P-334WH

802.11g High Power Wireless Router

User's Guide

Version 3.60
Edition 1
8/2006

ZyXEL

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Certifications

Federal Communications Commission (FCC) Interference Statement

The device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operations.

This device 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 device 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 device does cause harmful interference to radio/television reception, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1 Reorient or relocate the receiving antenna.

2 Increase the separation between the equipment and the receiver.

3 Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

4 Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement

- The device complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, under 47 CFR 2.1093 paragraph (d)(2). End users must follow the specific operating instructions for satisfying RF exposure compliance. To maintain compliance with FCC RF exposure compliance requirements, please follow operation instruction as documented in this manual.
- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- IEEE 802.11b or 802.11g operation of this product in the U.S.A. is firmware-limited to channels 1 through 11.
- To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

注意！

依據 低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

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前項合法通信，指依電信規定作業之無線電信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Notices

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device has been designed for the WLAN 2.4 GHz network throughout the EC region and Switzerland, with restrictions in France.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Viewing Certifications

1 Go to http://www.zyxel.com.

2 Select your product from the drop-down list box on the ZyXEL home page to go to that product's page.

3 Select the certification you wish to view from this page.

Safety Warnings

For your safety, be sure to read and follow all warning notices and instructions.

- Do NOT use this product near water, for example, in a wet basement or near a swimming pool.
- Do NOT expose your device to dampness, dust or corrosive liquids.
- Do NOT store things on the device.
- Do NOT install, use, or service this device during a thunderstorm. There is a remote risk of electric shock from lightning.
- Connect ONLY suitable accessories to the device.
- Do NOT open the device or unit. Opening or removing covers can expose you to dangerous high voltage points or other risks. ONLY qualified service personnel should service or disassemble this device. Please contact your vendor for further information.
- Make sure to connect the cables to the correct ports.
- Place connecting cables carefully so that no one will step on them or stumble over them.
- Always disconnect all cables from this device before servicing or disassembling.
- Use ONLY an appropriate power adaptor or cord for your device.
- Connect the power adaptor or cord to the right supply voltage (for example, 110V AC in North America or 230V AC in Europe).
- Do NOT allow anything to rest on the power adaptor or cord and do NOT place the product where anyone can walk on the power adaptor or cord.
- Do NOT use the device if the power adaptor or cord is damaged as it might cause electrocution.
- If the power adaptor or cord is damaged, remove it from the power outlet.
- Do NOT attempt to repair the power adaptor or cord. Contact your local vendor to order a new one.
- Do not use the device outside, and make sure all the connections are indoors. There is a remote risk of electric shock from lightning.
- Antenna Warning! This device meets ETSI and FCC certification requirements when using the included antenna(s). Only use the included antenna(s).
- If you wall mount your device, make sure that no electrical lines, gas or water pipes will be damaged.

This product is recyclable. Dispose of it properly.
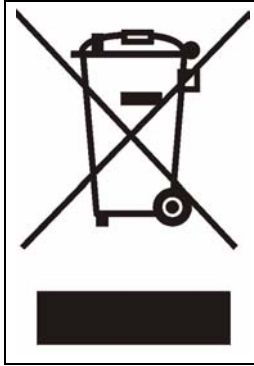
ZyXEL Limited Warranty

ZyXEL warrants to the original end user (purchaser) that this product is free from any defects in materials or workmanship for a period of up to two years from the date of purchase. During the warranty period, and upon proof of purchase, should the product have indications of failure due to faulty workmanship and/or materials, ZyXEL will, at its discretion, repair or replace the defective products or components without charge for either parts or labor, and to whatever extent it shall deem necessary to restore the product or components to proper operating condition. Any replacement will consist of a new or re-manufactured functionally equivalent product of equal or higher value, and will be solely at the discretion of ZyXEL. This warranty shall not apply if the product has been modified, misused, tampered with, damaged by an act of God, or subjected to abnormal working conditions.

Note

Repair or replacement, as provided under this warranty, is the exclusive remedy of the purchaser. This warranty is in lieu of all other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular use or purpose. ZyXEL shall in no event be held liable for indirect or consequential damages of any kind to the purchaser.

To obtain the services of this warranty, contact ZyXEL's Service Center for your Return Material Authorization number (RMA). Products must be returned Postage Prepaid. It is recommended that the unit be insured when shipped. Any returned products without proof of purchase or those with an out-dated warranty will be repaired or replaced (at the discretion of ZyXEL) and the customer will be billed for parts and labor. All repaired or replaced products will be shipped by ZyXEL to the corresponding return address, Postage Paid. This warranty gives you specific legal rights, and you may also have other rights that vary from country to country.

Registration

Register your product online to receive e-mail notices of firmware upgrades and information at www.zyxel.com for global products, or at www.us.zyxel.com for North American products.

Customer Support

Please have the following information ready when you contact customer support.

- Product model and serial number.
- Warranty Information.
- Date that you received your device.
- Brief description of the problem and the steps you took to solve it.

