package. ADSL connection technology enables many interactive multi-media applications such as video conferencing and collaborative computing.

The Router is easy to install and use. The DSL-500 connects to an Ethernet LAN via a standard Ethernet 10BASE-T interface using RJ-45 connectors. The ADSL connection is made using ordinary twisted-pair telephone line with standard RJ-11 connectors. This arrangement means that several PCs can be networked and connected to the Internet using a single WAN interface and IP address.

The Router supports transparent bridging and can be used for IP packet routing over the Internet. Cost saving features of the Router such as NAT (Network Address Translator) and DHCP (Dynamic Host Configuration Protocol) improve administration efficiency and improve security. The advanced security enhancements, packet filtering and port redirection, can help protect your network from potentially devastating intrusions by malicious agents from outside your network.

Router Features

The DSL-500 ADSL Ethernet Router utilizes the latest ADSL enhancements to provide a reliable Internet portal suitable for most small to medium sized offices. DSL-500 advantages include:

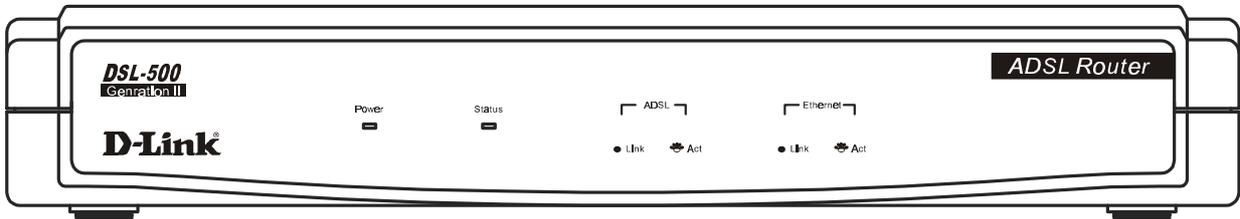
- **PPP (Point-to-Point Protocol) Security** The DSL-500 ADSL Router supports PAP (Password Authentication Protocol) and CHAP (Challenge Handshake Authentication Protocol) for PPP connections.
- **DHCP Support** DHCP (Dynamic Host Configuration Protocol) automatically and dynamically assigns all LAN IP settings to each host on your network. This eliminates the need to reconfigure every host whenever changes in network topology occur.
- **Network Address Translation (NAT)** For small office environments, the DSL-500 allows multiple users on the LAN to access the Internet concurrently through a single Internet account. This provides Internet access to everyone in the office for the price of a single user.

NAT improves network security in effect by hiding the private network behind one global and visible IP address. NAT address mapping can also be used to link two IP domains via a LAN-to-LAN connection.

- **TCP/IP (Transfer Control Protocol/Internet Protocol)** The DSL-500 supports TCP/IP protocol, the language used for the Internet. It is compatible with access servers manufactured by major vendors.
- **RIP-1/RIP-2** The DSL-500 supports both RIP-1 and RIP-2 exchanges with other routers. Using both versions lets the Router to communicate with all RIP enabled devices.
- **Static Routing** This allows you to select a data path to a particular network destination that will remain in the routing table and never “age out”. If you wish to define a specific route that will always be used for data traffic from your LAN to a specific destination within your LAN (for example to another router or a server) or outside your network (to a ISP defined default gateway for instance).
- **Default Routing** This allows you to choose a default path for incoming data packets for which the destination address is unknown. This is particularly useful when if the Router functions as the sole connection to the Internet.
- **ATM (Asynchronous Transfer Mode)** The DSL-500 supports *Bridged Ethernet over ATM* (RFC1483), *IP over ATM* (RFC1577) and *PPP over ATM* (RFC 2364).
- **Precise ATM Traffic Shaping** Traffic shaping is a method of controlling the flow rate of ATM data cells. This function helps to establish the Quality of Service for ATM data transfer.
- **G.hs (Auto-handshake)** This allows the Router to automatically choose either the G.lite or G.dmt ADSL connection standards.
- **High Performance** Very high rates of data transfer are possible with the Router. Up to 8 Mbps downstream bit rate using the G.dmt.
- **Full Network Management** The DSL-500 incorporates SNMP (Simple Network Management Protocol) support for web-based management and text-based network management via an RS-232 or **Telnet** connection.
- **Telnet Connection** The Telnet enables a network manager to access the Router's management software remotely.
- **Easy Installation** The DSL-500 uses a web-based graphical user interface program for convenient management access and easy set up. Any common web browser software can be used to manage the Router.

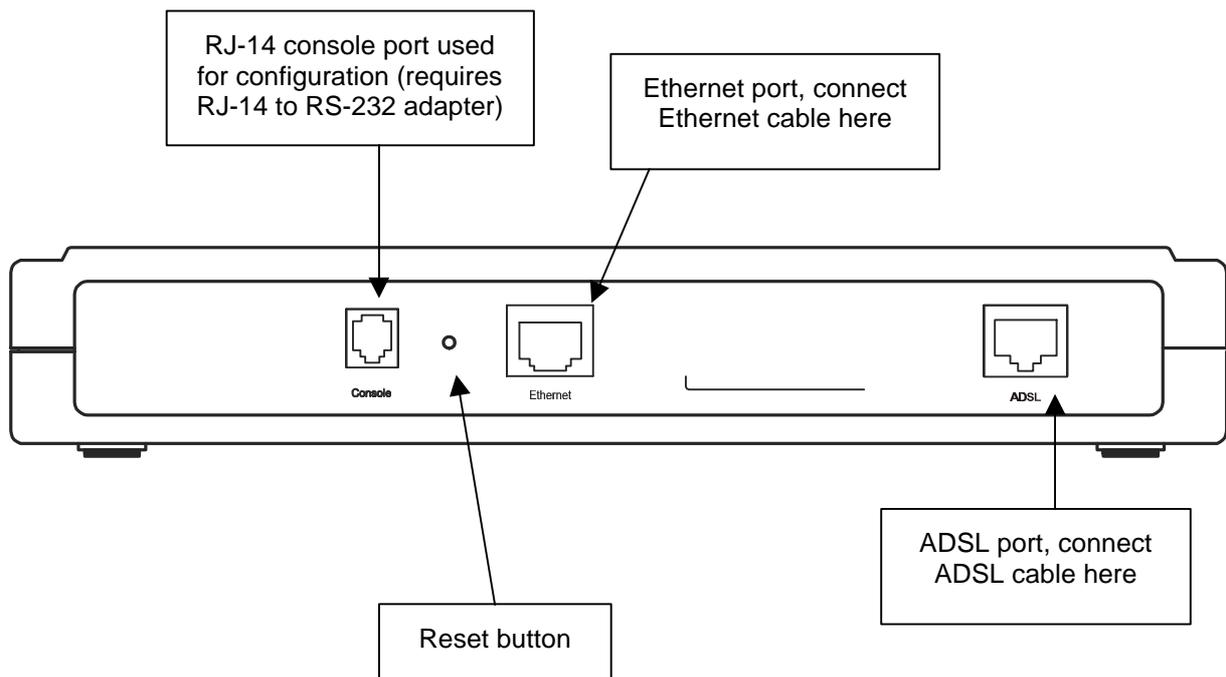
Front Panel

Place the Router in a location that allows a view of the LED indicators on the front panel.

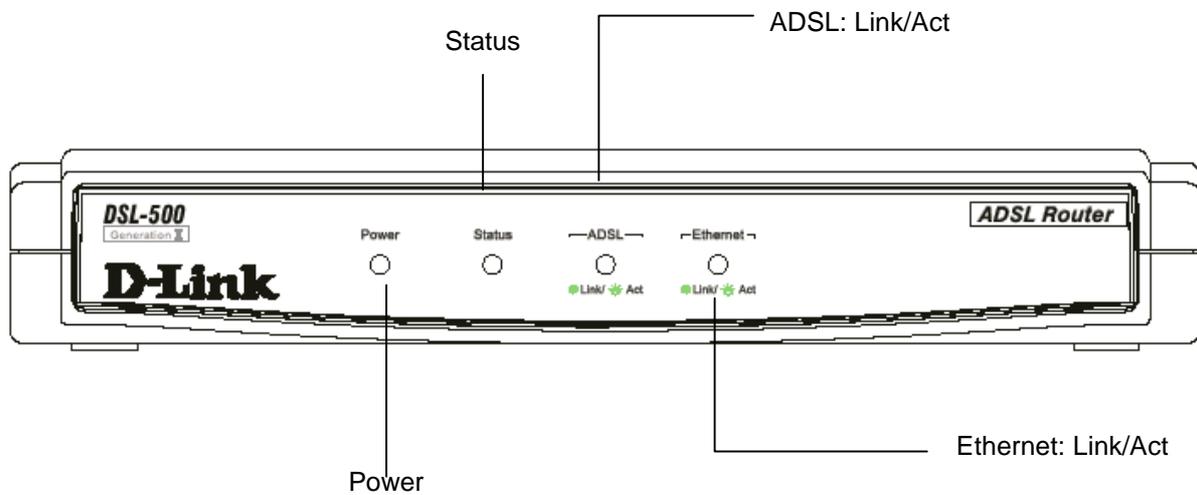


Rear Panel

All cable connections to the Router are made at the rear panel. The power switch and factory reset button is located here as well.



LED Indicators



The LED Indicators read as follows:

Power Steady green light indicates the unit is powered on.

Status Lights steady green during the ADSL negotiation phase. Once the connection status has been settled, the light will blink green.

ADSL: Link Steady green light indicates a valid ADSL connection. This will light after the ADSL negotiation process has been settled.

ADSL: Act Blinking green light indicates an active WAN session.

Ethernet: Link Steady green light indicates a valid Ethernet connection.

Ethernet: Act Blinking green indicates an active Ethernet session.

Packing List

Open the shipping carton and carefully remove all items. In addition to this User's Guide, ascertain that you have:

1. One DSL-500 ADSL Ethernet Router
2. One DSL-500 tool kit on CD-ROM containing The User's Guide
3. One twisted-pair telephone cable used for ADSL connection
4. One straight-through Ethernet cable
5. One AC power adapter suitable for your electric service

Hardware Installation

In this chapter you will learn about the various connections you will need to make in order to use the Router.

When selecting the location for the Router be sure to allow room to access the connections on the rear panel. You will want to place the Router so that you will be able to see the LED indicators on the front panel. Allow some space above the Router for ventilation to avoid problems with overheating.

It may be convenient for you locate the Router near the PC you intend to use for initial configuration of the Router. For initial configuration of the device you may need convenient access to the RS-232 serial port on the rear panel. The RS-232 serial port is intended for use with text-based console management software for the initial configuration and for out-of-band management of the Router. Whether it is necessary to use an RS-232 console manager for first time set up depends on how you allocate IP addresses on your network. Read Chapter 4, *First Time Set Up* to help you decide how best to use the Router on your network.

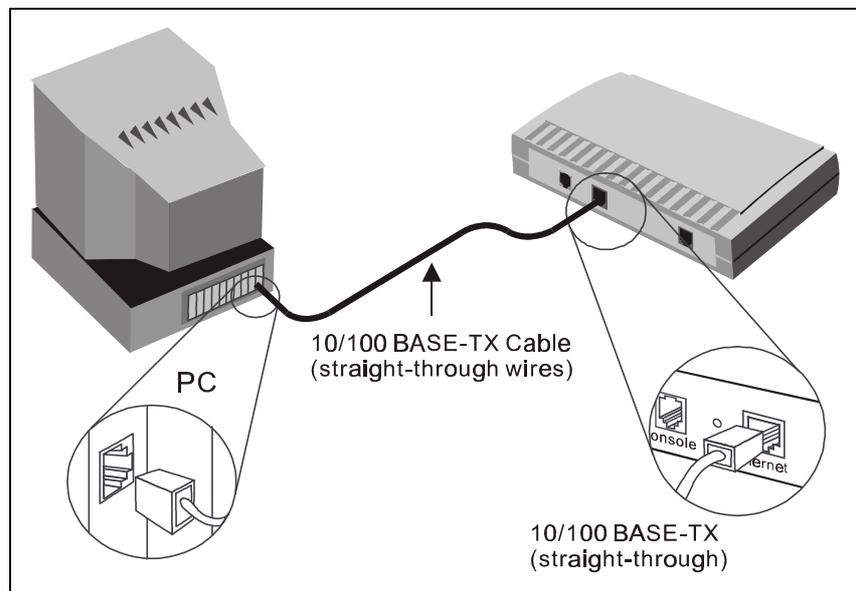
Connect ADSL Line

Use the twisted-pair ADSL cable (standard telephone cable) included with the Router to connect it to your telephone line. Simply plug one end of the cable into the ADSL port (RJ-11 receptacle) on the rear panel of the Router and insert the other end into the wall jack. The ADSL connection is the WAN interface. It links the Router to the network service provider's backbone infrastructure. This is the Router's access point to the Internet.

The Router must undergo a negotiation process to establish the terms of the ADSL connection. During this negotiation the Status LED will light a steady green, after which it will blink. If the ADSL line is disconnected, it will repeat this process.

PC to Router Connection

You can connect the Router directly to a 10/100BASE-TX Ethernet adapter card (NIC) installed on a PC using the Ethernet cable provided as shown in this diagram.



Connect Ethernet LAN to Router

The Router may be connected to any 10/100BASE-TX Ethernet LAN. Any connection to an Ethernet concentrating device such as a switch or hub must operate at a speed of 10/100 Mbps only. When connecting the Router to any Ethernet device that is capable of operating at speeds higher than 10Mbps, be sure that the device has auto-negotiation (NWay) enabled for the connecting port.

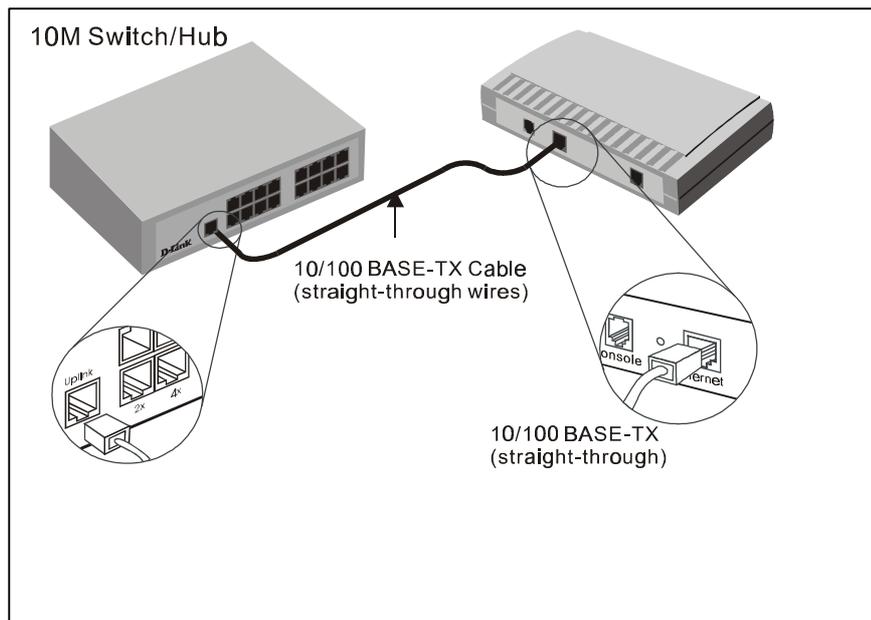
Use standard twisted-pair cable with RJ-45 connectors. The RJ-45 port on the Router is a crossed port (MDI-X). Follow standard Ethernet guidelines when deciding what type of cable to use to make this connection. When connecting the Router directly to a PC or server use a normal straight-through cable. You should use a crossed cable when connecting the Router to a normal (MDI-X) port on a switch or hub. Use a normal straight-through cable when connecting it to an uplink (MDI-II) port on a hub or switch. A valid connection will be indicated by the Ethernet Link LED indicator.

The rules governing Ethernet cable lengths apply to the LAN to Router connection. Be sure that the cable connecting the LAN to the Router does not exceed 100 meters.

Hub or Switch to Router Connection

Connect the Router to an uplink port (MDI-II) on an Ethernet hub or switch with a straight-through cable as shown in the diagram below:

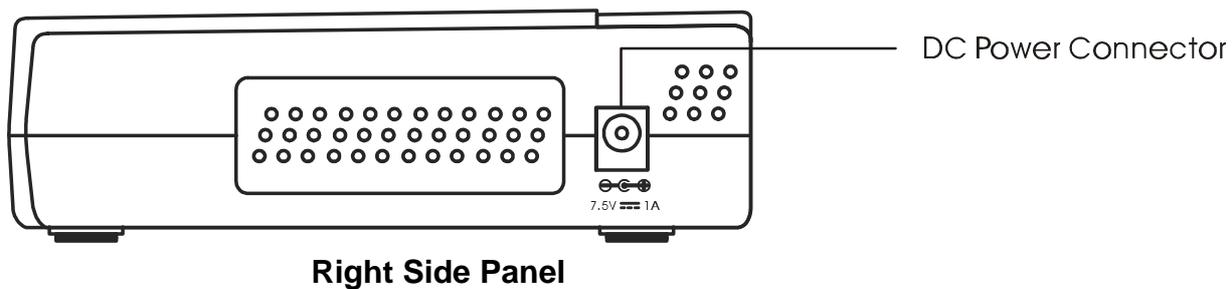
If you wish to reserve the uplink port on the switch or hub for another device, connect to any on the other MDI-X ports (1x, 2x, etc.) with a crossed cable.



Power On Router

To power on the device:

1. Insert the AC Power Adapter cord into the power receptacle located on the right side panel of the Router and plug the adapter into a nearby power source.
2. You should see the Power LED indicator light up and remain lit.



4

First Time Set Up

This chapter discusses the steps to first establish the WAN connection. The remaining features not directly concerned with establishing the initial connection are explained in Chapter 5, *Web-based Management*.

It will be convenient for most users to establish an initial ADSL connection for one PC equipped with an Ethernet NIC (Network Interface Card). It is recommended that you install and configure the Router using one non-networked computer. This allows you to verify that the ADSL service is functioning and that you are able to communicate with the device. Once the initial ADSL connection is established, you can proceed to build an Ethernet LAN around the device or incorporate it into an existing LAN. For convenience, the PC used to configure the Router is referred to as the manager PC.

IP Settings

To further simplify things it is recommended that you use the Router's web-based management software for initial configuration. To communicate with the Router, the manager PC must be connected to it via an Ethernet connection and have a web browser installed. Furthermore, the manager PC must reside within the same subnet as the Router. This can be done easily using the DHCP function of the Router. The Router will act as a DHCP server by default. You can configure the manager PC to obtain its IP settings from the Router by following the procedure in the next section, *Configure the Manager PC for DHCP*.

You should start by configuring the manager PC to obtain IP settings from the Router. Next disconnect the manager PC from the network and connect it directly to the Router with a straight-through Ethernet cable.

Bridged Connections (RFC 1483)

For connections using the DSL-500 as a simple bridge, it may be more convenient to change the LAN IP address of the device. Instructions for changing the device's LAN IP address read Appendix B, *LAN IP Setup*, for more information.

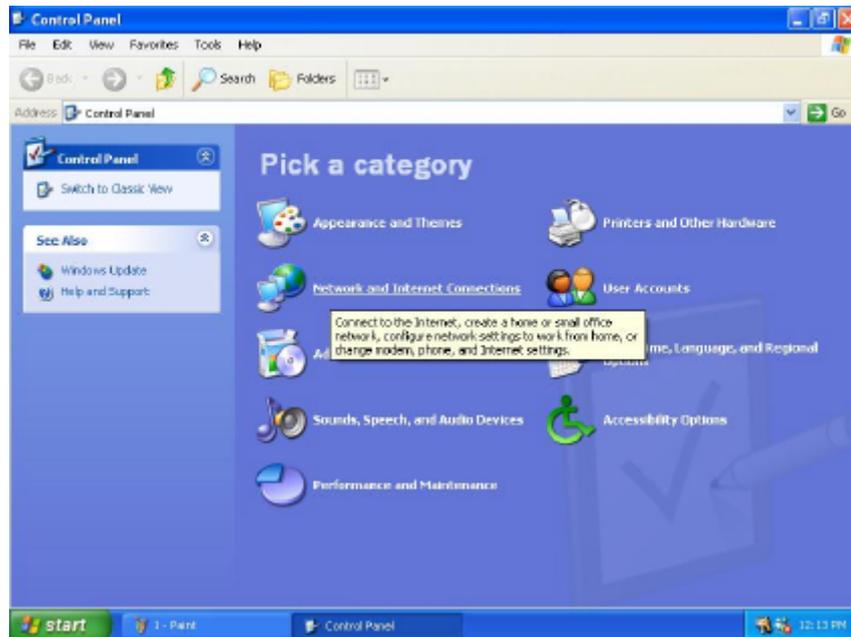
Configure the Manager PC as a DHCP Client (Windows XP)

Use the following steps to configure the manager PC to be a DHCP client. These same steps must be performed for every host PC on your network if you use the DHCP function of the Router.

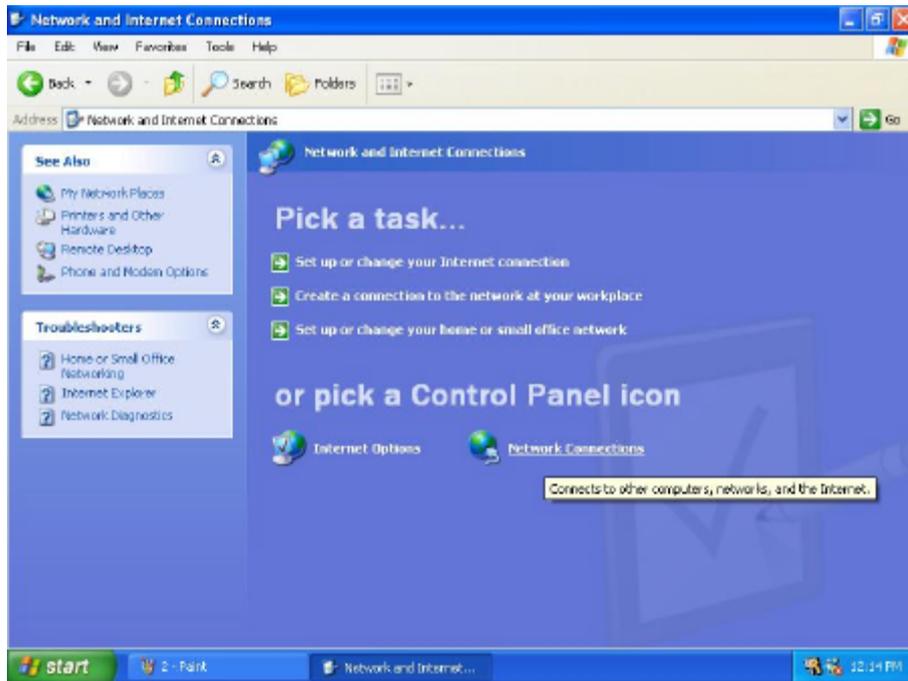
1. From the **Start** menu on your desktop, go to click on **Control Panel**.



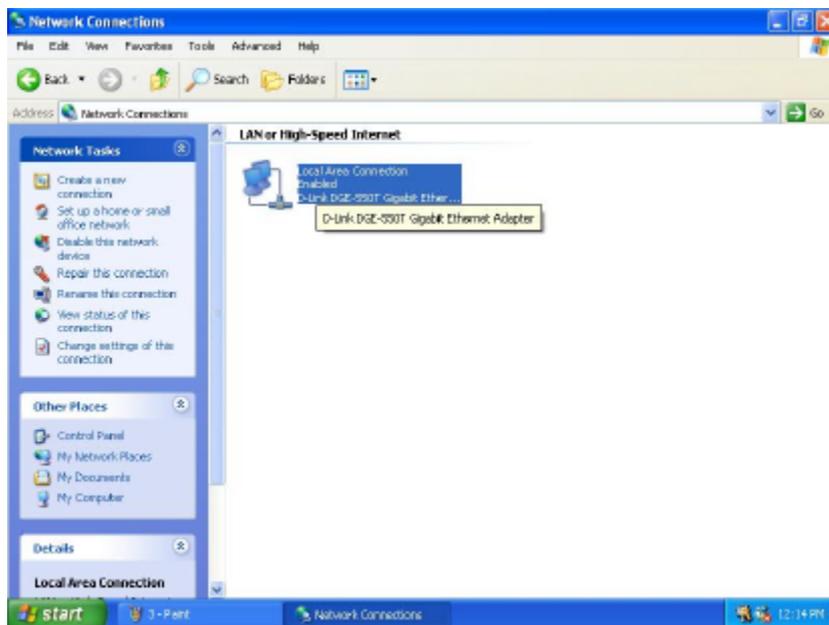
2. In the Control Panel folder, click on **Network and Internet Connections**.



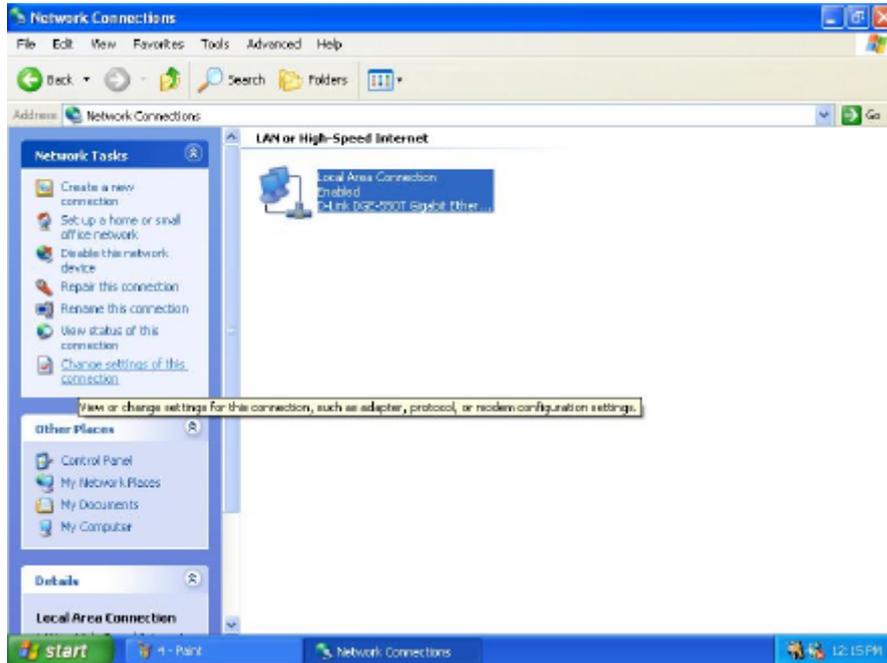
3. In the Network and Internet Connections folder, click on **Network Connections**.



4. In the Network Connections folder, highlight the **Local Area Connection** icon by clicking on it once. A new option is revealed under Network Tabs in the left side panel.



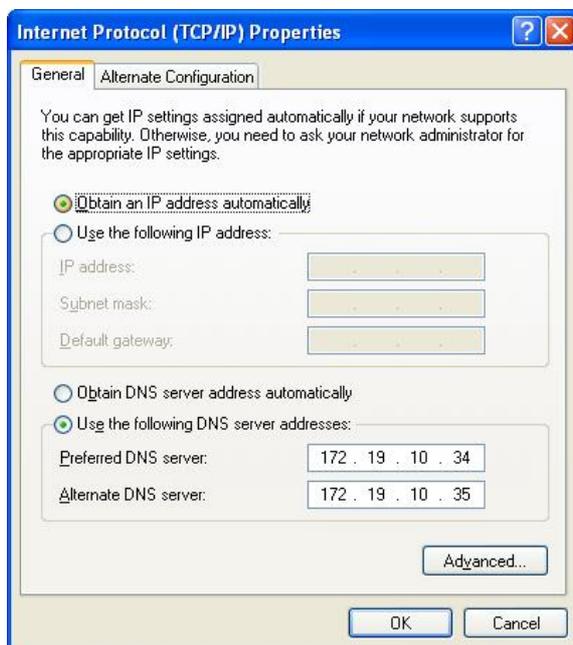
5. Click on **Change settings of the connection** under Network Tabs.



6. In the **General** Tab of the **Local Area Connection Properties** menu, highlight **Internet Protocol (TCP/IP)** under “This connection uses the following items:” by clicking on it once. Click on the **Properties** button.



7. Select “Obtain an IP address automatically” by clicking once in the circle. Click the **OK** button.



Your computer is now ready to use the Router's DHCP function.

Access the Web-based Manager

The Manager PC can now use a web browser to communicate with the Router.

Note: Be sure that the web browser on the Manager PC is not configured to use a proxy server in the Internet settings. In Windows Internet Explorer, you can check if a proxy server is enabled using the following procedure:

1. In Windows, click on the START button, go to Settings and choose Control Panel.
2. In the Control Panel window, double-click on the Internet Options icon.
3. Click the Connections tab and click on the LAN Settings button.
4. Verify that the "Use proxy server" option is NOT checked. If it is checked, click in the checked box to deselect the option and click OK.

To use the web-based management software, launch a suitable web browser and direct it to the IP address of the Router. Type in **http://** followed by the default IP address, **192.168.0.1** in the address bar of the browser. The URL in the address bar should read: **http://192.168.0.1**.

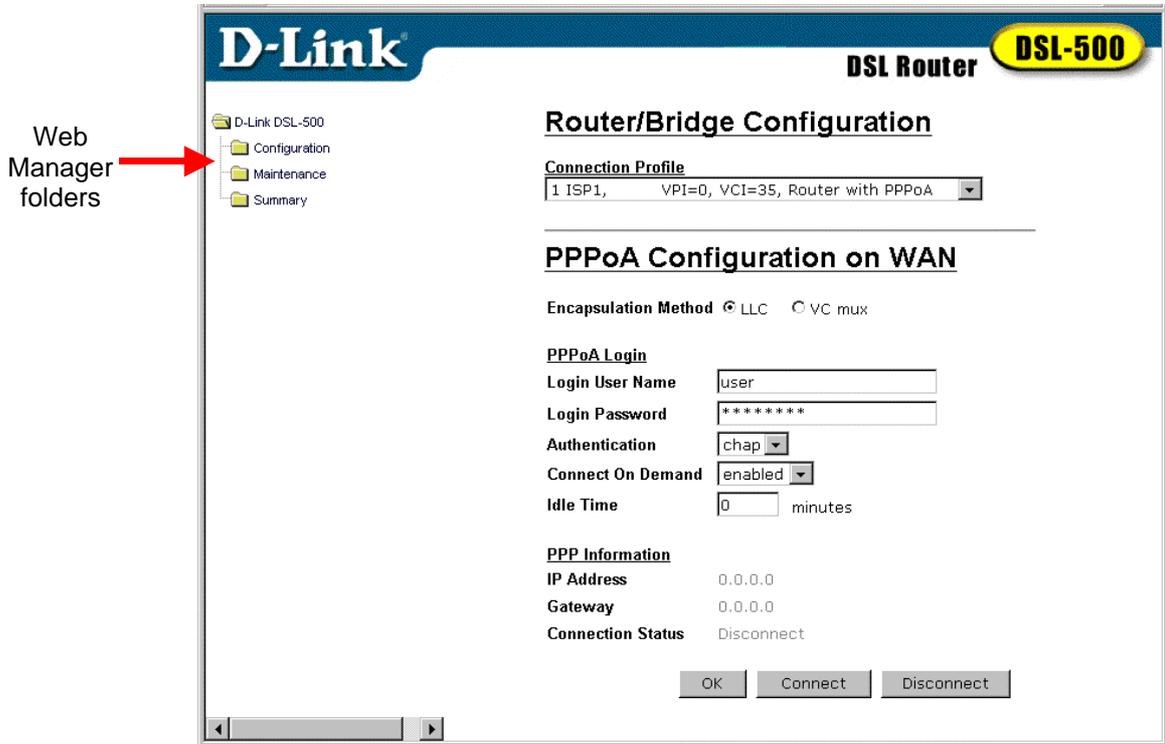
In the page that opens, click on the **Login to web-based management module** button in the center.

A new window will appear and you will be prompted for a user name and password to access the web-based manager. Use the default user name **admin** and password **admin** for first time set up. You should change the web-based manager access user name and password once you have verified that a connection can be established. The user name and password allows any PC within the same subnet as the Router to access the web-based manger.



Note: Do not confuse the user name and password used to access the web-based manager with the ADSL account user name and password needed for PPP connections to access the ADSL or network service provider's network.

Logging in will bring up the Router/Bridge Configuration window of the web-based management module. In this window, you will see the D-Link DSL-500 folder is open revealing its contents of three subfolders. These subfolders contain menu buttons you can click on to see various menu screens used to configure the device for connection to the WAN and other functions.



Web-based Manager Main Menu – First Time Log On

Configure the WAN Connection

Now that you have accessed the web-based manager, you can configure the device for the WAN connection. For PPPoE and PPPoA connections, you will need to provide a User Name and Password used by your ISP for authentication purposes. For “Bridged Ethernet” (RFC 1483) connections, a static IP address must be used. It is necessary to supply IP settings for the WAN connection and other information discussed in Chapter 2, *Prepare for Installation*.

All connection methods available to the Router are discussed in this chapter, beginning with PPPoA connections. PPPoA is the default method used by the Router.

If you are using a PPPoE, IPoA, or Bridged Ethernet (RFC 1483) connection, it is necessary to change the connection method. Please read *Changing the Connection Type* following the *PPPoA Connections* section for more information.

PPPoA Connections

The default connection method used by the Router is Point-to-Point-Protocol over ATM (PPPoA). In the PPPoA Configuration window, you must enter the user name and password for network account authentication and verification. When this information is entered, the changes must be saved and the Router restarted.

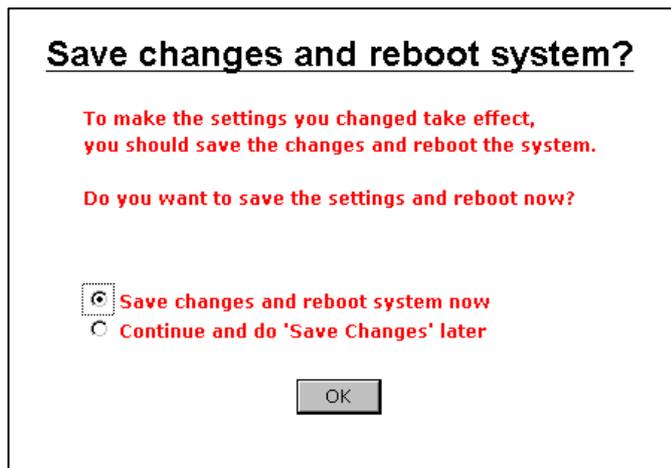
The screenshot shows the 'Router/Bridge Configuration' window for a D-Link DSL-500 router. The 'Connection Profile' is set to '1 ISP1, VPI=0, VCI=35, Router with PPPoA'. Under 'PPPoA Configuration on WAN', the 'Encapsulation Method' is set to 'LLC'. The 'PPPoA Login' section includes a 'Login User Name' field with 'user', a 'Login Password' field with '*****', an 'Authentication' dropdown set to 'chap', a 'Connect On Demand' dropdown set to 'enabled', and an 'Idle Time' field set to '0' minutes. The 'PPP Information' section shows 'IP Address' as '0.0.0.0', 'Gateway' as '0.0.0.0', and 'Connection Status' as 'Disconnect'. At the bottom, there are 'OK', 'Connect', and 'Disconnect' buttons.

Router/Bridge Configuration - PPPoA

In the **Bridge/Router Configuration** window, follow these steps to establish the WAN connection using PPPoA:

1. Under **PPPoA Login**, enter the **Login User Name** used for your network account. The user name and login password, are used to authenticate the identity of the ADSL client and provide access to the service provider's network. The user name and login password can be any combination of up to 64 characters.
2. Enter the Login Password.
3. Unless you are instructed to use a different **Authentication** method, leave the default **chap** protocol selected. The alternative method, **pap**, can be selected from the pull-down menu if required by the service provider.
4. Leave the **Connect on Demand** option as **enabled** in the pull-down menu. This will allow the Router to establish a WAN connection upon restarting.
5. Leave **Idle Time** set to the default value 0.

6. Click on the **OK** button on the bottom of the window. A new screen appears:



7. The **Save changes and reboot system?** message prompt offers two options:
- A. You can save the configuration changes and restart the device now by clicking **OK**; or,
 - B. If you want to change the user name and password used to access the Web Manager, select the "Continue and do 'Save Changes' later" option and click **OK**, and go to the System Username and Password menu in the Maintenance folder.