METHOD LOCATION	SUPPORT E-MAIL SALES E-MAIL	TELEPHONE FAX	WEB SITE FTP SITE	REGULAR MAIL
CORPORATE HEADQUARTERS (WORLDWIDE)	support@zyxel.com.tw sales@zyxel.com.tw	+886-3-578-3942 +886-3-578-2439	www.zyxel.com www.europe.zyxel.com ftp.zyxel.com ftp.europe.zyxel.com	ZyXEL Communications Corp. 6 Innovation Road II Science Park Hsinchu 300 Taiwan
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DENMARK	support@zyxel.dk sales@zyxel.dk	+45-39-55-07-00 +45-39-55-07-07	www.zyxel.dk	ZyXEL Communications A/S Columbusvej 2860 Soeborg Denmark
FINLAND	support@zyxel.fi sales@zyxel.fi	+358-9-4780-8411 +358-9-4780 8448	www.zyxel.fi	ZyXEL Communications Oy Malminkaari 10 00700 Helsinki Finland
FRANCE	info@zyxel.fr	+33-4-72-52-97-97 +33-4-72-52-19-20	www.zyxel.fr	ZyXEL France 1 rue des Vergers Bat. 1 / C 69760 Limonest France
GERMANY	support@zyxel.de sales@zyxel.de	+49-2405-6909-0 +49-2405-6909-99	www.zyxel.de	ZyXEL Deutschland GmbH. Adenauerstr. 20/A2 D-52146 Wuerselen Germany
HUNGARY	support@zyxel.hu info@zyxel.hu	+36-1-3361649 +36-1-3259100	www.zyxel.hu	ZyXEL Hungary 48, Zoldlomb Str. H-1025, Budapest Hungary
KAZAKHSTAN	http://zyxel.kz/support sales@zyxel.kz	+7-3272-590-698 +7-3272-590-689	www.zyxel.kz	ZyXEL Kazakhstan 43, Dostyk ave.,Office 414 Dostyk Business Centre 050010, Almaty Republic of Kazakhstan
NORTH AMERICA	support@zyxel.com sales@zyxel.com	1-800-255-4101 +1-714-632-0882 +1-714-632-0858	www.us.zyxel.com ftp.us.zyxel.com	ZyXEL Communications Inc. 1130 N. Miller St. Anaheim CA 92806-2001 U.S.A.

METHOD	SUPPORT E-MAIL	TELEPHONE	WEB SITE	REGULAR MAIL
LOCATION	SALES E-MAIL	FAX	FTP SITE	
NORWAY	support@zyxel.no	+47-22-80-61-80	www.zyxel.no	ZyXEL Communications A/S Nils Hansens vei 13 0667 Oslo Norway
	sales@zyxel.no	+47-22-80-61-81		
POLAND	info@pl.zyxel.com	+48 (22) 333 8250	www.pl.zyxel.com	ZyXEL Communications ul. Okrzei 1A 03-715 Warszawa Poland
		+48 (22) 333 8251		
RUSSIA	http://zyxel.ru/support	+7-095-542-89-29	www.zyxel.ru	ZyXEL Russia Ostrovityanova 37a Str. Moscow, 117279 Russia
	sales@zyxel.ru	+7-095-542-89-25		
SPAIN	support@zyxel.es	+34-902-195-420	www.zyxel.es	ZyXEL Communications Arte, 21 5ª planta 28033 Madrid Spain
	sales@zyxel.es	+34-913-005-345		
SWEDEN	support@zyxel.se	+46-31-744-7700	www.zyxel.se	ZyXEL Communications A/S Sjöporten 4, 41764 Göteborg Sweden
	sales@zyxel.se	+46-31-744-7701		
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	sales@ua.zyxel.com	+380-44-494-49-32		
UNITED KINGDOM	support@zyxel.co.uk	+44-1344 303044 08707 555779 (UK only)	www.zyxel.co.uk	ZyXEL Communications UK Ltd.,11 The Courtyard, Eastern Road, Bracknell, Berkshire, RG12 2XB, United Kingdom (UK)
	sales@zyxel.co.uk	+44-1344 303034	ftp.zyxel.co.uk	

+" is the (prefix) number you enter to make an international telephone call.

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Preface

Congratulations on your purchase of the P-334WH 802.11g High Power Wireless Router. This manual is designed to guide you through the configuration of your ZyXEL Device for its various applications.

About This User's Guide

This User's Guide is designed to guide you through the configuration of your ZyXEL Device using the web configurator.

Note: Use the web configurator or command interpreter interface to configure your ZyXEL Device. Not all features can be configured through all interfaces.

Related Documentation

- Supporting Disk

  Refer to the included CD for support documents.

- Quick Start Guide

  The Quick Start Guide is designed to help you get up and running right away. They contain connection information and instructions on getting started.

- Web Configurator Online Help

  Embedded web help for descriptions of individual screens and supplementary information.

- ZyXEL Web Site

  Please go to http://www.zyxel.com for product news, firmware, updated documents, and other support materials.

User Guide Feedback

Help us help you! E-mail all User Guide-related comments, questions or suggestions for improvement to techwriters@zyxel.com.tw or send regular mail to The Technical Writing Team, ZyXEL Communications Corp., 6 Innovation Road II, Science-Based Industrial Park, Hsinchu, 300, Taiwan. Thank you!

Syntax Conventions

- "Enter" means for you to type one or more characters. "Select" or "Choose" means for you to use one predefined choice.
- Mouse action sequences are denoted using a right angle bracket (>). For example, "In Windows, click **Start > Settings > Control Panel**" means first click the **Start** button, then point your mouse pointer to **Settings** and then click **Control Panel**.
- "e.g.," is a shorthand for "for instance", and "i.e.," means "that is" or "in other words".
- The P-334WH may be referred to as the "ZyXEL Device" in this User's Guide.

Graphics Icons Key

ZyXEL Device	Computer	Notebook computer
Server	DSLAM	Firewall
Modem	Switch	Router
Wireless Signal		

CHAPTER 1
Getting to Know Your ZyXEL Device

This chapter introduces the main features and applications of the ZyXEL Device.

1.1 ZyXEL Device Overview

The ZyXEL Device is the ideal secure wireless firewall router for all data passing between the Internet and LAN's.

You can also deploy the ZyXEL Device as an access point (AP) or a WiFi WAN router that allows you to access the Internet via a wireless WAN connection.

You can configure firewall and/or content filtering for secure Internet access. You can also use media bandwidth management to efficiently manage traffic on your network.

In the product name, "W" denotes wireless functionality. The ZyXEL Device has an embedded mini-PCI module for 802.11g Wireless LAN connectivity. The ZyXEL Device supports the IEEE 802.11b and g standards, so that either IEEE 802.11b or IEEE 802.11g compatible clients can wirelessly accesss the ZyXEL Device or the wired network network behind it.

Note: Only use firmware for your ZyXEL Device's specific model.

1.2 ZyXEL Device Features

The following sections describe ZyXEL Device features.

1.2.1 Physical Features

10/100 Mbps Auto-negotiating Ethernet/Fast Ethernet Interface(s)

This auto-negotiation feature allows the ZyXEL Device to detect the speed of incoming transmissions and adjust appropriately without manual intervention. It allows data transfer of either 10 Mbps or 100 Mbps in either half-duplex or full-duplex mode depending on your Ethernet network.

Auto-negotiation allows data transfer of 100 Mbps in full-duplex mode

Auto-crossover 10/100 Mbps Ethernet Interface(s)

These interfaces automatically adjust to either a crossover or straight-through Ethernet cable.

4-Port Switch

A combination of switch and router makes your ZyXEL Device a cost-effective and viable network solution. You can add up to four computers to the ZyXEL Device without the cost of a hub. Add more than four computers to your LAN by using a hub.

Reset Button

The reset button is built into the rear panel. Use this button to restore the factory default password to 1234; IP address to 192.168.1.1, subnet mask to 255.255.255.0 and DHCP server enabled with a pool of 32 IP addresses starting at 192.168.1.33.

1.2.2 Non-Physical Features

Bandwidth Management

ZyXEL's Bandwidth Management allows you to specify bandwidth classes based on an application and/or subnet. You can allocate specific amounts of bandwidth capacity (bandwidth budgets) to different bandwidth classes.

Firewall

The ZyXEL Device is a stateful inspection firewall with DoS (Denial of Service) protection. By default, when the firewall is activated, all incoming traffic from the WAN to the LAN is blocked unless it is initiated from the LAN. The ZyXEL Device firewall supports TCP/UDP inspection, DoS detection and prevention, real time alerts, reports and logs.

Content Filtering

The ZyXEL Device can also block access to web sites containing keywords that you specify. You can define time periods and days during which content filtering is enabled and include or exclude a range of users on the LAN from content filtering.

Time and Date

The ZyXEL Device allows you to get the current time and date from an external server when you turn on your ZyXEL Device. You can also set the time manually.

Universal Plug and Play (UPnP)

Using the standard TCP/IP protocol, the ZyXEL Device and other UPnP enabled devices can dynamically join a network, obtain an IP address and convey its capabilities to other devices on the network.

PPPoE

PPPoE facilitates the interaction of a host with an Internet modem to achieve access to high-speed data networks via a familiar "dial-up networking" user interface.

PPTP Encapsulation

Point-to-Point Tunneling Protocol (PPTP) is a network protocol that enables secure transfer of data from a remote client to a private server, creating a Virtual Private Network (VPN) using a TCP/IP-based network.

PPTP supports on-demand, multi-protocol and virtual private networking over public networks, such as the Internet. The ZyXEL Device supports one PPTP server connection at any given time.

Dynamic DNS Support

With Dynamic DNS (Domain Name System) support, you can have a static hostname alias for a dynamic IP address, allowing the host to be more easily accessible from various locations on the Internet. You must register for this service with a Dynamic DNS service provider.

IP Multicast

Deliver IP packets to a specific group of hosts using IP multicast. IGMP (Internet Group Management Protocol) is the protocol used to support multicast groups. The latest version is version 2 (see RFC 2236); the ZyXEL Device supports both versions 1 and 2.

IP Alias

IP Alias allows you to partition a physical network into logical networks over the same Ethernet interface. The ZyXEL Device supports three logical LAN interfaces via its single physical Ethernet LAN interface with the ZyXEL Device itself as the gateway for each LAN network.

Network Address Translation (NAT)

Network Address Translation (NAT) allows the translation of an Internet protocol address used within one network (for example a private IP address used in a local network) to a different IP address known within another network (for example a public IP address used on the Internet).

Port Forwarding

Use this feature to forward incoming service requests to a server on your local network. You may enter a single port number or a range of port numbers to be forwarded, and the local IP address of the desired server.

DHCP (Dynamic Host Configuration Protocol)

DHCP (Dynamic Host Configuration Protocol) allows the individual client computers to obtain the TCP/IP configuration at start-up from a centralized DHCP server. The ZyXEL Device has built-in DHCP server capability, enabled by default, which means it can assign IP addresses, an IP default gateway and DNS servers to all systems that support the DHCP client.

Full Network Management

The embedded web configurator is an all-platform web-based utility that allows you to easily access the ZyXEL Device's management settings and configure the firewall.

RoadRunner Support

In addition to standard cable modem services, the ZyXEL Device supports Time Warner's RoadRunner Service.

Logging and Tracing

- Built-in message logging and packet tracing.
- Unix syslog facility support.
- Firewall logs.
- Content filtering logs.

Upgrade ZyXEL Device Firmware via LAN

The firmware of the ZyXEL Device can be upgraded via the LAN (refer to the **Maintenance-Tools-Firmware** screen).

Embedded FTP and TFTP Servers

The ZyXEL Device's embedded FTP and TFTP Servers enable fast firmware upgrades as well as configuration file backups and restoration.