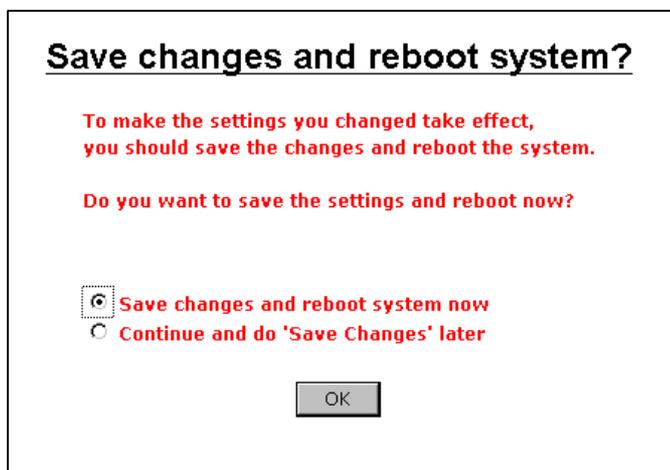
Changing the Connection Profile

The default connection method used by the Router for the WAN connection is PPP over ATM. If you wish to use this method, it is not necessary to change this setting. However, if you will use a static IP address for a “Bridged Ethernet” (RFC 1483) connection, PPP over Ethernet or IPoA you must change the connection method.

There are two menus used to change the connection method or connection profile. The Bridge/Router Configuration menu, the first screen that appears when you log in, can be used to configure the device to use one of the three available methods. This procedure is described below. The connection profile can also be changed using the Connection Profile menu, this is described in its own section in Chapter 5.

To change the connection profile using the Bridge/Router Configuration menu, follow these steps:

1. In the **Bridge/Router Configuration** window, use the drop-down menu under **Connection Profile** to select an alternative connection method. The alternative connection options are **Bridge with RFC 1483**, **Router with PPPoE** and **Router with IPoA**. You will also see the VPI and VCI values listed here.
2. Click on the **OK** button on the bottom of the window. A new screen will appear:

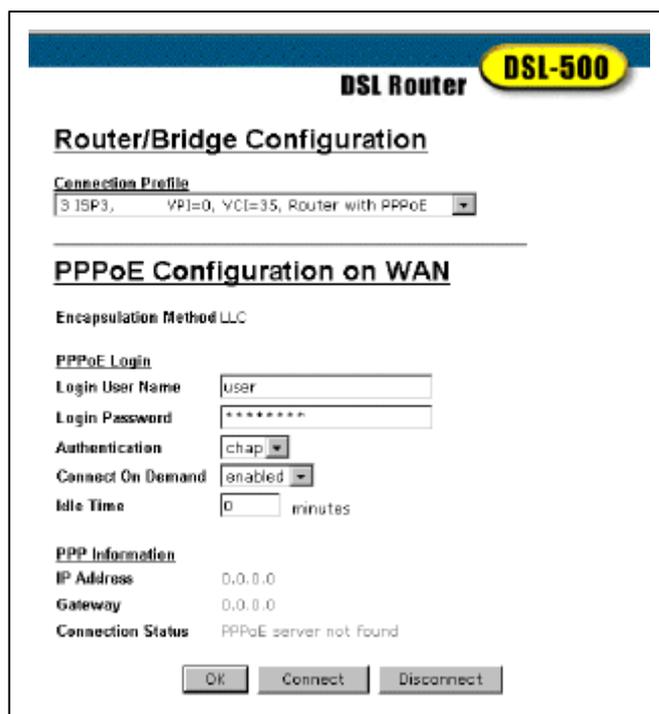


3. The **Save changes and reboot system?** message prompt offers two option:
 - A. You can save the configuration changes and restart the device now by clicking **OK**; or,
 - B. If you want to change the user name and password used to access the Web Manager, select the “Continue and do ‘Save Changes’ later” option and click **OK**, and go to the System Username and Password menu in the Maintenance folder.

PPPoE Connections

Although the connection methods differ significantly, from the viewpoint of the ADSL subscriber, there is little difference between the two variations of PPP connections. The information entered for PPPoE connections is the same as that used for PPPoA connections.

Once you have changed the connection method to PPPoE, saved the configuration change and restarted the device, you can proceed to enter authentication information used to connect to the WAN. Follow these steps:

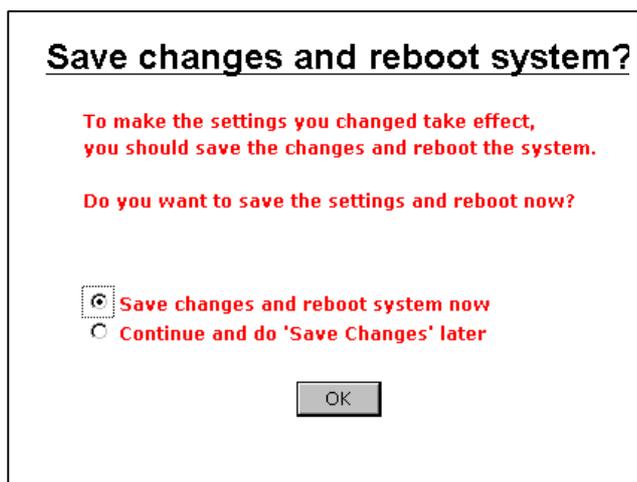


The screenshot shows the configuration page for a DSL Router. At the top, it says "DSL Router" and "DSL-500". The main heading is "Router/Bridge Configuration". Under "Connection Profile", there is a dropdown menu showing "3 ISP3, VPI=0, VC1=35, Router with PPPoE". Below this is the "PPPoE Configuration on WAN" section. It includes "Encapsulation Method LLC", "PPPoE Login" with fields for "Login User Name" (user) and "Login Password" (masked with asterisks), "Authentication" (chap), "Connect On Demand" (enabled), and "Idle Time" (0 minutes). The "PPP Information" section shows "IP Address" and "Gateway" both set to 0.0.0.0, and "Connection Status" as "PPPoE server not found". At the bottom are "OK", "Connect", and "Disconnect" buttons.

Router/Bridge Configuration - PPPoE

1. Under **PPPoE Login**, enter the **Login User Name** used for your network account. The user name and login password, are used to authenticate the identity of the ADSL client and provide access to the service provider's network. The user name and login password can be any combination of up to 64 characters.
2. Enter the Login Password.
3. Unless you are instructed to use a different **Authentication** method, leave the default **chap** protocol selected. The alternative method, **pap**, can be selected from the pull-down menu if required by the service provider.
4. Leave the **Connect on Demand** option as **enabled** in the pull-down menu. This will allow the Router to establish a WAN connection upon restarting.
5. Leave **Idle Time** set to the default value 0.

6. Click on the **OK** button on the bottom of the window. A new screen appears:



7. The **Save changes and reboot system?** message prompt offers two option:
- A. You can save the configuration changes and restart the device now by clicking **OK**; or,
 - B. If you want to change the user name and password used to access the Web Manager, select the “Continue and do ‘Save Changes’ later” option and click **OK**, and go to the System Username and Password menu in the Maintenance folder.

RFC 1483 Bridged Ethernet Connections

If you are using the “Bridged Ethernet” method for the WAN connection, the global IP settings must be configured in another device. When using this connection method, the device functions as a bridge, so it does not perform any IP functions. The device will have a IP address on the LAN, but not on the WAN interface. After changing the connection profile to **Bridge with RFC 1483**, you will need to configure the PC or server connected to the DSL-500 so the WAN interface a way to obtain a global IP address. This can be accomplished in different ways according to the circumstances of your network and the nature of your ADSL subscriber account. Your network service provider will give you instructions or additional computer software as needed to handle global IP settings for your account.

IPoA Connections

IPoA connections may require that global IP settings be configured for the device manually or be configured to use DHCP to obtain these settings. If you are instructed to set the WAN IP address manually or use DHCP, read the *IPoA Configuration* section of Chapter 5. Otherwise, the connection will be established upon restarting the device.

Changing the User Name and Password

Before you configure the Router and connect to the WAN you should change the user name and password used to access the web-based manager. Open the Maintenance folder and click on the System Username and Password button to change the manager username and password.



The screenshot shows a web-based configuration page for a DSL Router. At the top, there is a blue header with the text "DSL Router" and a yellow oval containing "DSL-500". Below the header, the title "System Username and Password" is displayed. The form contains four input fields: "User Name" (with "admin" entered), "Old Password", "New Password", and "Confirm New Password". An "OK" button is located at the bottom right of the form.

User Name and Password Menu

1. Type the current **User Name** in the entry field provided.
2. Type in the current password in the **Old Password** entry field.
3. Type in the **New Password** in the entry field provided.
4. Type in the new password again in the **Confirm New Password** field.
5. Click the **OK** button.
6. The **Save changes and reboot system?** message appears:
 - A. You can save the configuration changes and restart the device now by clicking **OK**; or,
 - B. If you want to change the user name and password used to access the Web Manager, select the "Continue and do 'Save Changes' later" option and click **OK**.

Connect to WAN

Once you have configured the Router, saved changes and restarted it, you can connect the manager PC to the Internet. The procedure is the same for PPPoE and PPPoA connections.

Connect with PPP (PPPoE and PPPoA)

If you have enabled the Connect on Demand feature, the Router will have established the WAN connection upon restarting.

If the Connect on Demand feature has been disabled, click the **Connect** button to initiate the PPP connection via the ADSL WAN interface. The “handshake” process will take a few seconds.

In the PPPoE or PPPoA Configuration window, viewing the **Connection Status** *Connected*, under **PPPoE Information** or **PPPoA Information** will indicate a valid connection. A valid ADSL connection can also be confirmed by observing the LED indicators on the front panel of the device.

Disconnect PPP

For PPP connections, the WAN connection can be terminated at any time by clicking on the **Disconnect** button in the PPPoE or PPPoA Configuration window. It is recommended that you disconnect the ADSL connection and change the user name and password used to access the web-based manager. Then set up the rest of your network.

Connect with IPoA (RFC 1577)

IP over ATM connections may require global IP settings for the device. Your service provider will give you IP settings information if needed. Some IPoA connections function like peer-to-peer connections and therefore do not require IP settings on the WAN interface.

Connect with RFC 1483

Upon restarting the device, it will serve as a bridge, and therefore it will not have any IP (Layer 3) function on the WAN interface. Your network service provider will instruct you on what further steps are needed to establish the WAN connection. You may have to install software on your PC or you may be required to alter the IP settings of the NIC adapter on your PC.

You will notice that the configuration options have changed. Please read *Bridge with RFC 1483* in Chapter 5 for more information on bridge configuration.

Web-based Management

The DSL-500 offers a web-based (HTML) graphical user interface allowing users to manage the Router from anywhere on the LAN using a standard browser, software such as Netscape Navigator or Microsoft Internet Explorer. The web browser is used for direct communication with the Router using HTTP protocol.

Accessing the Web Manager

In order to access the web-based management interface it will be necessary to have both the manager's PC and the Router on the same IP subnet. If the manager PC is configured as a DHCP client, the Router will automatically assign IP settings. If you choose to disable the DHCP function, it will be necessary to either change the IP settings of the PC or change the IP address of the Router. See Chapter 6 for information about assigning IP addresses on the network and changing the IP address of the device using the console interface.

To use the web-based management software simply run the browser you have installed on your computer and point it to the IP address defined for the device. The first time you access the web-based manager you will need to type the default IP address, **192.168.0.1** in the address bar of the browser. The URL in the address bar should read: **http://192.168.0.1**. If you change the IP address you will use the new IP address to access the web-based manager.

In the page that opens, click on the **Login to web-based management module** button.

A new window will appear and you will be prompted for a user name and password. Use default user name **admin** and password **admin** for first time set up.



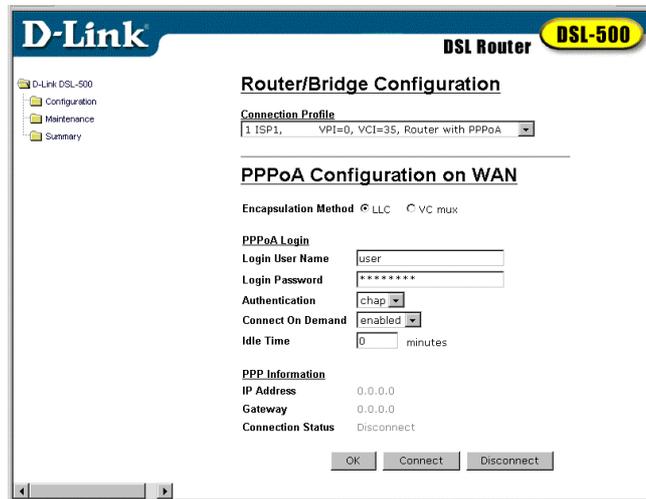
User Login

Note: Be sure that the web browser on the Manager PC is not configured to use a proxy server in the Internet settings. In Windows Internet Explorer, you can check if a proxy server is enabled using the following procedure:

1. In Windows, click on the START button, go to Settings and choose Control Panel.
2. In the Control Panel window, double-click on the Internet Options icon.
3. Click the Connections tab and click on the LAN Settings button.
4. Verify that the "Use proxy server" option is NOT checked. If it is checked, click in the checked box to deselect the option and click OK.

Web Manager Interface

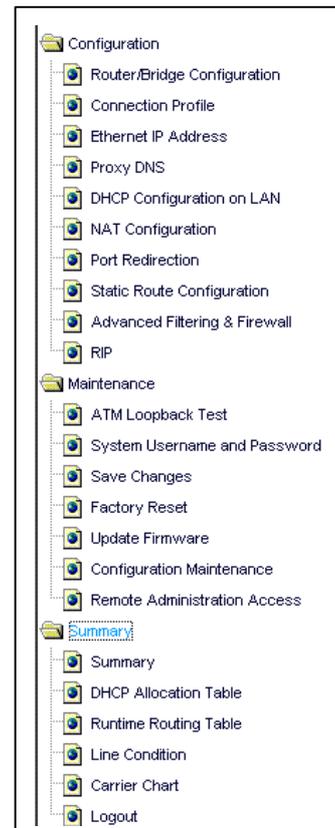
Once you have successfully logged on to the web manager, your browser will display the Bridge/Router Configuration menu. If you wish to change the connection method used by the device, please see *Changing the Connection Method* in the Chapter 4.



Web Manager GUI – First Time Login

Folders and Menus

The web manager interface is divided into two sections, the left side displays an open folder labeled D-Link DSL-500. The subfolders inside are labeled Configuration, Maintenance and Summary. The contents of these subfolders differs depending on the connection profile of the device. The figure to the right reveals the contents of the folders when the device is configured to serve as a router (Router with PPPoA or PPPoE connections). The next section, *Router with PPP Configuration*, instructs you on how to use the web manager for configuration of the DSL-500 functioning as a router. For device configuration of bridged (RFC 1483) connections, skip ahead to *Bridge with RFC 1483 Configuration*.



Router Configuration Menus

Changing the Connection Profile

Use the Connection Profile menu to add, change or delete connection profiles. This menu is used to change the VPI/VCI settings for the device.

Profile Name	VPI	VCI	Connection Type	Delete
1 ISP1	0	35	Router with PPPoA	Delete
2 ISP2	0	35	Bridge with RFC 1483	Delete
3 ISP3	0	35	Router with PPPoE	Delete
4	0	0		Delete
5	0	0		Delete
6	0	0		Delete
7	0	0		Delete
8	0	0		Delete

Connection Profile Screen

The Connection Profile screen contains a numbered list of existing profiles is as follows:

Profile Name	Connection profile name
VPI	Virtual Path Identifier
VCI	Virtual Channel Identifier
Connection Type	The functional role of the DSL-500 and connection protocol used

A profile may be deleted by clicking on the **Delete** button for that profile. To change an existing profile click on the number for that profile Connection Profile Configuration menu will appear. To add a new profile, click on an unused number to see the Connection Profile Configuration menu.

Connection Profile Configuration

DSL Router **DSL-500**

Connection Profile Configuration

Profile Name

VPI (0-255)

VCI (32-65535)

Connection Type

 Exit

Connection Profile Configuration

Use the Connection Profile Configuration menu to change the following parameters:

Profile Name	Type in a new name for this profile
VPI	Type in the new VPI setting (0-255)
VCI	Type in the new VCI setting (32-65535)
Connection Type	From the drop-down menu select <i>Router with PPPoA</i> , <i>Router with PPPoE</i> , <i>Router with IPoA</i> , or <i>Bridge with RFC 1483</i>

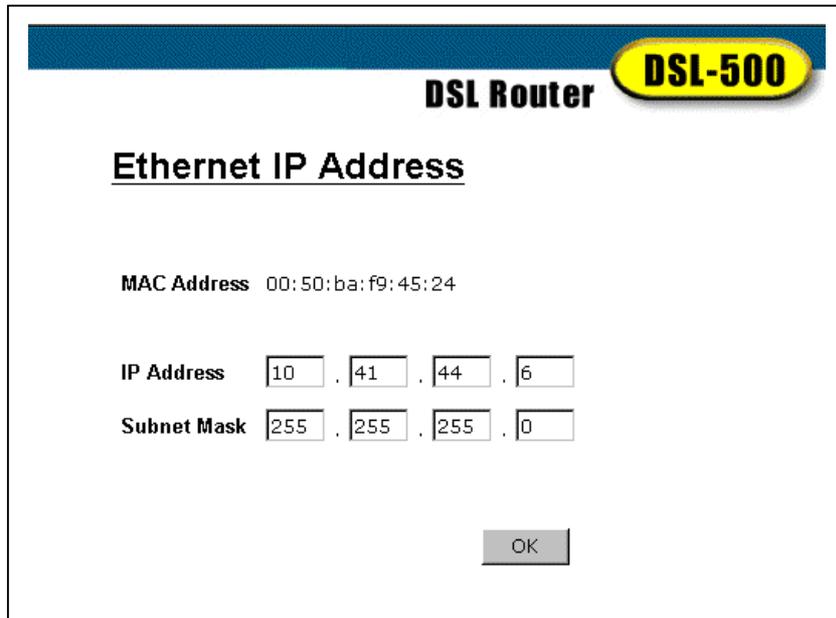
When all the changes have been made, click on the **OK** button. You will be prompted to save the changes and reboot the device.

To return to the Connection Profile Screen, click the Exit icon.

Note: The VPI and VCI numbers are assigned by the network service provider. These values should not be changed unless you are instructed to do so. Incorrect VPI or VCI settings will not allow the device to connect to the WAN.

IP Address on LAN

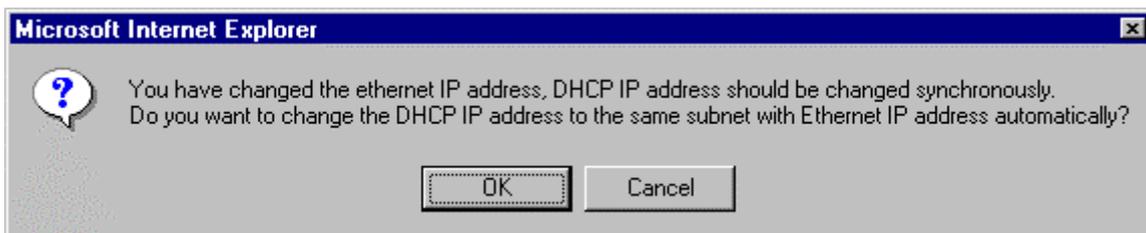
Use this menu to change the LAN IP address of the Router.



The screenshot shows the 'DSL Router' interface with a yellow 'DSL-500' badge. The main heading is 'Ethernet IP Address'. Below it, the 'MAC Address' is displayed as '00:50:ba:f9:45:24'. The 'IP Address' field is set to '10.41.44.6' and the 'Subnet Mask' field is set to '255.255.255.0'. An 'OK' button is located at the bottom right of the menu.

Ethernet IP Address Menu

The Ethernet IP Address displays the current LAN IP settings of the Router. To change the IP address, type in the new **IP Address** and **Subnet Mask** in the spaces provided and click on the **OK** button. If DHCP is enabled, a screen prompt will appear:



If you will continue to use the DHCP function, click the **OK** button.

You will be prompted again to restart the device. Restart now or continue to make changes and save the changes later.

Router Configuration

The DSL-500 serving as a router has a different role than it does when it is configured to be a bridge. This section discusses the different menus used for configuration when it serves as a router. The device is configured as a router when using a connection profile characterized by a PPPoE, PPPoA or IPoA connection.

PPP Configuration (PPPoE & PPPoA)

The first menu displayed is the Router/Bridge Configuration menu. You may access this window at any time by clicking on the first button in the Configuration folder.

The screenshot shows the 'DSL Router DSL-500' interface. The main title is 'Router/Bridge Configuration'. Below it is a 'Connection Profile' dropdown menu set to '3 ISPs, VPI=0, VCI=35, Router with PPPoE'. The section is titled 'PPPoE Configuration on WAN'. It includes the following fields: 'Encapsulation Method' set to 'LLC', 'PPPoE Login' section with 'Login User Name' (User), 'Login Password' (masked with asterisks), 'Authentication' (chap), 'Connect On Demand' (enabled), and 'Idle Time' (0 minutes). The 'PPP Information' section shows 'IP Address' (0.0.0.0), 'Gateway' (0.0.0.0), and 'Connection Status' (PPPoE server not found). At the bottom are 'OK', 'Connect', and 'Disconnect' buttons.

Router with PPP Configuration Menu

The PPP Configuration menu presents the following user defined parameters:

Connection Profile	Drop-down menu used to change connection method.
Login User Name	Used for authentication by your network service provider.
Login Password	Used for authentication by your network service provider.
Authentication	Protocol used to confirm the identity of the subscriber. Choose chap (default) or pap from the drop-down menu.
Connect on Demand	Select enabled or disabled. When this function is enabled the router will connect any workstation on your LAN to the Internet upon request. If this function is disabled, it will be necessary to access this menu and hit the Connect button each time you want to establish a connection to the WAN or the Internet.
Idle Time	The default value = 0. This means that the Router is always connected and able to connect on demand. If your network account is billed according to the amount of time the Router is actually connected to the Internet, enter an appropriate Idle Time value (in seconds). This will disconnect the Router after the WAN connection has been idle for the amount of time specified.

When you finished making changes to the PPP configuration, click the **OK** button to save the changes. It will be necessary to restart the Router for the new configuration to go into effect.

PPPoE Information

This read-only field provides information regarding the status of the Router connection to the WAN. The global **IP Address** for the Router should be assigned automatically by the network service provider's PPP server. The **Connection Status** will read Disconnect until the Router has established the WAN connection.

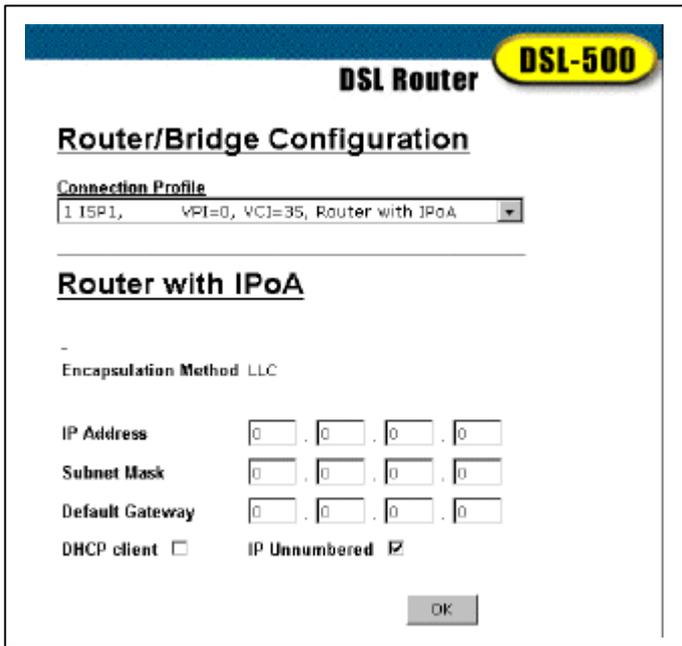
Connect to WAN

If you have enabled the Connect on Demand feature, the Router will have established the WAN connection upon restarting.

If the Connect on Demand feature has been disabled, click the **Connect** button to initiate the PPP connection via the ADSL WAN interface. The "handshake" process will take a few seconds. To sever the WAN connection, click on the **Disconnect** button.

IPoA Configuration

The IP over ATM connection method uses a different method to connect to the WAN. Some IPoA connections operate in a way similar to peer-to-peer connections, and therefore do not require a global IP address for the WAN interface. Some networks using IPoA do require global IP settings. In this case the settings are assigned manually or by DHCP. The default configuration for IPoA is peer-to-peer connection, that is, global IP settings are not required.



The screenshot shows the configuration page for a DSL Router. At the top, it says "DSL Router" and "DSL-500". The main heading is "Router/Bridge Configuration". Underneath, there is a "Connection Profile" dropdown menu showing "1 ISP1, VPI=0, VCI=35, Router with IPoA". Below this is the "Router with IPoA" section. It includes an "Encapsulation Method" set to "LLC". There are four input fields for "IP Address", "Subnet Mask", and "Default Gateway", each with a small "0" in the first box. There are two checkboxes: "DHCP client" (unchecked) and "IP Unnumbered" (checked). An "OK" button is at the bottom right.

Router with IPoA Configuration

For peer-to-peer network connections, check the **IP Unnumbered** box (checked by default) and click **OK**.

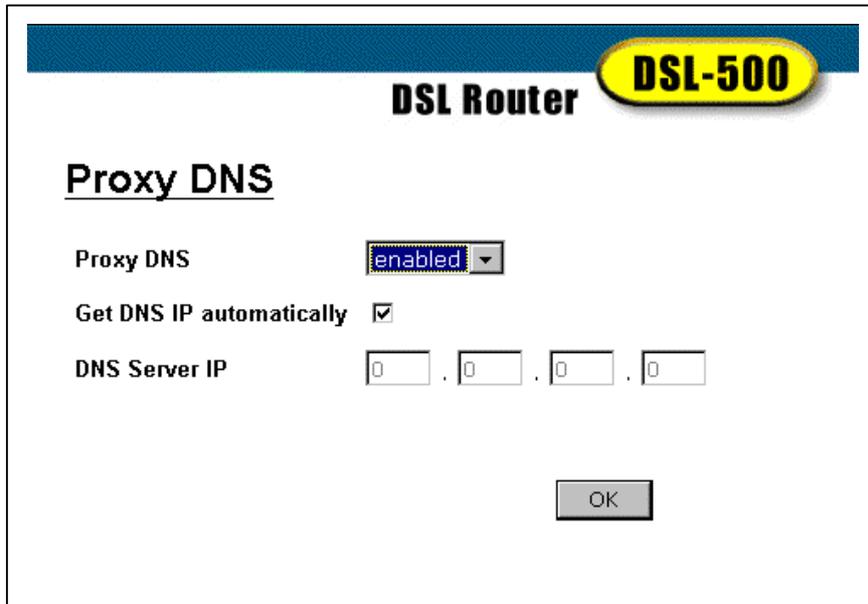
For DHCP service, check the **DHCP client** box and click **OK**.

To assign the global IP settings manually, type in the **IP Address**, **Subnet Mask** and **Default Gateway** IP settings given assigned by your network service provider, and click **OK**.

Clicking **OK** will bring up the Save and reboot system? prompt.

Proxy DNS Settings

You may use the Router to provide DNS services for work stations on your LAN. To configure on-board DNS, click on the Proxy DNS button.



The screenshot shows the 'DSL Router' interface with a 'DSL-500' logo. The 'Proxy DNS' section is active, displaying a dropdown menu set to 'enabled', a checked checkbox for 'Get DNS IP automatically', and four input fields for 'DNS Server IP' (each containing a '0'). An 'OK' button is located at the bottom right of the settings area.

Proxy DNS Menu

The Proxy DNS Menu presents the following user defined parameters:

- | | |
|---------------------------------|--|
| Proxy DNS | Default = enabled. Choose <i>enabled</i> or <i>disabled</i> from the drop-down menu to enable or disable the proxy DNS function. |
| Get DNS IP automatically | Default = auto-detect. Click in the box to use (checked) or not use (unchecked) automatic DNS detection. Using automatic DNS detection not allow you to select a DNS server. |
| DNS Server IP | (DNS auto-detect must be disabled) Type in the IP address of the DNS server you want to use. |

When you are finished making changes to the Router DNS settings click on the **OK** button. You must save the changes and restart the device for the settings to go into effect.

DHCP Configuration

Use the DHCP Configuration on LAN menu to configure the Router to act as a DHCP server for the LAN.

DSL Router **DSL-500**

DHCP Configuration on LAN

Start IP Address . . .

End IP Address . . .

Netmask . . .

Default Gateway . . .

Leased Time hour

Primary DNS . . .

Secondary DNS . . .

Primary WINS . . .

Secondary WINS . . .

Domain Name

State

DHCP Configuration Menu

Configure LAN DHCP services by defining the following parameters:

- Start IP Address** Type in the base address for the IP pool of unassigned IP addresses.
- End IP Address** Type in the last address of the contiguous IP address range to be used by the Router for DHCP function.
- Netmask** Type in a subnet mask IP address.
- Default Gateway** Type in the Default Gateway IP Address that will be assigned to and used by the DHCP clients.
- Leased Time** This specifies the amount of time (in hours) a client can lease an IP address, from the dynamically allocated IP pool.
- Primary DNS** Enter any Internet DNS server IP address available through the WAN connection or use the DNS settings supplied by your service provider.
- Secondary DNS** Enter a backup DNS IP address or leave blank.
- Primary WINS** Some LANs may require using WINS servers, enter the IP address of the WINS server or leave blank.
- Secondary WINS** Enter a back-up WINS server IP address or leave blank.
- Domain Name** Enter a domain name for the network group or leave blank.
- State** Default = enabled. If you wish to disable the DHCP function, select *disabled* from the drop-down menu.

NAT Configuration

Network Address Translation (NAT) is a routing protocol that allows your network to become a *private* network that is isolated from, yet connected to the Internet. It does this by changing the IP address of packets from a *global* IP address usable on the Internet to a *local* IP address usable on your private network (but not on the Internet) and vice-versa. The Router allows up to 128 host IP addresses.

NAT has two major benefits. First, NAT allows many users to access the Internet using a single global IP address. This can greatly reduce the costs associated with Internet access and helps alleviate the current shortage of Internet IP addresses. Secondly, the NAT process creates an added degree of security by hiding your private network behind one IP address. The NAT function will normally only allow incoming packets that are generated in response to a request from a host within the LAN.

If your network uses web servers, FTP servers or other proxies used for data requests from outside the private network, you can use NAT in conjunction with Port Redirection to allow appropriate use of your servers by outside users. See the section on Port Redirection for more information.

For the purposes of network administration, NAT is almost indispensable. Hosts and servers on the internal network can be moved easily. Using NAT together with DHCP can greatly reduce the workload of a network manager while allowing tremendous flexibility.

To view the NAT Configuration menu, click on the NAT Configuration button:

The screenshot shows the NAT Configuration menu for a DSL-500 router. At the top, it says "DSL Router" and "DSL-500". The main title is "NAT Configuration". Below this, there are three configuration options: "NAT Function" with a dropdown menu set to "enabled", "DMZ State" with a dropdown menu set to "disabled", and "DMZ IP Address" with four empty input boxes separated by dots. At the bottom, there is an "OK" button.

NAT Configuration Menu

The following parameters can be configured using the NAT Configuration menu:

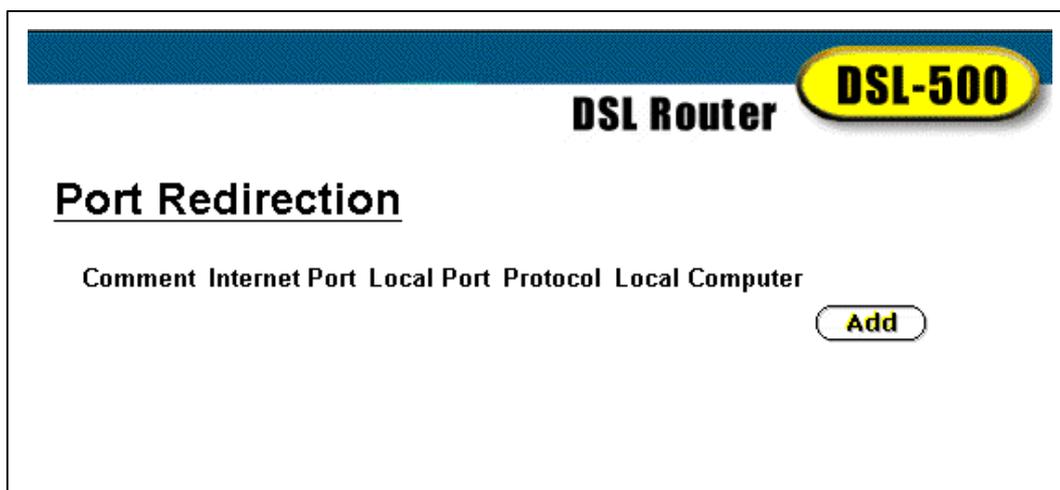
- | | |
|-----------------------|--|
| NAT Function | Default = enabled. Select <i>enabled</i> or <i>disabled</i> to enable or disable the NAT function. |
| DMZ State | Default = disabled. Select <i>enabled</i> or <i>disabled</i> to enable or disable the DMZ function. |
| DMZ IP Address | With the DMZ State enabled, type in the LAN IP address of a designated DMZ device. (see explanation below) |

DMZ IP Address

NAT may conflict with certain interactive applications such as video conferencing or playing Internet video games. For these applications, a NAT bypass can be set up using a DMZ IP address. The DMZ IP address is a “visible” address and does not benefit from the full protection of the NAT function. Therefore it is advisable that other security precautions be enabled to protect the other computers and devices on the LAN. It may be wise to use isolate the device with the DMZ IP address from the rest of the LAN.

For example, if you want to use video conferencing and still use NAT, you can use the DMZ IP address function. In this case, you must have a PC or server through which video conferencing will take place. The IP address of this PC or server will then be the DMZ IP address. You can designate the server's IP address as the DMZ by typing in the IP address in the **DMZ IP Address** space provided and clicking the **OK** button.

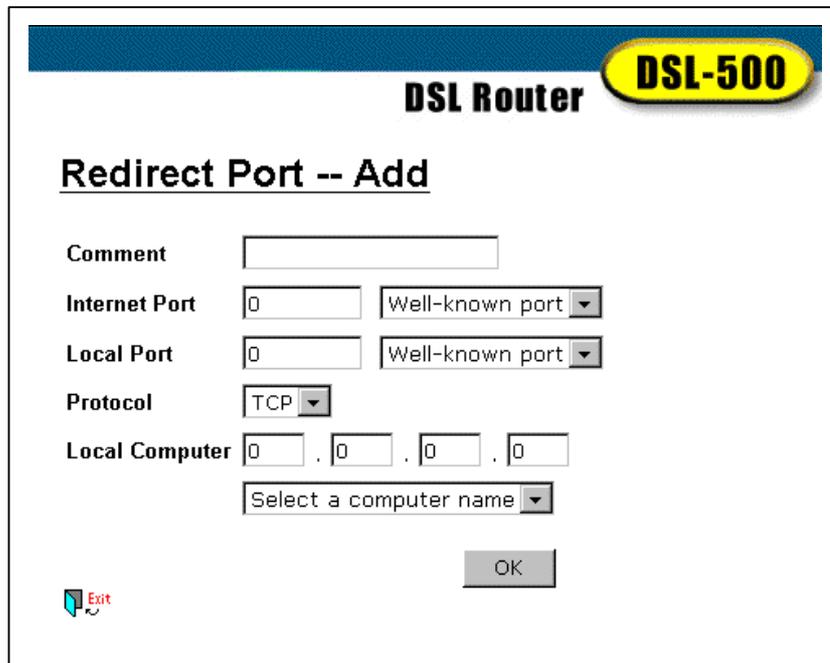
Port Redirection



Port Redirection Add Menu

The Port Redirection feature of the Router is used in conjunction with NAT to improve security and efficiency. Port redirection can be used to direct potentially hazardous packets to a proxy server outside your firewall. For example, it is common practice to direct HTTP packets to a designated HTTP server in the DMZ. Other common applications might include directing incoming SMTP packets to an Email server for data scrutiny and improved network efficiency. Click the **Add** button in the Port Redirection window to access the Redirect Port - Add menu.