1.2.3 Wireless Features

Wireless LAN

The ZyXEL Device supports the IEEE 802.11g standard, which is fully compatible with the IEEE 802.11b standard, meaning that you can have both IEEE 802.11b and IEEE 802.11g wireless clients in the same wireless network.

Note: The ZyXEL Device may be prone to RF (Radio Frequency) interference from other 2.4 GHz devices such as microwave ovens, wireless phones, Bluetooth enabled devices, and other wireless LANs.

WPA and WPA2

Wi-Fi Protected Access (WPA) is a subset of the IEEE 802.11i standard. WPA 2 (IEEE 802.11i) is a wireless security standard that defines stronger encryption, authentication and key management than WPA.

Key differences between WPA(2) and WEP are improved data encryption and user authentication.

Antenna

The ZyXEL Device is equipped with a 2dBi fixed antenna to provide clear radio signal between the wireless stations and the access points.

Wireless LAN MAC Address Filtering

Your ZyXEL Device can check the MAC addresses of wireless stations against a list of allowed or denied MAC addresses.

WEP Encryption

WEP (Wired Equivalent Privacy) encrypts data frames before transmitting over the wireless network to help keep network communications private.

Wireless List

With the wireless list, you can see the list of the wireless stations that are currently using the ZyXEL Device to access your wired network.

1.3 Applications for the ZyXEL Device

Here are some examples of what you can do with your ZyXEL Device.

The ZyXEL Device supports three operating modes: **Router**, **Access Point** and **WiFi WAN Router**.

1.3.1 Router Mode

The ZyXEL Device is in **Router** mode by default and function as a normal (wireless) router.

1.3.1.1 Secure Broadband Internet Access via Cable, DSL or Wireless Modem

You can connect a cable modem, DSL or wireless modem to the ZyXEL Device for broadband Internet access via an Ethernet or a wireless port on the modem. The ZyXEL Device guarantees not only high speed Internet access, but secure internal network protection and traffic management as well.

Figure 1   Secure Internet Access via Cable, DSL or Wireless Modem
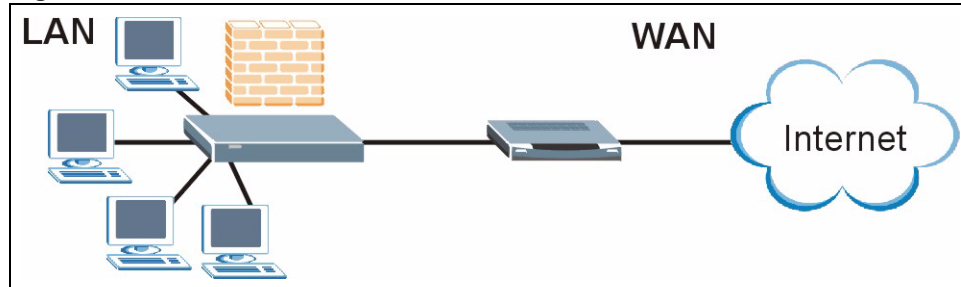
1.3.1.2 Wireless LAN Application

Add a wireless LAN to your existing network without expensive network cables. Wireless stations can move freely anywhere in the coverage area and use resources on the wired network.

Figure 2   WLAN Application Example
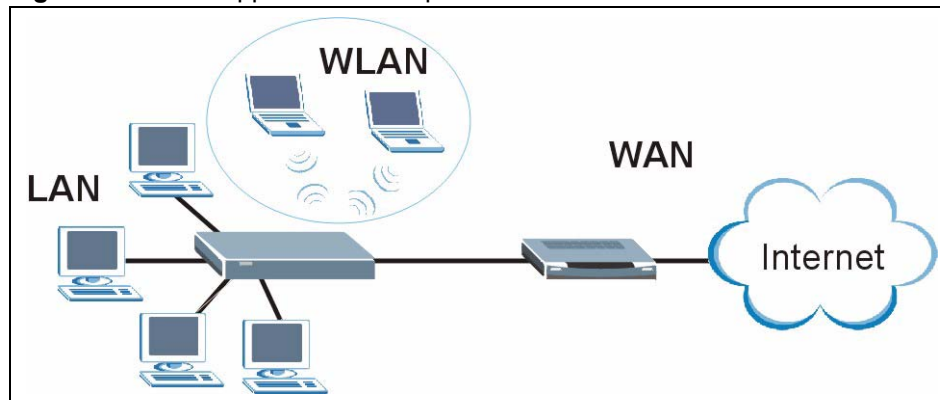
1.3.2 Access Point Mode

You can have the ZyXEL Device works as a pure access point (AP). When the ZyXEL Device is in **Access Point** mode, all LAN and WAN ports act as a hub.

The application diagram for **Access Point** mode is similar to the WLAN application in **Router** mode (see Figure 2 on page 34), except that the ZyXEL Device in **Access Point** mode does not have advanced features, such as NAT, DHCP server, firewall, bandwidth management, etc.

1.3.3 WiFi WAN Router Mode

If you set the ZyXEL Device to **WiFi WAN Router** mode, the ZyXEL Device uses a wireless WAN connection via an AP or wireless router, instead of a wired connection via a DSL/cable modem.

Note: You can set the ZyXEL Device to WiFi WAN router mode only when you use Ethernet encapsulation.

When the ZyXEL Device is in **WiFi WAN Router** mode, all LAN and WAN ports act as a hub. You cannot connect them to a modem or router. In this mode, the ZyXEL Device does not allow network access to wireless clients (WLAN).