Port Redirection (continued)



Redirect Port – Add Menu

The Redirect Port window presents eight entry fields:

- Comment** Assign an appropriate name to the new route.
- Internet Port** Enter the designated TCP or UDP protocol port number or use a well-known port for the particular protocol packet you wish to redirect.
 - Well-known port** Select one of the well-known ports to redirect incoming packets through that port.
- Local Port** Enter the port number used by the designated host on the LAN or use a well-known port.
 - Well-known port** Select one of the well-known ports to redirect incoming packets through that port on the local host.
- Protocol** Choose the protocol either TCP or UDP from the drop-down menu.
- Local Computer** Enter the IP address of the local designated host computer or device.

Click the **OK** button when the port redirection parameters have been entered. You can save and reboot the system now, or if you want to add more redirection sets, choose to save later and click the Exit icon to go back to the previous menu.

Static Route Configuration

Use Static Routing to specify a route used for data traffic within your LAN. This can be used to specify that all packets destined for a particular subnet use a predetermined gateway.

	IP Address	Subnet Mask	Gateway	Interface	Metric	State	Name	
1	8.29.19.45	255.255.255.0	10.7.30.97	LAN	2	enabled	Hong_Kong	Delete
2	10.10.19.11	255.255.255.0	10.12.31.79	LAN	0	disabled	China	Delete
3	7.4.17.76	255.0.0.0	10.16.19.62	LAN	1	enabled	USA	Delete
4	11.3.19.46	255.0.0.0	10.1.17.95	LAN	1	enabled	Japan	Delete
5	0.0.0.0	0.0.0.0	0.0.0.0	LAN	0	disabled		Delete
6	0.0.0.0	0.0.0.0	0.0.0.0	LAN	0	disabled		Delete
7	0.0.0.0	0.0.0.0	0.0.0.0	LAN	0	disabled		Delete
8	0.0.0.0	0.0.0.0	0.0.0.0	LAN	0	disabled		Delete
9	0.0.0.0	0.0.0.0	0.0.0.0	LAN	0	disabled		Delete
10	0.0.0.0	0.0.0.0	0.0.0.0	LAN	0	disabled		Delete
11	0.0.0.0	0.0.0.0	0.0.0.0	LAN	0	disabled		Delete
12	0.0.0.0	0.0.0.0	0.0.0.0	LAN	0	disabled		Delete

Static Route Configuration Table

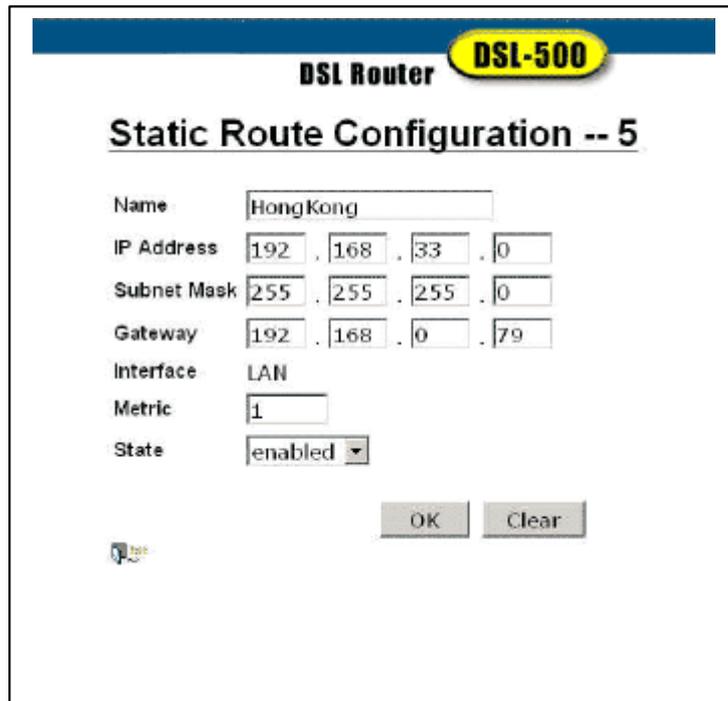
Up to 18 static route configurations can be entered into the table. To eliminate an existing static route configuration, click the **Delete** button for that configuration.

The information listed for the static route configuration is as follows:

- IP Address** IP address of the subnet or device where packets are routed.
- Subnet Mask** Subnet mask that allows packets to be routed as intended.
- Gateway** IP address of the gateway used for this static route.
- Interface** LAN interface
- Metric** Maximum number of hops allowed for the static route.
- State** Route is enabled or disabled.
- Name** Name of the subnet or static route used.

To modify an existing route configuration click on the number for that route to see the configuration menu. To define a new route, click on an unused static route configuration number to see the configuration menu.

Static Route Configuration – Modify/Add



The screenshot shows the 'Static Route Configuration -- 5' menu on a DSL Router. The form contains the following fields and values:

Name	HongKong
IP Address	192 . 168 . 33 . 0
Subnet Mask	255 . 255 . 255 . 0
Gateway	192 . 168 . 0 . 79
Interface	LAN
Metric	1
State	enabled

Buttons: OK, Clear

Static Route Configuration Menu

To add or modify a static route, define the following parameters:

- | | |
|--------------------|---|
| Name | Provide a name for the static route or subnet (optional). |
| IP Address | Type in the IP address of the subnet or device where packets are routed. |
| Subnet Mask | Type in an appropriate subnet mask that allows the static route to function. |
| Gateway | Type in the IP address of the gateway used for traffic destined for the specified subnet or device. |
| Metric | Type in the maximum number of hops allowed for the static route. |
| State | Enable or disable the route using the drop-down menu. |

Click on **OK** to put the static route into the table. It will appear in the Static Route Table shown previously.

To clear the settings for this configuration, click the **Clear** button.

To return to the Static Route Table, click the Exit icon.

Advanced Filter & Firewall

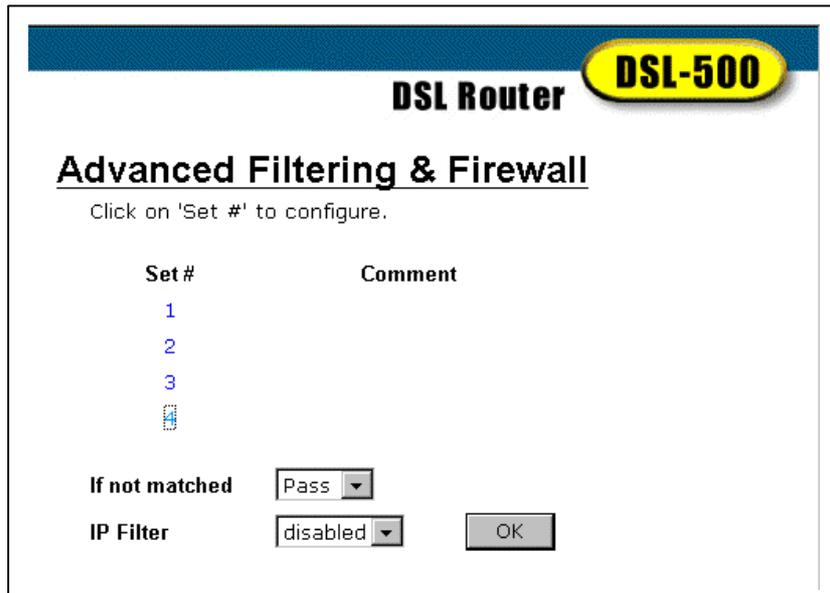
One of the most important elements of any network security implementation is the firewall. Packet filtering is a basic firewall security measure and should be used on any network that is exposed to security risk. A packet filter system examines data packets and scrutinizes them in order to control network access. Filtering rules determine whether packets are passed through the Router from either side of the gateway. The rules are created and controlled by the network administrator and can be precisely defined. These rules are used to block access to the LAN from outside the network and/or to deny access to the WAN from within the network. The Router uses filtering rules to examine data packet headers for specific information. Packets passing through the Router that do not meet the criteria specified by the rule set are dropped.

In order to improve network security without severely limiting network efficiency, it is important to carefully plan the sets of access rules. Effective implementation of packet filtering requires detailed knowledge of network

services and communication protocols. An overly complicated filtering scheme can adversely effect routing performance, while an inadequate set of rules may needlessly compromise security.

Packet filtering can be used in conjunction with NAT, port redirection and proxy servers to help provide basic firewall protection. However, these measures do not address many security issues and should be used as only one part of an overall network security strategy. It is important to remember that IP packet filtering examines only the packet header and is not concerned with application information. Therefore, packet filtering does not protect against higher-level security threats that may operate at the application or other level.

Filtering rules can be precisely defined based upon source and destination IP address, as well as port and protocol information. Up to four filter sets can be used; each set contains up to sixteen filtering rules subsets.



Filter & Firewall Menu 1

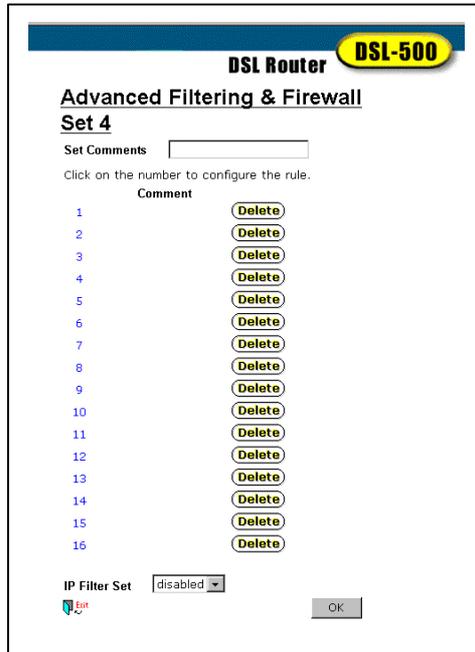
The first Filter & Firewall menu lists the four filtering sets, each followed by an identifying comment. Below the list are two drop-down menus. The filtering sets are sets of filtering rules defined in the menus shown below.

When you are finished defining the rules for each set, use the **If not matched** menu to select *Pass* or *Block* for all the sets listed. From the **IP Filter** menu, select *enabled* or *disabled* to enable or disable the listed filtering sets. When all the changes are made to the sets as you want them, click on the **OK** button. You can save the sets and reboot the system now or continue to make other changes.

Create or Modify Packet Filtering

To define new filtering rules or modify an existing one follow these steps:

1. In the first Advanced Filtering and Firewall window, click on the set number you wish to configure to proceed to the Set # window.



Filtering & Firewall – Set # Menu

2. In the Set # window, click on the rule number to define or modify that rule. The rule definition menu appears.



Filtering & Firewall - Define Rules Menu

For each rule in a set, you may define the following parameters:

Comment	Type in an appropriate identifying comment for the rule.
Pass or Block	Select <i>Pass</i> or <i>Block</i> to perform this action on packets as defined below.
Direction	Select <i>In</i> or <i>Out</i> to pass or block packets coming in or going out of the network.
Protocol	Select <i>IGMP</i> , <i>TCP</i> , <i>UDP</i> or <i>All</i> to pass or block packets of that protocol type.

IP Address Filter Rule

Source	Type in the source IP address and select the Subnet Mask to pass or block packets from that IP address.
Destination	Type in the destination IP address and select the Subnet Mask to pass or block packets destined to that IP address.

Port Filter Rule

UDP and TCP packets only. Select a range of ports to pass or block.

Use the following guide to define the port or port range (Start Port and End Port):

- < : specifies the port numbers less than and equal to the Start Port number
- > : specifies the port numbers greater than and equal to the Start Port number
- = : sets the port number equal to the Start Port if there is no End Port specified; if an End Port number is specified, this defines a range of ports to filter. The range is defined as the port numbers between the Start Port and End Port, including the Start and End Port numbers.
- ≠ : the port number does not equal to the Start Port if there is no End Port specified; if an End Port number is specified, this defines a range of ports not to filter. The range is defined as the port numbers between the Start Port and End Port, including the Start and End Port numbers.

Filter Rule State Select *enabled* or *disabled* to enable or disable the filter rule as defined in the menu.

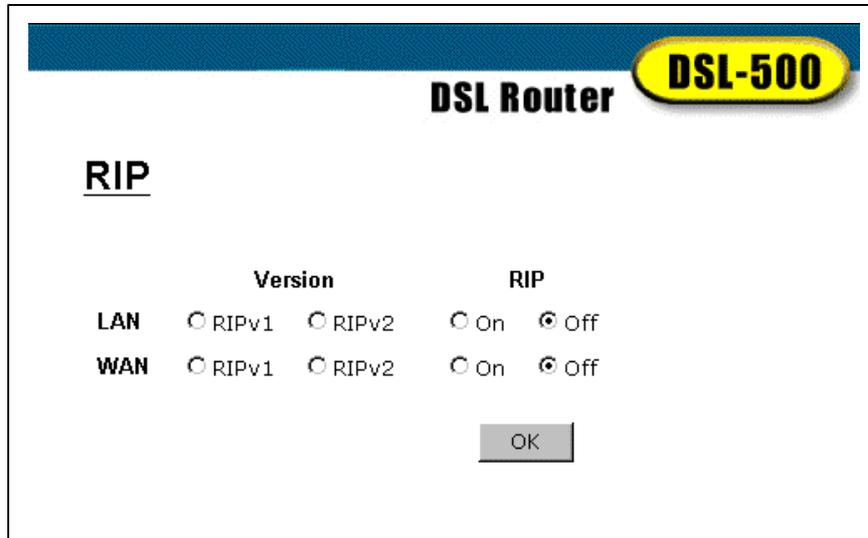
When you have defined the rule, click on **OK**, the Save changes and reboot system prompt will appear. You can save and reboot now, or continue to define more filtering rules.

To clear the rules menu to show the default values, click the **Clear** button.

To return to the Set # menu, click the Exit icon. The comment you entered for new rule will appear next to the rule number.

RIP

To enable RIP or specify use of Version 1 or 2 access the RIP menu.



The screenshot shows the configuration interface for the DSL Router. At the top, there is a blue header with the text "DSL Router" and a yellow oval containing "DSL-500". Below the header, the word "RIP" is underlined. The main content area contains two rows of radio button options. The first row is for the "LAN" interface, and the second row is for the "WAN" interface. Each row has two columns: "Version" and "RIP". Under "Version", there are two radio buttons: "RIPv1" and "RIPv2". Under "RIP", there are two radio buttons: "On" and "Off". The "Off" radio button is selected for both interfaces. At the bottom center, there is a grey "OK" button.

	Version		RIP	
LAN	<input type="radio"/> RIPv1	<input type="radio"/> RIPv2	<input type="radio"/> On	<input checked="" type="radio"/> Off
WAN	<input type="radio"/> RIPv1	<input type="radio"/> RIPv2	<input type="radio"/> On	<input checked="" type="radio"/> Off

OK

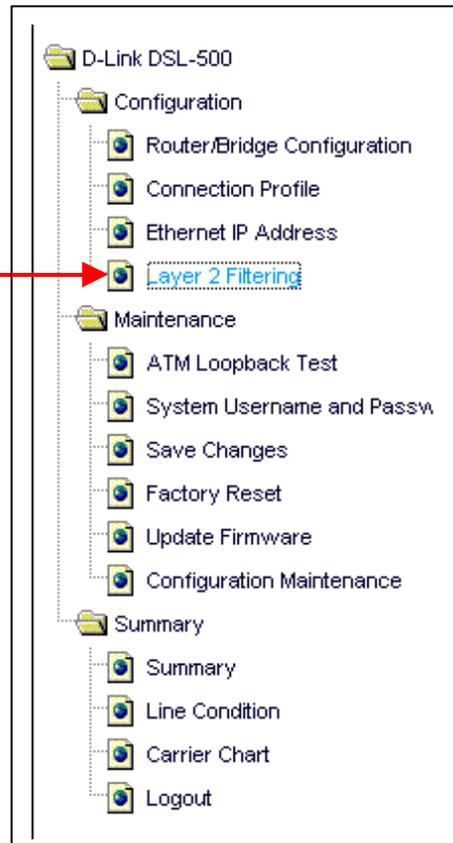
RIP Menu

Select to use RIPv1, RIPv2 or On (both versions) for the LAN and WAN interface. To disable both versions of RIP select Off. Click **OK** to bring up the Save changes and reboot system menu.

Bridge with RFC 1483 Configuration

Menu options for the DSL-500 are different when the connection profile specifies Bridge with RFC 1483 since it is acting in the capacity of a bridge rather than a router. You can see from the figure below that there are fewer menu options for device configuration. Most of the menus in the Configuration file are the same and are used in the same way they are used for Router with PPP configuration. Instructions for using the Connection Profile and Ethernet IP Address menus can be found in the previous section, *Router with PPP Configuration*.

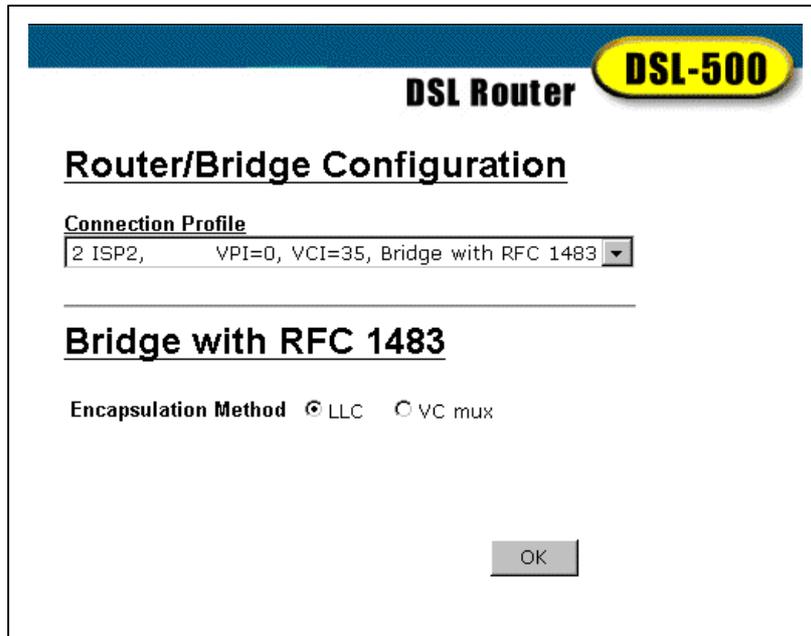
The Layer 2 Filtering menu only appears when the device is in bridge mode.



Bridge Configuration Menus

Change Encapsulation - Bridge Configuration

When the device connection profile defines the device as a Bridge with RFC 1483, the first window that appears after login is the Bridge/Router Configuration window. Use this menu to change the encapsulation method used for packets transported through the bridge.



Bridge Configuration Menu

To change the **Encapsulation Method**, click *LLC* or *VC mux* as specified by your service provider and click the **OK** button. You will see the Save changes and reboot system? menu. The default encapsulation setting is LLC.

This menu may also be used change the connection method in the **Connection Profile** drop-down menu.

Layer 2 Filtering (bridge mode only)

The Layer 2 filtering option is available in the bridge configuration folder, it is not an option when the device is configured as a router.

Layer 2 Filtering

- ARP
- PPPoE
- IP Multicast
- IPv6 Multicast
- IP Broadcast/RARP
- IPX
- NetBEUI
- Appletalk
- Bridge Management Information

means pass such frame type.

Layer 2 Filter Menu

By default, the bridge will pass all packets in either direction. You may specify that certain types of packets be dropped in order to free up bandwidth or improve security. To block a packet type, click in the box so that check mark does not appear in the box and click **OK**. You will see the Save changes and reboot system? menu.

Maintenance

The Maintenance folder contains the same menus for bridge and router configurations with the exception of the Remote Administration Access option, available only for router configurations.

ATM Loopback Test

ATM loopback tests are used to verify connectivity and path integrity along a specified ATM circuit. In the test, a cell is sent to an endpoint or to the end of the first segment of the ATM path. If the path is available and the connections are functioning, an test cell will be returned along the same ATM path and be detected by the device. This is very similar to a Ping test. The test can help to determine if connectivity problems originate from outside the LAN.

The screenshot shows the configuration interface for the ATM Loopback Test. It includes input fields for VPI (0) and VCI (35), a pull-down menu for F4/F5 (F5), and another pull-down menu for etoe/segment (End to End). A Status field is present but empty. A 'Loop Test' button is at the bottom.

ATM Loopback Screen

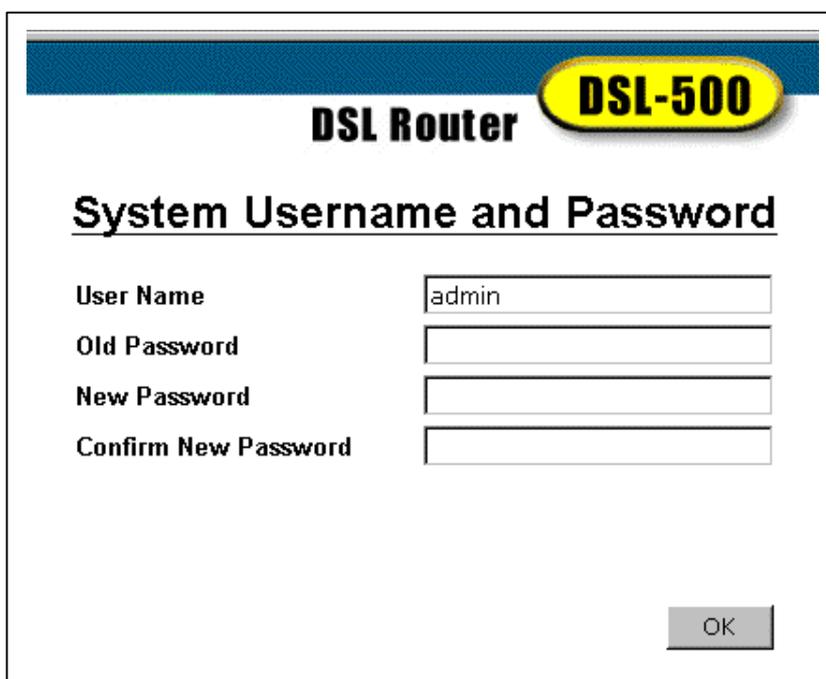
To perform the test, define the following parameters:

- | | |
|---------------------|---|
| VPI | Type in the VPI setting used for the network connection. |
| VCI | Type in the VCI setting used for the network connection. |
| F4/F5 | Choose F4 (Virtual Path) or F5 (Virtual Connection) from the pull-down menu to define the flow type. An F4 flow test is used to verify that ATM network information (ATM cells) can be shared between network elements. This information is used within virtual paths to report an unavailable path or a virtual path that cannot be guaranteed. An F5 flow test is also used to verify that ATM network information can be shared between network elements. This information is used within virtual connections to report degraded virtual channel performance such as late arriving cells, lost cells, and cell insertion problems. |
| etoe/segment | Select the test type from the remaining pull-down menu. Choose <i>End-to-End</i> to test the entire path from the Router to the ATM connection endpoint. Choose <i>segment</i> to test the path from the Router to the end of the first ATM connection segment. |
| Status | A success or fail message appears here after the test is completed. If the reply cell is received within the standard-defined time, the Status will read <i>OK</i> . This indicates that the specified test path is functioning normally and all connections were successful. If the Status reads <i>Fail</i> , there is a fault in the segment or path tested. |

When all the test parameters have been specified, click on the **Loop Test** button to initiate the test.

System Username and Password

Use this screen to change the username and password used to access the Web Manager. The Web Manager can be accessed remotely from outside the LAN when it is functioning in router mode using the Remote Administration Access menu (described in a later section).



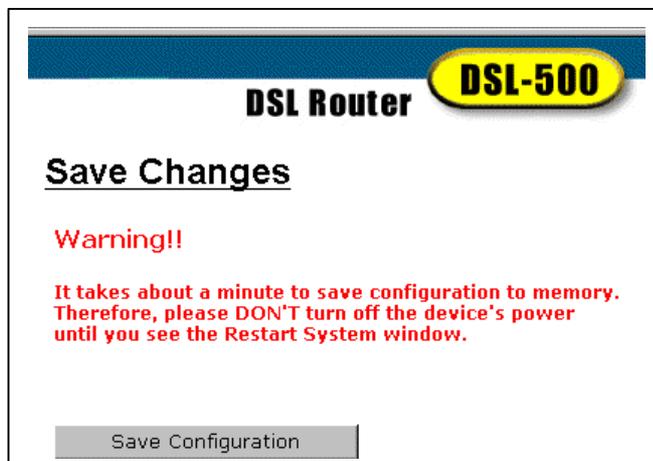
The screenshot shows a web interface for a DSL Router. At the top, there is a blue header bar with the text "DSL Router" and a yellow oval containing "DSL-500". Below the header, the title "System Username and Password" is displayed. The form contains four input fields: "User Name" (with "admin" entered), "Old Password", "New Password", and "Confirm New Password". An "OK" button is located at the bottom right of the form.

User Name and Password Menu

1. Type the current **User Name** in the entry field provided.
2. Type in the current password in the **Old Password** entry field.
3. Type in the **New Password** in the entry field provided.
4. Type in the new password again in the **Confirm New Password** field.
5. Click the **OK** button. The Save changes and reboot system? message appears.

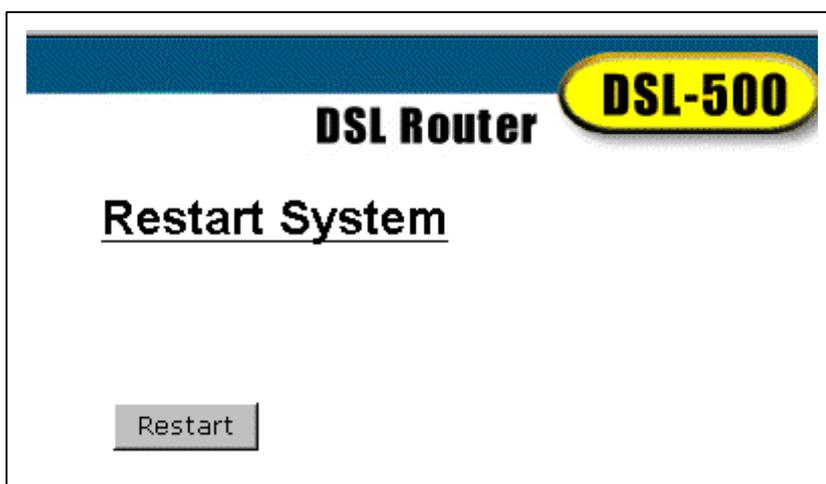
Save Changes

In order to save the configuration changes you have just made they must be saved to the Router's non-volatile RAM. In the Maintenance folder, click on the Save Changes button to access the menu below:



Save Changes Menu

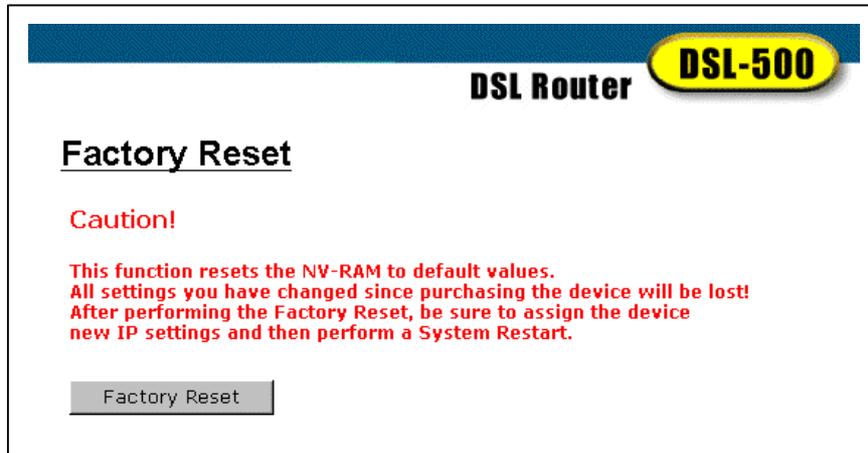
1. Click the **Save Configuration** button. A pop-up message window will inform you that the Router must be restarted. Do not turn off the power to the Router while the settings are being saved.
2. When the **Restart System** window appears, click the **Restart** button.



Restart System Window

Factory Reset

The DSL-500 can be reset to the default configuration for all settings using the Factory Reset option. This will also change the both the LAN and WAN IP address of the device, so these will need to be reconfigured accordingly.

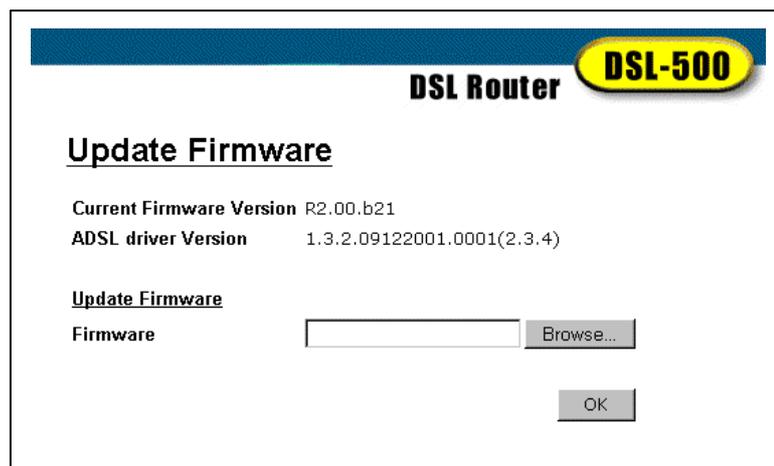


Factory Reset Screen

To perform a factory reset, click the **Factory Reset** button. Since the IP settings will return to their default, you will lose access to the Web Manager. To use the Web Manager interface, the LAN IP address will need to be reconfigured.

Update Firmware

Use the Update Firmware feature to load the latest firmware for the device. You can obtain the latest version of the DSL-500 firmware by logging onto the D-Link web site at www.dlink.com. Access the D-Link web site by clicking on the D-Link logo in the upper left corner of the browser window. Save the latest firmware version to a file on the Manager PC or accessible server.

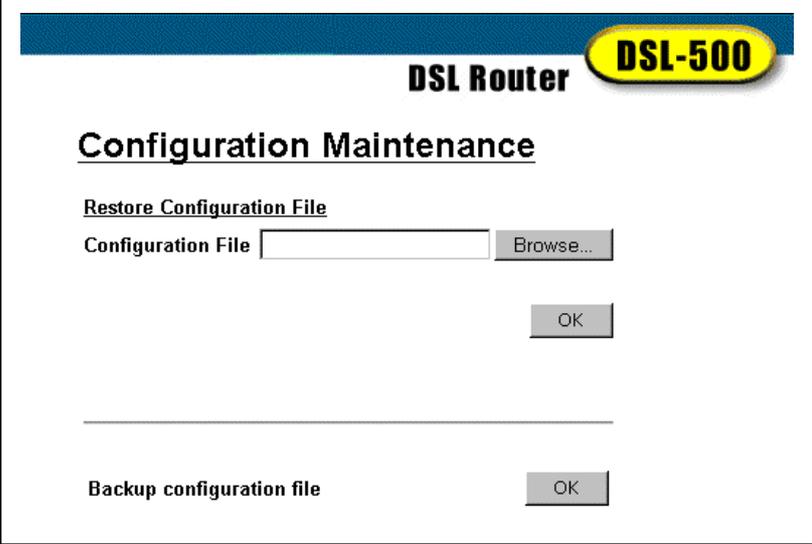


Update Firmware Screen

To upgrade firmware, type in the name and path of the file or click on the **Browse** button to search for the file. Click the **OK** button to begin copying the file. The file will load and restart automatically.

Configuration File Maintenance

Use the Configuration File Maintenance store current settings to a file on the Manager PC or to load previously saved configuration files on the device.



The screenshot shows the 'DSL Router' interface with a yellow 'DSL-500' badge. The main heading is 'Configuration Maintenance'. Under the sub-heading 'Restore Configuration File', there is a 'Configuration File' text input field followed by a 'Browse...' button. Below this is an 'OK' button. A horizontal line separates this section from the 'Backup configuration file' section, which has an 'OK' button.

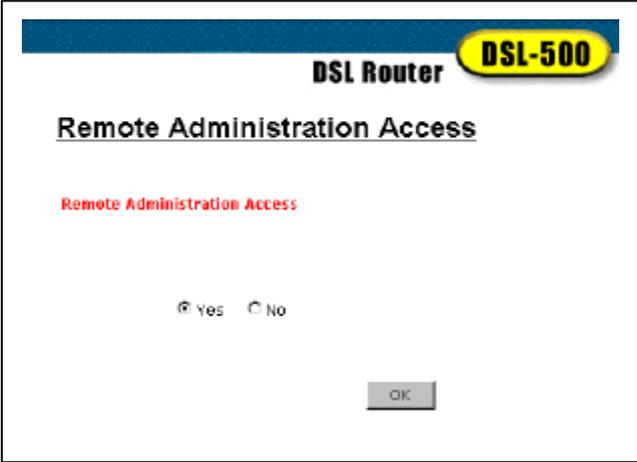
Configuration Maintenance Screen

To save the current settings to a configuration file on the PC, click on the lower **OK** button, after the *Backup configuration file* option. The file will be saved as dslRouter.cfg or you can specify another file name.

To load a saved configuration file from the PC, type in the full name and path in the Configuration File space or click on the **Browse** button to search for the file.

Remote Administration Access (Router mode only)

The Router can be administered using a PC located outside the LAN. Permission to allow remote management must first be allowed by enabled remote management.



The screenshot shows the 'DSL Router' interface with a yellow 'DSL-500' badge. The main heading is 'Remote Administration Access'. Below the heading, the text 'Remote Administration Access' is displayed in red. There are two radio buttons: 'Yes' (which is selected) and 'No'. Below the radio buttons is an 'OK' button.

Remote Administration Access

Enable remote access to the web manager by selecting *Yes* and clicking **OK**. The Save changes and reboot? Prompt will appear. Remote Administration is disabled by default.

Summary

The contents of the Summary folder differ depending on the mode of operation used by the device. In router mode, the folder offers two additional screens, a DHCP table and a runtime routing table. In addition, the Summary chart contains different information.

Summary	
<u>IP Address Configuration</u>	
IP Address	10.41.44.6
Subnet Mask	255.255.255.0
MAC Address	00:50:ba:f9:45:24
<u>PPPoA Login</u>	
Login User Name	user
Authentication	chap
<u>PPP Information</u>	
IP Address	0.0.0.0
Connection Status	Connecting
<u>PVC</u>	
VPI	0
VCI	35
<u>Connection Type</u>	
Connection Type	Router with PPPoA
Encapsulation Method	LLC
<u>DHCP Configuration</u>	
Start IP Address	192.168.0.2
End IP Address	192.168.0.33
Netmask	255.255.255.0
Default Gateway	192.168.0.1
Leased Time	72 hour
Primary DNS	192.168.0.1
Domain Name	
State	enabled
<u>NAT Configuration</u>	
NAT Function	enabled

Router Summary Screen

In router mode, the information presented in the Summary screen is as follows:

LAN IP Address Configuration

IP Address	LAN IP Address of the Router
Subnet Mask	Router Subnet Mask on the LAN
MAC Address	Router MAC Address

PPP Login

Login User Name	User name for PPP log in
Authentication	Authentication method used for PPP connection

PPP Information

IP Address	WAN IP Address used by the Router
Connection Status	Status of WAN connection

PVC Information

VPI	Virtual Path Identifier
VCI	Virtual Circuit Identifier

Connection

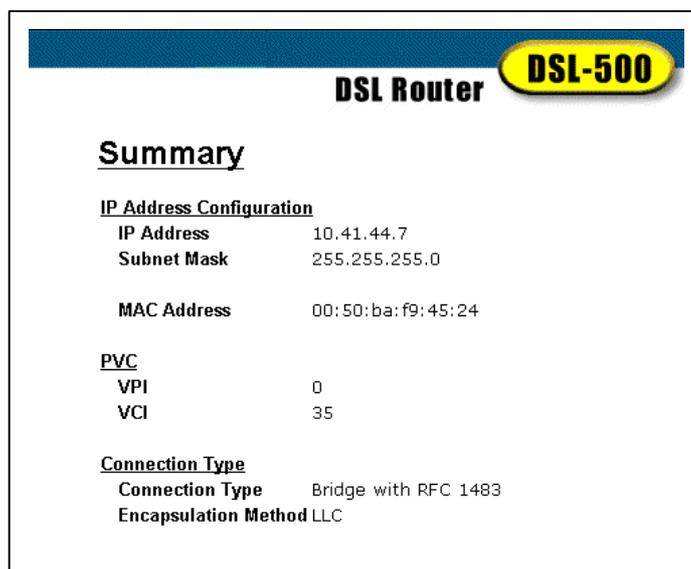
Connection Type	PPPoA, PPPoE or IPoA
Encapsulation Method	Packet encapsulation method used LLC or VC Mux

DHCP Information

Start IP Address	Beginning IP address used for LAN DHCP scheme
End IP Address	Ending IP address used for LAN DHCP scheme
Netmask	Subnet Mask used on LAN
Default Gateway	LAN default gateway IP address
Leased Time	LAN IP address lease time
Primary DNS	DNS server IP address
Domain Name	Domain name used
State	DHCP enable or disabled

NAT Configuration

NAT Function	NAT enabled or disabled
---------------------	-------------------------



Bridge Summary Screen

In bridge mode, the device does not contain information associated with router functions in the Summary screen.