Figure 3 WiFi WAN Router Application
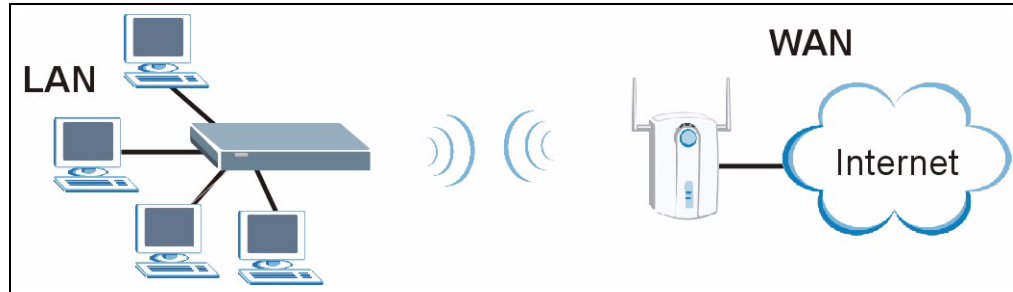
1.4 Configuring Operating Mode

To configure the operating mode, click **Maintenance > Sys OP Mode**. When you select an option, a screen pops up showing you LAN and WAN settings for that mode, click **OK** to close the screen. Click **Apply** to save your changes to the ZyXEL Device. Click **Reset** to return to the previous configuration.

Figure 4 System Operating Mode

1.5 Front Panel LEDs

Figure 5 Front Panel
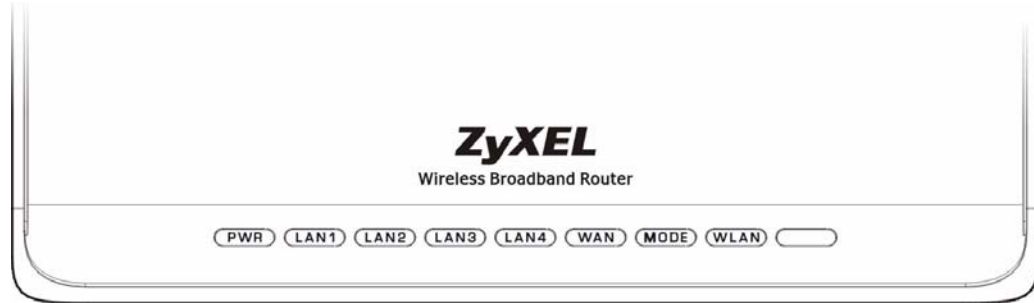
The following table describes the LEDs.

Table 1 Front Panel LEDs

	COLOR	STATUS	DESCRIPTION
PWR	Green	On	The ZyXEL Device is receiving power and functioning properly.
		Blinking	The ZyXEL Device is performing testing.
	Red	On	Power to the ZyXEL Device is too low.
	None	Off	The ZyXEL Device is not receiving power.
LAN 1-4	Green	On	The ZyXEL Device has a successful 10Mb Ethernet connection.
		Blinking	The ZyXEL Device is sending/receiving data.
	Amber	On	The ZyXEL Device has a successful 100Mb Ethernet connection.
		Blinking	The ZyXEL Device is sending/receiving data.
	None	Off	The LAN is not connected.
WAN	Green	On	The ZyXEL Device has a successful 10Mb WAN connection.
		Blinking	The ZyXEL Device is sending/receiving data.
	Amber	On	The ZyXEL Device has a successful 100Mb Ethernet connection.
		Blinking	The ZyXEL Device is sending/receiving data.
	None	Off	The WAN connection is not ready, or has failed.
MODE	Green	On	The ZyXEL Device is in WiFi WAN router mode.
	Amber	On	The ZyXEL Device is in access point mode.
	None	Off	The ZyXEL Device is in router mode.
WLAN	Green	On	The ZyXEL Device is ready, but is not sending/receiving data through the wireless LAN.
		Blinking	The ZyXEL Device is sending/receiving data through the wireless LAN.
	None	Off	The wireless LAN is not ready or has failed.

CHAPTER 2
Introducing the Web Configurator

This chapter describes how to access the ZyXEL Device web configurator and provides an overview of its screens.

2.1 Web Configurator Overview

The web configurator is an HTML-based management interface that allows easy ZyXEL Device setup and management via Internet browser. Use Internet Explorer 6.0 and later or Netscape Navigator 7.0 and later versions. The recommended screen resolution is 1024 by 768 pixels.

In order to use the web configurator you need to allow:

• Web browser pop-up windows from your device. Web pop-up blocking is enabled by default in Windows XP SP (Service Pack) 2.
• JavaScripts (enabled by default).
• Java permissions (enabled by default).

Refer to the Troubleshooting chapter to see how to make sure these functions are allowed in Internet Explorer.

2.2 Accessing the Web Configurator

1 Make sure your ZyXEL Device hardware is properly connected and prepare your computer/computer network to connect to the ZyXEL Device (refer to the Quick Start Guide).

2 Launch your web browser.

3 Type "192.168.1.1" as the URL.

4 Type "1234" (default) as the password and click **Login**. In some versions, the default password appears automatically - if this is the case, click **Login**.

5 You should see a screen asking you to change your password (highly recommended) as shown next. Type a new password (and retype it to confirm) and click **Apply** or click **Ignore**.

Figure 6   Change Password Screen

> **Note:** The management session automatically times out when the time period set in the **Administrator Inactivity Timer** field expires (default five minutes). Simply log back into the ZyXEL Device if this happens to you.

2.3 Resetting the ZyXEL Device

If you forget your password or cannot access the web configurator, you will need to use the **RESET** button at the back of the ZyXEL Device to reload the factory-default configuration file. This means that you will lose all configurations that you had previously and the password will be reset to "1234".