Line Condition

In the Line Condition window you can monitor the characteristics of the ADSL connection and confirm that it has been established.

The screenshot shows the 'DSL Router DSL-500' interface with the 'Line Condition' window open. The window displays the following data:

<u>Protocol</u>	
Data Path	Interleave
Operation Mode	G.DMT
ADSL State	Showtime
<u>Rate</u>	
Downstream	7616 kbps
Upstream	928 kbps
<u>SNR</u>	
SNR	13 dB
<u>ATEN</u>	
ATEN Downstream	0 dB
ATEN Upstream	6 dB
<u>Loop Distance</u>	
Loop Distance	0 K ft.
<u>Near end</u>	
FEC	0
CRC	0
HEC	0
<u>Far end</u>	
FEC	9170
CRC	52
HEC	11
<u>Packet Counter</u>	
Transmit Packets	463
Receive Packets	0

Line Condition Screen

Line condition statistics listed here are as follows:

Protocol

Data Path	Current data path type Fast or Interleaved
Operation Mode	Modulation technique used for ADSL connection, G.DMT or G.lite

Rate

Downstream	Downstream data transfer rate in Kbps
Upstream Rate	Upstream data transfer rate in Kbps

SNR

SNR	Signal-to-noise ratio in dB
------------	-----------------------------

ATEN

ATEN Downstream	Downstream attenuation of signal in dB
ATEN Upstream	Upstream attenuation of signal in dB

Loop Distance

Loop Distance	Loop in K ft. range = 0 – 18 K ft.
----------------------	------------------------------------

Near End

Number of data transfer errors on the near end (ATU-R) listed according to the correction technique

- FEC Forward Error Correction
- CRC Cyclic Redundancy Control
- HEC Header Error Check

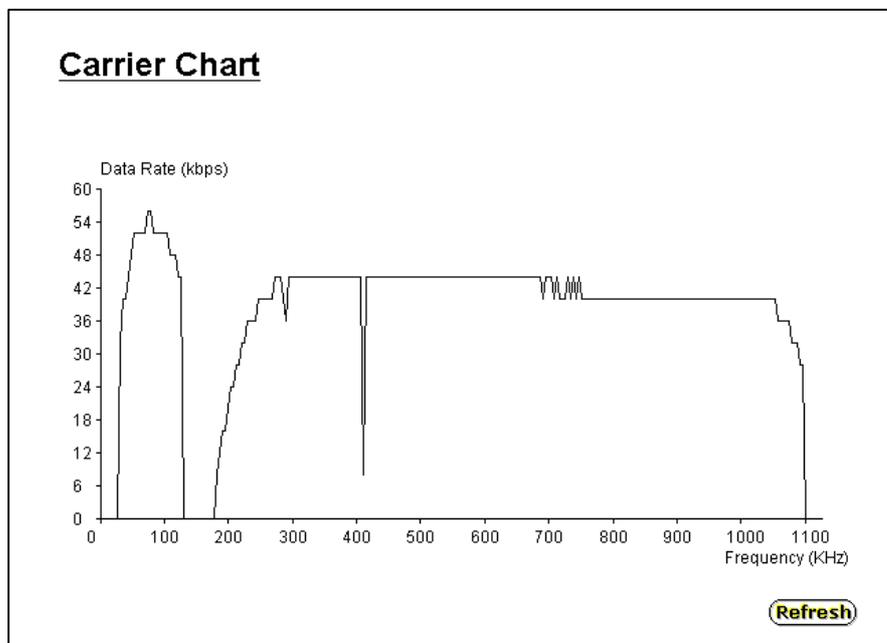
Far End

Number of data transfer errors on the far end (ATU-C) listed according to the correction technique

- FEC Forward Error Correction
- CRC Cyclic Redundancy Control
- HEC Header Error Check

Carrier Chart

The Carrier Chart illustrates the data rates distributed across the upstream and downstream frequency ranges.

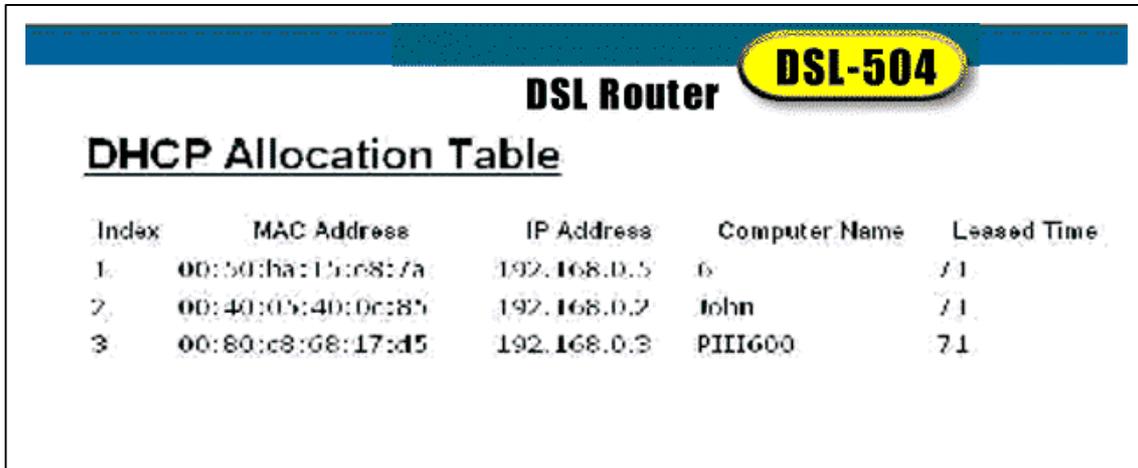


Carrier Chart

This chart can be used to gauge signal quality for the entire upstream (lower portion) and downstream (upper portion) range of discrete modular tones. The example above displays normal signal function for the full range of frequencies.

DHCP Allocation Table (Router mode only)

The DHCP Allocation Table provides a summary of current IP setting allocation for the network.



Index	MAC Address	IP Address	Computer Name	Leased Time
1	00:50:ba:15:c8:7a	192.168.0.5	6	71
2	00:40:05:40:0c:85	192.168.0.2	John	71
3	00:80:c8:68:17:d5	192.168.0.3	PIII600	71

DHCP Allocation Table

Information listed in the DHCP Allocation Table includes the following:

Index	Index reference number for entry
MAC Address	MAC address of computer or networked device
IP Address	Assigned IP address of computer or networked device
Computer Name	Name of computer or networked device
Leased Time	Leased time of assigned IP address

Runtime Routing Table (Router mode only)

The Runtime Routing Table provides a summary of dynamic and static routing information for both the LAN and WAN interface.

DSL Router		DSL-500					
Runtime Routing Table							
	IP Address	Subnet Mask	Gateway	Protocol	Interface	Metric	Name
1	192.168.0.0	255.255.255.0	0.0.0.0	Direct	LAN	1	ethernet
2	192.168.61.0	255.255.255.0	192.168.0.115	Static	LAN	1	UK
3	192.168.33.0	255.255.255.0	192.168.0.79	Static	LAN	1	HongKong
4	172.19.0.0	255.255.0.0	192.168.0.58	Static	LAN	4	Japan
5	172.16.0.0	255.255.0.0	192.168.0.67	Static	LAN	2	China
6	10.4.2.0	255.255.255.0	192.168.0.25	Static	LAN	0	USA
7	0.0.0.0	0.0.0.0	0.0.0.0	Static	WAN	1	ppp_route

Runtime Routing Table

Information listed in the Runtime Routing Table includes the following:

IP Address	IP address of network, subnet or device used for route
Subnet Mask	Subnet mask used for route
Gateway	IP address of gateway device used for route
Protocol	Route protocol or type, Direct or Static
Interface	Interface of network, subnet or device used for router, LAN or WAN
Metric	Number of hops used/allowed for route
Name	Name assigned to route



Technical Specifications

GENERAL		
STANDARDS:	<ul style="list-style-type: none"> • ITU G.992.1 (G.dmt) • ITU G.992.2 (G.lite) • ITU G.994.1 (G.Hs) • ITU-T Rec. I.361 • ITU-T Rec. I.610 • IEEE 802.3 • IEEE 802.3u • IEEE 802.1d • RFC 791 (IP Routing) • RFC 792 (UDP) • RFC 826 (ARP) • RFC 1058 (RIP 1) • RFC 1389 (RIP 2) • RFC 1213 compliant • RFC 1483 (Bridged Ethernet) • RFC 1577 (IP over ATM) 	<ul style="list-style-type: none"> • RFC 1661 (PPP) • RFC 1994 (CHAP) • RFC 1334 (PAP) • RFC 2364 (PPP over ATM) • RFC 1631 (NAT) • RFC 1877 (Automatic IP assignment) • RFC 2516 (PPP over Ethernet) • Supports RFC 2131 and RFC 2132 (DHCP) • Compatible with all T1.413 issue 2 (full rate DMT over analog POTS), and CO DSLAM equipment • Supports ATM Forum UNI V3.1 PVC
PROTOCOLS:	TCP/IP UDP RIP-1 RIP-2 IGMP	DHCP BOOTP ARP AAL5
DATA TRANSFER RATE:	G.dmt full rate: Downstream up to 8 Mbps Upstream up to 640 Kbps G.lite: Downstream up to 1.5 Mbps Upstream up to 512 Kbps	
MEDIA INTERFACE EXCHANGE:	RJ-11 port ADSL telephone line connection RJ-45 port for 10BASET Ethernet connection RS-232 (DB9 female) console port for local configuration	

Physical and Environmental	
DC inputs: Power Adapter:	Input: 100V ~ 240V AC 50 ~ 60Hz Output: 7.5V DC 1A
Power Consumption:	5 Watts (max)
Operating Temperature:	0° to 40° C (32° - 104° F)
Humidity:	5 to 95% (non-condensing)
Dimensions:	190 mm x 116.8 mm x 30.9 mm
Weight:	360 gm
EMI:	CE Class B FCC Class B
Safety:	UL/CUL TUV
Reliability:	Mean Time Between Failure (MTBF) min. 4 years



LAN IP Setup

The DSL-500 is designed to provide network administrators maximum flexibility for IP addressing on the Ethernet LAN. The easiest IP setup choice in most cases is to let the Router do it using DHCP, which is enabled by default. This appendix briefly describes various options including DHCP, used for IP setup on a LAN. If you are new to IP networking, the next appendix provides some background information on basic IP concepts.

Assigning Network IP Addresses

The IP address settings, which include the IP address, subnet mask and gateway IP address are the first and most important internal network settings that need to be configured. The Router is assigned a default LAN IP address and subnet mask. If you do not have a preexisting IP network and are setting one up now, using the factory default IP address settings can greatly ease the setup process. If you already have a preexisting IP network, you can adjust the IP settings for the Router to fit within your existing scheme.

Using the Default IP Address

The Router is shipped with a preset default IP address setting of 192.168.0.1 for the LAN port. There are two ways to use this default IP address, you can manually assign an IP address and subnet mask for each PC on the LAN or you can instruct the Router to automatically assign them using DHCP. The simplest method is to use DHCP. The DHCP function is active by default.

Manual IP Address Assignment

Manually configuring IP settings for the LAN means you must manually set an IP address, subnet mask and IP address of the default gateway (the Router's IP address) on each networked computer. The example listed below describes IP configuration for computers running Windows 98 or Windows 95. Regardless of what operating system is used on each workstation, the three network IP settings must be defined so the network interface used by each workstation can be identified by the Router, and vice versa. For detailed information about configuring your workstations IP settings, consult the user's guide included with the operating system or the network interface card (NIC).

1. In Windows 95/98, click on the **START** button, go to **Settings** and choose **Control Panel**.
2. In the window that opens, double-click on the **Network** icon.
3. Under the Configuration tab, select the **TCP/IP** component and click *Properties*.
4. Choose the *Specify an IP address* option and edit the address settings accordingly. Consult the table below for IP settings on a Class C network.

Using Default IP without DHCP			
Host	IP Address	Subnet Mask	Gateway IP
Router	192.168.0.1	255.255.255.0	
Computer #1	192.168.0.2	255.255.255.0	192.168.0.1
Computer #2	192.168.0.3	255.255.255.0	192.168.0.1
Computer #3	192.168.0.4	255.255.255.0	192.168.0.1

LAN IP Setup - Example #1

Please note that when using the default IP address as in the above example, the first three numbers in the IP address must always be the same with only the fourth number changing. The first three numbers define the network IP address (all machines must belong to the same IP network), while the last number denotes the host IP address (each computer must have a unique address to distinguish it on the network). The IP address scheme used in Example #1 can be used for any LAN that requires up to 253 separate IP addresses (excluding the Router). Notice that the subnet mask is the same for all machines and the default gateway address is the LAN IP address of the Router.

It is a good idea to make a note of each device's IP address for reference during troubleshooting or when adding new stations or devices.

Using DHCP

The second way to use the default settings is to allow the Router to automatically assign IP settings for workstation using DHCP. To do this, simply make sure your computers' IP addresses are set to 0.0.0.0 (under Windows, choose the option Obtain an IP address automatically in the TCP/IP network component described above). When the computers are restarted, their IP settings will automatically be assigned by the Router. The Router is set by default to use DHCP. See the discussion in Chapter 5 for information on how to use configure the Router for DHCP.

Changing the IP Address of the Router

When planning your LAN IP address setup, you may use any scheme allowed by rules that govern IP assignment. It may be more convenient or easier to remember an IP scheme that use a different address for the Router. Or you may be installing the Router on a network that has already established the IP settings. Changing the IP address is a simple matter and can be done using the web manager (see *LAN IP Address* in Chapter 5). If you are incorporating the Router into a LAN with an existing IP structure, be sure to disable the DHCP function. Also, consider the effects of the NAT function which is enable by default.

An IP addressing scheme commonly used for Ethernet LANs establishes 10.0.0.1 as the base address for the network. Using Example #2 below, the Router is assigned the base address 10.0.0.1 and the remaining addresses are assigned manually or using DHCP.

Alternative IP Assignment			
Host	IP Address	Subnet Mask	Gateway IP
Router	10.0.0.1	255.255.255.0	
Computer #1	10.0.0.2	255.255.255.0	192.168.0.1
Computer #2	10.0.0.3	255.255.255.0	192.168.0.1
Computer #3	10.0.0.4	255.255.255.0	192.168.0.1

LAN IP Setup - Example #2

These two examples are only examples you can use to help you get started. If you are interested in more advanced information on how to use IP addressing on a LAN there are numerous resources freely available on the Internet. There are also many books and chapters of books on the subject of IP address assignment, IP networking and the TCP/IP protocol suite.



IP Concepts

This appendix describes some basic IP concepts, the TCP/IP addressing scheme and show how to assign IP Addresses.

When setting up the Router, you must make sure it has a valid IP address. Even if you will not use the WAN port (ADSL port), you should, at the very least, make sure the Ethernet LAN port is assigned a valid IP address. This is required for telnet, in-band SNMP management, and related functions such as “trap” handling and TFTP firmware download.

IP Addresses

The Internet Protocol (IP) was designed for routing data between network sites all over the world, and was later adapted for routing data between networks within any site (often referred to as “subnetworks” or “subnets”). IP includes a system by which a unique number can be assigned to each of the millions of networks and each of the computers on those networks. Such a number is called an IP address.

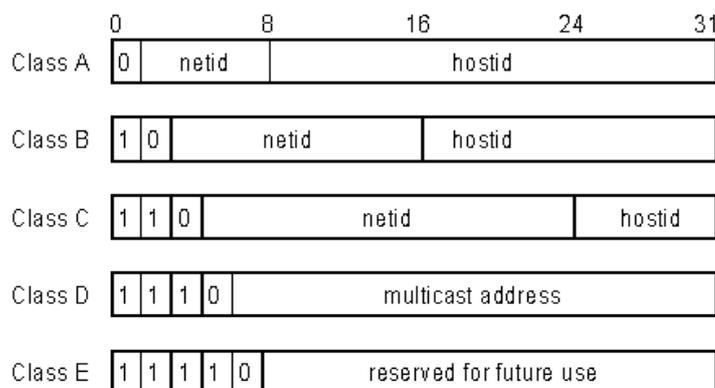
To make IP addresses easy to understand, the originators of IP adopted a system of representation called “dotted decimal” or “dotted quad” notation. Below are examples of IP addresses written in this format:

201.202.203.204 189.21.241.56 125.87.0.1

Each of the four values in an IP address is the ordinary decimal (base 10) representation of a value that a computer can handle using eight “bits” (binary digits — 1s and 0s). The dots are simply convenient visual separators.

Zeros are often used as placeholders in dotted decimal notation; 189.21.241.56 can therefore also appear as 189.021.241.056.

IP networks are divided into three classes on the basis of size. A full IP address contains a network portion and a “host” (device) portion. The network and host portions of the address are different lengths for different classes of networks, as shown in the table below.



Networks attached to the Internet are assigned class types that determine the maximum number of possible hosts per network. The previous figure illustrates how the net and host portions of the IP address differ among the three classes. Class A is assigned to networks that have more than 65,535 hosts; Class B is for networks that have 256 to 65534 hosts; Class C is for networks with less than 256 hosts.