2.3.1 Procedure to Use the Reset Button

1 Make sure the **PWR** LED is on (not blinking).

2 Press the **RESET** button for ten seconds or until the **PWR** LED begins to blink and then release it. When the **PWR** LED begins to blink, the defaults have been restored and the ZyXEL Device restarts.

2.4 Navigating the Web Configurator

The following summarizes how to navigate the web configurator from the **Status** screen. The screen varies depending on the operating mode you choose.

2.4.1 Router Mode Status

The following screen displays when the ZyXEL Device is set to router mode. The ZyXEL Device is in router mode by default.

Figure 7 Web Configurator Status Screen (Router Mode)

The following table describes the icons shown in the **Status** screen.

Table 2 Status Screen Icon Key

ICON	DESCRIPTION
	Select a language from the drop-down list box to have the web configurator display in that language.
	Click this icon to open a web help page relevant to the screen you are currently configuring.
	Click this icon to open the setup wizard. The ZyXEL Device has a connection wizard and a bandwidth management wizard.
	Click this icon to view copyright and a link for related product information.
	Click this icon at any time to exit the web configurator.

Table 2   Status Screen Icon Key (continued)

ICON	DESCRIPTION
Refresh Interval: 20 seconds ▾	Select a number of seconds or **None** from the drop-down list box to refresh all screen statistics automatically at the end of every time interval or to not refresh the screen statistics.
Refresh Now	Click this button to refresh the status screen statistics.

The following table describes the labels shown in the **Status** screen.

Table 3   Web Configurator Status Screen (Router Mode)

LABEL	DESCRIPTION
Device Information	
System Name	This is the **System Name** you enter in the **Maintenance** > **System** > **General** screen. It is for identification purposes.
Firmware Version	This is the ZyNOS firmware version and the date created. ZyNOS is ZyXEL's proprietary Network Operating System design.
WAN Information	
- MAC Address	This shows the WAN Ethernet adapter MAC Address of your device.
- IP Address	This shows the WAN port's IP address.
- IP Subnet Mask	This shows the WAN port's subnet mask.
- DHCP	This shows the WAN port's DHCP role - **Client** or **None**.
LAN Information	
- MAC Address	This shows the LAN Ethernet adapter MAC Address of your device.
- IP Address	This shows the LAN port's IP address.
- IP Subnet Mask	This shows the LAN port's subnet mask.
- DHCP	This shows the LAN port's DHCP role - **Server**, **Relay** or **None**.
WLAN Information	
- MAC Address	This shows the wireless adapter MAC Address of your device.
- Name(SSID)	This shows a descriptive name used to identify the ZyXEL Device in the wireless LAN.
- Channel	This shows the channel number which you select manually or the ZyXEL Device automatically scans and selects.
- Operating Channel	This shows the channel number which the ZyXEL Device is currently using over the wireless LAN.
- Security Mode	This shows the level of wireless security the ZyXEL Device is using.
- 802.11 Mode	This shows the wireless standard.
System Status	
System Uptime	This is the total time the ZyXEL Device has been on.
Current Date/Time	This field displays your ZyXEL Device's present date and time.
System Resource	

Table 3 Web Configurator Status Screen (Router Mode) (continued)

LABEL	DESCRIPTION
- CPU Usage	This displays what percentage of the ZyXEL Device's processing ability is currently used. When this percentage is close to 100%, the ZyXEL Device is running at full load, and the throughput is not going to improve anymore. If you want some applications to have more throughput, you should turn off other applications (for example, using bandwidth management.
- Memory Usage	This shows what percentage of the heap memory the ZyXEL Device is using. Heap memory refers to the memory that is not used by ZyNOS (ZyXEL Network Operating System) and is thus available for running processes like NAT and the firewall.
System Setting	
- Firewall	This shows whether the firewall is active or not.
- Bandwidth Management	This shows whether the bandwidth management is active or not.
- UPnP	This shows whether UPnP is active or not.
- Configuration Mode	This shows whether the advanced screens of each feature are turned on (**Advanced**) or not (**Basic**).
- System Operation Mode	This shows whether the ZyXEL Device is working as a router, access point or WiFi WAN router.
Interface Status	
Interface	This displays the ZyXEL Device port types. The port types are: **WAN**, **LAN** and **WLAN**.
Status	For the LAN and WAN ports, this field displays **Down** (line is down) or **Up** (line is up or connected). For the WLAN, it displays **Up** when the WLAN is enabled or **Down** when the WLAN is disabled.
Rate	For the LAN ports, this displays the port speed and duplex setting or **N/A** when the line is disconnected. For the WAN port, it displays the port speed and duplex setting if you're using Ethernet encapsulation and **Idle** (line (ppp) idle), **Dial** (starting to trigger a call) and **Drop** (dropping a call) if you're using PPPoE or PPTP encapsulation. This field displays **N/A** when the line is disconnected. For the WLAN, it displays the maximum transmission rate when the WLAN is enabled and **N/A** when the WLAN is disabled.
Summary	
BW MGNT Monitor	Use this screen to view the ZyXEL Device's bandwidth usage and allotments.
DHCP Table	Use this screen to view current DHCP client information.
Packet Statistics	Use this screen to view port status and packet specific statistics.
WLAN Station Status	Use this screen to view the wireless stations that are currently associated to the ZyXEL Device.

2.4.2 Access Point Mode Status

The following screen displays when the ZyXEL Device is set to AP mode.

Figure 8   Web Configurator Status Screen (AP Mode)
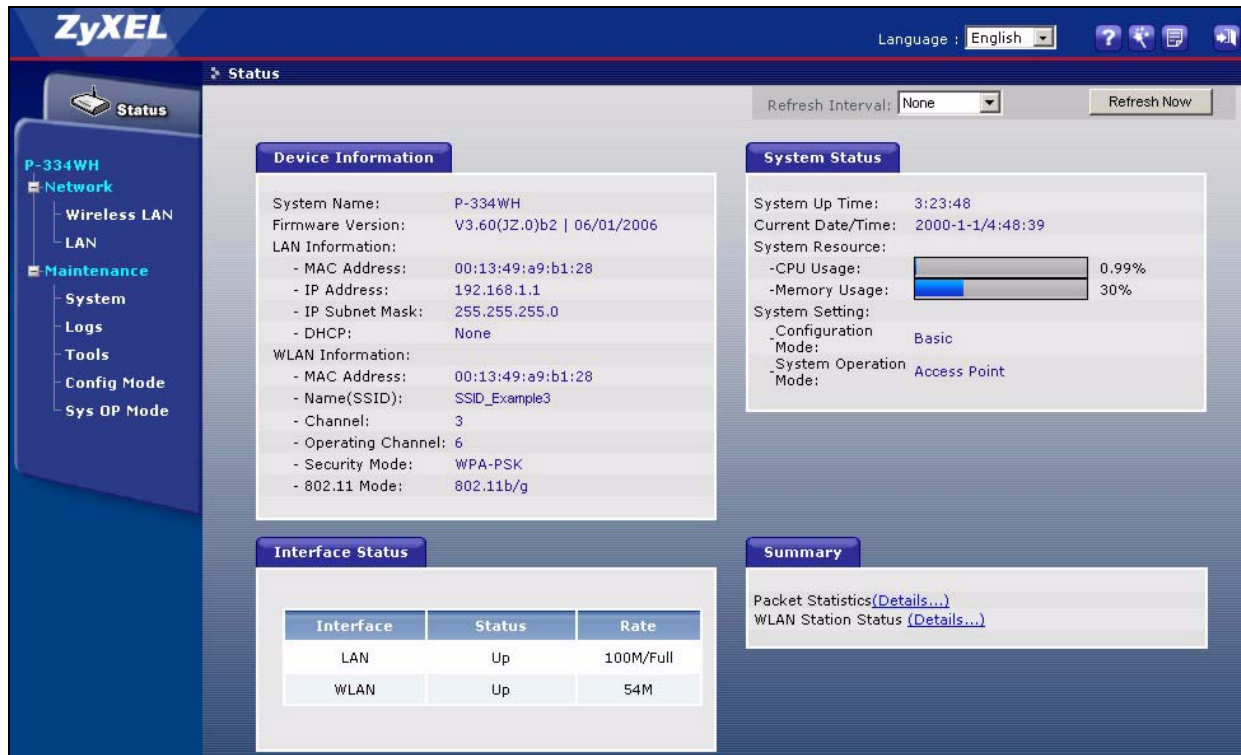
The following table describes the icons shown in the **Status** screen.

Table 4   Status Screen Icon Key

	DESCRIPTION
Language : English / English German French Spanish Chinese Italian	Select a language from the drop-down list box to have the web configurator display in that language.
?	Click this icon to open a web help page relevant to the screen you are currently configuring.
(wizard icon)	Click this icon to open the setup wizard. The ZyXEL Device has a connection wizard and a bandwidth management wizard.
(copyright icon)	Click this icon to view copyright and a link for related product information.
(exit icon)	Click this icon at any time to exit the web configurator.
Refresh Interval: 20 seconds	Select a number of seconds or **None** from the drop-down list box to refresh all screen statistics automatically at the end of every time interval or to not refresh the screen statistics.
Refresh Now	Click this button to refresh the status screen statistics.

The following table describes the labels shown in the **Status** screen.

Table 5 Web Configurator Status Screen (AP Mode)

LABEL	DESCRIPTION
Device Information	
System Name	This is the **System Name** you enter in the **Maintenance** > **System** > **General** screen. It is for identification purposes.
Firmware Version	This is the ZyNOS firmware version and the date created. ZyNOS is ZyXEL's proprietary Network Operating System design.
LAN Information	
- MAC Address	This shows the LAN Ethernet adapter MAC Address of your device.
- IP Address	This shows the LAN port's IP address.
- IP Subnet Mask	This shows the LAN port's subnet mask.
- DHCP	This shows the LAN port's DHCP role - **Server**, **Relay** or **None**.
WLAN Information	
- MAC Address	This shows the wireless adapter MAC Address of your device.
- Name(SSID)	This shows a descriptive name used to identify the ZyXEL Device in the wireless LAN.
- Channel	This shows the channel number which you select manually or the ZyXEL Device automatically scans and selects.
- Operating Channel	This shows the channel number which the ZyXEL Device is currently using over the wireless LAN.
- Security Mode	This shows the level of wireless security the ZyXEL Device is using.
- 802.11 Mode	This shows the wireless standard.
System Status	
System Uptime	This is the total time the ZyXEL Device has been on.
Current Date/Time	This field displays your ZyXEL Device's present date and time.
System Resource	
- CPU Usage	This displays what percentage of the ZyXEL Device's processing ability is currently used. When this percentage is close to 100%, the ZyXEL Device is running at full load, and the throughput is not going to improve anymore. If you want some applications to have more throughput, you should turn off other applications (for example, using bandwidth management.
- Memory Usage	This shows what percentage of the heap memory the ZyXEL Device is using. Heap memory refers to the memory that is not used by ZyNOS (ZyXEL Network Operating System) and is thus available for running processes like NAT and the firewall.
System Setting	
- Configuration Mode	This shows whether the advanced screens of each feature are turned on (**Advanced**) or not (**Basic**).
- System Operation Mode	This shows whether the ZyXEL Device is working as a router, access point or WiFi WAN router.
Interface Status	
Interface	This displays the ZyXEL Device port types.