IP Network Classes			
Class	Maximum Number of Networks in Class	Network Addresses (Host Portion in Parenthesis)	Maximum Number of Hosts per Network
A	126	1(.0.0.0) to 126(.0.0.0)	16,777,214
B	16,382	128.1(.0.0) to 191.254(.0.0)	65,534
C	2,097,150	192.0.1(.0) to 223.255.254(.0)	254

Note: All network addresses outside of these ranges (Class D and E) are either reserved or set aside for experimental networks or multicasting.

When an IP address's host portion contains only zero(s), the address identifies a network and not a host. No physical device may be given such an address.

The network portion must start with a value from 1 to 126 or from 128 to 223. Any other value(s) in the network portion may be from 0 to 255, except that in class B the network addresses 128.0.0.0 and 191.255.0.0 are reserved, and in class C the network addresses 192.0.0.0 and 223.255.255.0 are reserved.

The value(s) in the host portion of a physical device's IP address can be in the range of 0 through 255 as long as this portion is not all-0 or all-255. Values outside the range of 0 to 255 can never appear in an IP address (0 to 255 is the full range of integer values that can be expressed with eight bits).

The network portion must be the same for all the IP devices on a discrete physical network (a single Ethernet LAN, for example, or a WAN link). The host portion must be different for each IP device — or, to be more precise, each IP-capable port or interface — connected directly to that network.

The network portion of an IP address will be referred to in this manual as a **network number**; the host portion will be referred to as a **host number**.

To connect to the Internet or to any private IP network that uses an Internet-assigned network number, you must obtain a registered IP network number from an Internet-authorized network information center. In many countries you must apply through a government agency, however they can usually be obtained from your Internet Service Provider (ISP).

If your organization's networks are, and will always remain, a closed system with no connection to the Internet or to any other IP network, you can choose your own network numbers as long as they conform to the above rules.

If your networks are isolated from the Internet, e.g. only between your two branch offices, you can assign any IP Addresses to hosts without problems. However, the Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of IP Addresses specifically for private (stub) networks:

Class	Beginning Address	Ending Address
A	10.0.0.0	10.255.255.255
B	172.16.0.0	172.31.255.255
C	192.168.0.0	192.168.255.255

It is recommended that you choose private network IP Addresses from the above list. For more information on address assignment, refer to RFC 1597, *Address Allocation for Private Internets* and RFC 1466, *Guidelines for Management of IP Address Space*.

Subnet Mask

In the absence of subnetworks, standard TCP/IP addressing may be used by specifying subnet masks as shown below.

IP Class	Subnet Mask
Class A	255.0.0.0
Class B	255.255.0.0
Class C	255.255.255.0

Subnet mask settings other than those listed above add significance to the interpretation of bits in the IP address. The bits of the subnet mask correspond directly to the bits of the IP address. Any bit in a subnet mask that is to correspond to a net ID bit in the IP address must be set to 1.

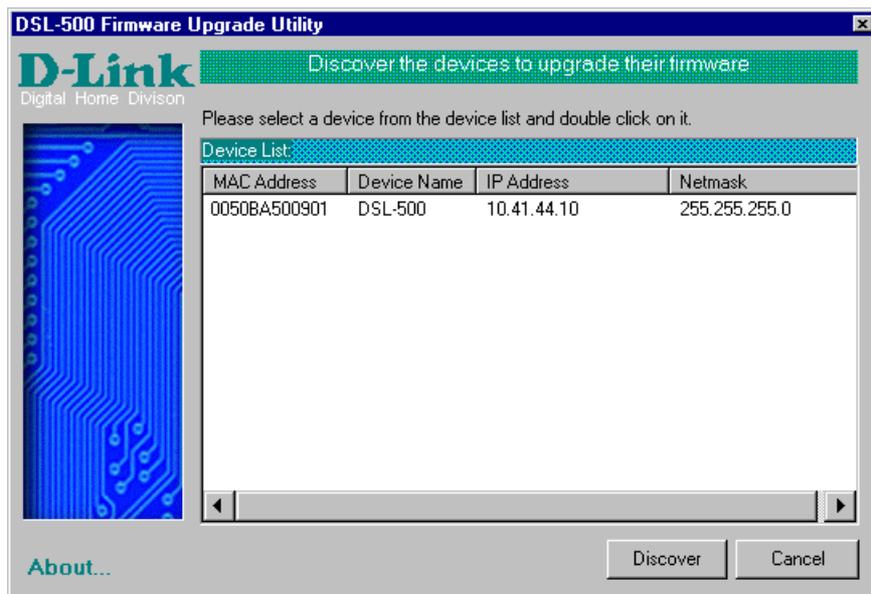


DSL-500 Firmware Upgrade Utility

You can update system firmware using the DSL-500 Firmware Upgrade Utility. To upgrade the Router's firmware, first install the Upgrade Utility software on a computer running a Windows operating system. Install the utility by clicking the file titled **setup.exe** located on the Installation CD-ROM. It will be installed automatically. It is recommended that the PC be directly connected to the Router using a crossed cable, however you may upgrade it through the LAN from a remote host.

You also need to download the latest firmware version file from the D-Link web site to the PC on which you will use the Upgrade Utility. Instructions for downloading the firmware are located on the web site at www.dlink.com.

To launch the DSL-500 Firmware Upgrade Utility, click on the icon. Allow a few moments for the software to discover the Router on the network. After the discovery phase the following window will appear. You will see all the DSL-500 Routers on your network. You can identify individual devices by either its IP address or its MAC address. Select the device you wish to upgrade by double clicking on it.

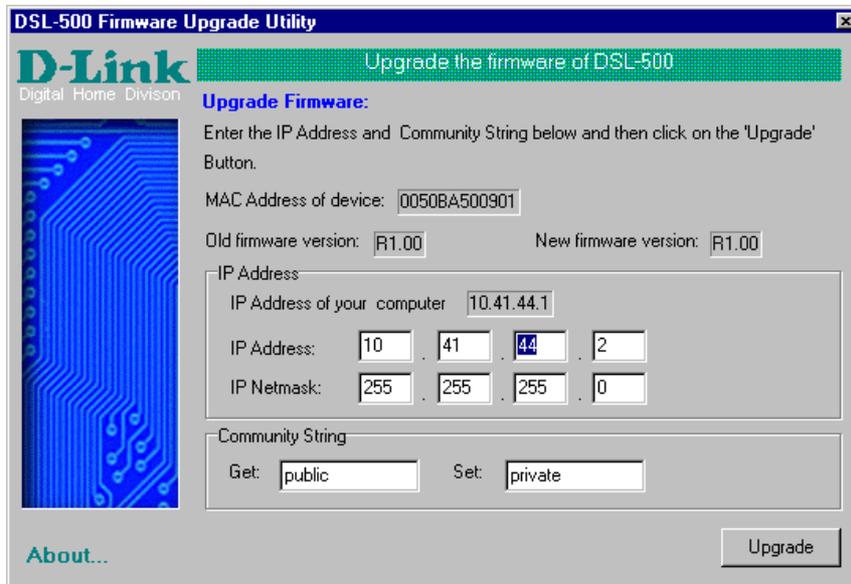


When you select a Router to upgrade you will be prompted for a password. The default password is **admin**. If you want to change the password, you can change it using the console manager interface as described in Chapter 6.



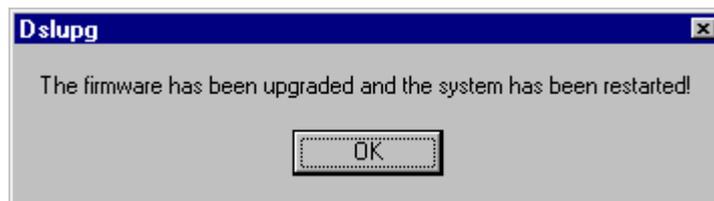
Enter the password and click OK.

In the new window you will see the MAC address of the Router and the IP address of the PC you are using. The PC and the Router must be on the same subnet for the upgrade to be completed. The upgrade utility will suggest a new IP address to be temporarily assigned to the device during the firmware upgrade procedure. Check the suggested IP address listed for the Router to be sure that it does not conflict with any existing IP addresses on your network. To change the temporary IP address of the Router, type in an available IP address in the space provided. You should change only the host portion of the address.



To upload the new firmware to the selected Router click the 'Upgrade' button. The utility will automatically load the new firmware. During the upgrade process it is important that you allow the entire file to load onto the device. Do not turn off the Router while the flash memory is being updated. A warning will appear during the upgrade reminding you not to power off the device.

When the new firmware has been successfully loaded a new window will inform you of the upgrade and tell you that the Router has been restarted. Click OK to proceed.





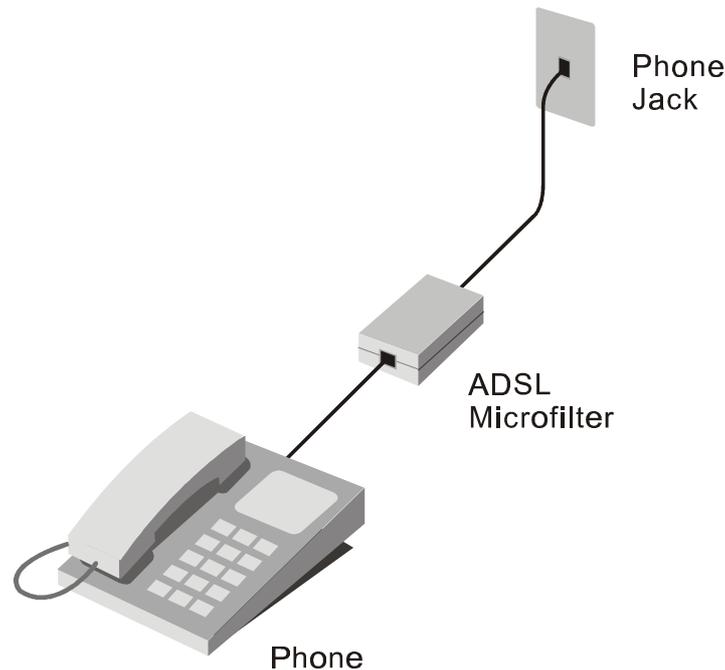
Microfilters and Splitters

Most ADSL clients will be required to install a simple device that prevents the ADSL line from interfering with regular telephone services. These devices are commonly referred to as microfilters or sometimes called (inaccurately) line splitters. They are easy to install and use standard telephone connectors and cable.

Some ADSL service providers will send a telecommunications technician to modify the telephone line, usually at the point where the telephone line enters the building. If a technician has divided or split your telephone line into two separate lines - one for regular telephone service and the other for ADSL - then you do not need to use any type of filter device. Follow the instructions given to you by your ADSL service provider about where and how you should connect the Modem to the ADSL line.

Microfilters

Unless you are instructed to use a “line splitter” (see below), it will be necessary to install a microfilter (low pass filter) device for each telephone or telephone device (answering machines, Faxes etc.) that share the line with the ADSL service. Microfilters are easy-to-install, in-line devices, which attach to the telephone cable between the telephone and wall jack. Microfilters that install behind the wall plate are also available. A typical in-line microfilter installation is shown in the diagram below.



Microfilter Installation

Note: Do not install the microfilter between the Modem and the telephone jack. Microfilters are only intended for use with regular telephones, Fax machines and other regular telephone devices.

Line Splitter

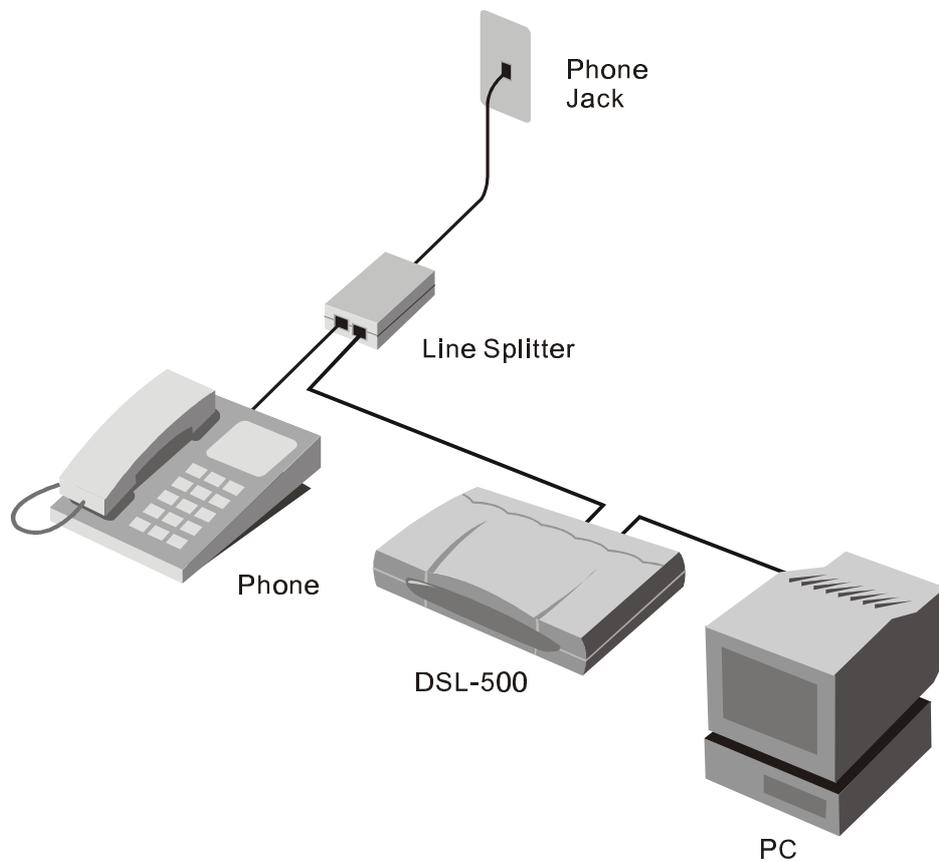
If you are instructed to use a “line splitter”, you must install the device between the Modem and the phone jack. Use standard telephone cable with standard RJ-11 connectors. The splitter has three RJ-11 ports used to connect to the wall jack, the Modem and if desired, a telephone or telephone device. The connection ports are typically labeled as follows:

Line - This port connects to the wall jack.

ADSL – This port connects to the Modem.

Phone – This port connects to a telephone or other telephone device.

The diagram below illustrates the proper use of the splitter.



Line Splitter Installation

D-Link Offices

- Australia** **D-Link Australasia**
Unit 16, 390 Eastern Valley Way, Roseville, NSW 2069 Australia
TEL: 61-2-9417-7100 FAX: 61-2-9417-1077 TOLL FREE (Australia): 1800-177100
TOLL FREE (New Zealand): 0800-900900
URL: www.dlink.com.au E-MAIL: support@dlink.com.au & info@dlink.com.au
- Level 1, 434 St. Kilda Road, Melbourne, Victoria 3004 Australia
TEL: 61-3-9281-3232 FAX: 61-3-9281-3229 MOBILE: 0412-660-064
- Canada** **D-Link Canada**
2180 Winston Park Drive, Oakville, Ontario, L6H 5W1 Canada
TEL: 1-905-829-5033 FAX: 1-905-829-5095 BBS: 1-965-279-8732
TOLL FREE: 1-800-354-6522 URL: www.dlink.ca
FTP: ftp.dlinknet.com E-MAIL: techsup@dlink.ca
- Chile** **D-Link South America**
Isidora Goyechea 2934 of 702, Las Condes, Santiago, Chile, S. A.
TEL: 56-2-232-3185 FAX: 56-2-232-0923 URL: www.dlink.cl
E-MAIL: ccasassu@dlink.cl & tsilva@dlink.cl
- China** **D-Link China**
2F, Sigma Building, 49 Zhichun Road, Haidan District, 100080 Beijing, China
TEL: 86-10-88097777 FAX: 86-10-88096789 URL: www.dlink.com.cn
E-MAIL: liwei@digitalchina.com.cn
- Denmark** **D-Link Denmark**
Naverland 2, DK-2600 Glostrup, Copenhagen, Denmark
TEL: 45-43-969040 FAX: 45-43-424347 URL: www.dlink.dk E-MAIL: info@dlink.dk
- Egypt** **D-Link Middle East**
7 Assem Ebn Sabet Street, Heliopolis, Cairo, Egypt
TEL: 20-2-635-6176 FAX: 20-2-635-6192 URL: www.dlink-me.com
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INFO: 1-800-326-1688 URL: www.dlink.com
E-MAIL: tech@dlink.com & support@dlink.com

Registration Card

Print, type or use block letters.

Your name: Mr./Ms _____

Organization: _____ Dept. _____

Your title at organization: _____

Telephone: _____ Fax: _____

Organization's full address: _____

Country: _____

Date of purchase (Month/Day/Year): _____

Product Model	Product Serial No.	* Product installed in type of computer (e.g., Compaq 486)	* Product installed in computer serial No.

(* Applies to adapters only)

Product was purchased from:

Reseller's name: _____

Telephone: _____ Fax: _____

Reseller's full address: _____

Answers to the following questions help us to support your product:

1. Where and how will the product primarily be used?

Home Office Travel Company Business Home Business Personal Use

2. How many employees work at installation site?

1 employee 2-9 10-49 50-99 100-499 500-999 1000 or more

3. What network protocol(s) does your organization use ?

XNS/IPX TCP/IP DECnet Others _____

4. What network operating system(s) does your organization use ?

D-Link LANsmart Novell NetWare NetWare Lite SCO Unix/Xenix PC NFS 3Com 3+Open
 Banyan Vines DECnet Pathwork Windows NT Windows NTAS Windows '95
 Others _____

5. What network management program does your organization use ?

D-View HP OpenView/Windows HP OpenView/Unix SunNet Manager Novell NMS
 NetView 6000 Others _____

6. What network medium/media does your organization use ?

Fiber-optics Thick coax Ethernet Thin coax Ethernet 10BASE-T UTP/STP
 100BASE-TX 100BASE-T4 100VGAnyLAN Others _____

7. What applications are used on your network?

Desktop publishing Spreadsheet Word processing CAD/CAM
 Database management Accounting Others _____

8. What category best describes your company?

Aerospace Engineering Education Finance Hospital Legal Insurance/Real Estate Manufacturing
 Retail/Chainstore/Wholesale Government Transportation/Utilities/Communication VAR
 System house/company Other _____

9. Would you recommend your D-Link product to a friend?

Yes No Don't know yet

10. Your comments on this product? _____

PLEASE
PLACE STAMP
HERE

TO:

D-Link®