Table 5   Web Configurator Status Screen (AP Mode) (continued)

LABEL	DESCRIPTION
Status	For the LAN ports, this field displays **Down** (line is down) or **Up** (line is up or connected). For the WLAN, it displays **Up** when the WLAN is enabled or **Down** when the WLAN is disabled.
Rate	For the LAN ports, this displays the port speed and duplex setting or **N/A** when the line is disconnected. For the WLAN, it displays the maximum transmission rate when the WLAN is enabled and **N/A** when the WLAN is disabled.
Summary	
Packet Statistics	Use this screen to view port status and packet specific statistics.
WLAN Station Status	Use this screen to view the wireless stations that are currently associated to the ZyXEL Device.

2.4.3 WiFi WAN Router Mode Status

The following screen displays when the ZyXEL Device is set to WiFi WAN router mode.

Figure 9   Web Configurator Status Screen (WiFi WAN Router Mode)

The following table describes the icons shown in the **Status** screen.

Table 6 Status Screen Icon Key

	DESCRIPTION
Language : English — English German French Spanish Chinese Italian	Select a language from the drop-down list box to have the web configurator display in that language.
?	Click this icon to open a web help page relevant to the screen you are currently configuring.
(wizard icon)	Click this icon to open the setup wizard. The ZyXEL Device has a connection wizard and a bandwidth management wizard.
(copyright icon)	Click this icon to view copyright and a link for related product information.
(exit icon)	Click this icon at any time to exit the web configurator.
Refresh Interval: 20 seconds	Select a number of seconds or **None** from the drop-down list box to refresh all screen statistics automatically at the end of every time interval or to not refresh the screen statistics.
Refresh Now	Click this button to refresh the status screen statistics.

The following table describes the labels shown in the **Status** screen.

Table 7 Web Configurator Status Screen (WiFi WAN Router Mode)

LABEL	DESCRIPTION
Device Information	
System Name	This is the **System Name** you enter in the **Maintenance** > **System** > **General** screen. It is for identification purposes.
Firmware Version	This is the ZyNOS firmware version and the date created. ZyNOS is ZyXEL's proprietary Network Operating System design.
LAN Information	
- MAC Address	This shows the LAN Ethernet adapter MAC Address of your device.
- IP Address	This shows the LAN port's IP address.
- IP Subnet Mask	This shows the LAN port's subnet mask.
- DHCP	This shows the LAN port's DHCP role - **Server**, **Relay** or **None**.
WiFi WAN Information	
- MAC Address	This shows the wireless adapter MAC Address of your device.
- IP Address	This shows the WiFi WAN IP address obtained from an AP or wireless router.
- IP Subnet Mask	This shows the WiFi WAN subnet mask obtained from an AP or wireless router.
- DHCP	This shows the WiFi WAN port's DHCP role - **Client** or **None**.
- Name(SSID)	This shows a descriptive name used to identify the ZyXEL Device in the wireless LAN.
- Channel	This shows the channel number which the ZyXEL Device is currently using.

Table 7 Web Configurator Status Screen (WiFi WAN Router Mode) (continued)

LABEL	DESCRIPTION
- Security Mode	This shows the level of wireless security the ZyXEL Device is using.
- 802.11 Mode	This shows the wireless standard.
System Status	
System Uptime	This is the total time the ZyXEL Device has been on.
Current Date/Time	This field displays your ZyXEL Device's present date and time.
System Resource	
- CPU Usage	This displays what percentage of the ZyXEL Device's processing ability is currently used. When this percentage is close to 100%, the ZyXEL Device is running at full load, and the throughput is not going to improve anymore. If you want some applications to have more throughput, you should turn off other applications (for example, using bandwidth management.
- Memory Usage	This shows what percentage of the heap memory the ZyXEL Device is using. Heap memory refers to the memory that is not used by ZyNOS (ZyXEL Network Operating System) and is thus available for running processes like NAT and the firewall.
System Setting	
- Firewall	This shows whether the firewall is active or not.
- Bandwidth Management	This shows whether the bandwidth management is active or not.
- UPnP	This shows whether UPnP is active or not.
- Configuration Mode	This shows whether the advanced screens of each feature are turned on (**Advanced**) or not (**Basic**).
- System Operation Mode	This shows whether the ZyXEL Device is working as a router, access point or WiFi WAN router.
Interface Status	
Interface	This displays the ZyXEL Device port types.
Status	For the LAN ports, this field displays **Down** (line is down) or **Up** (line is up or connected). For the WiFi WAN, it displays **Up** when the WiFi WAN is enabled or **Down** when the WiFi WAN is disabled.
Rate	For the LAN ports, this displays the port speed and duplex setting or **N/A** when the line is disconnected. For the WiFi WAN, it displays the maximum transmission rate when the WiFi WAN is enabled and **N/A** when the WiFi WAN is disabled.
Summary	
BW MGNT Monitor	Use this screen to view the ZyXEL Device's bandwidth usage and allotments.
DHCP Table	Use this screen to view current DHCP client information.
Packet Statistics	Use this screen to view port status and packet specific statistics.

2.4.4 Navigation Panel

After you enter the password, use the sub-menus on the navigation panel to configure ZyXEL Device features.

The following table lists the features available for each operating mode.

Table 8   Router, AP and WiFi WAN Router Mode Features Comparison

FEATURE	ROUTER MODE	ACCESS POINT MODE	WIFI WAN ROUTER MODE
Connection Wizard	O		
Banwidth Management Monitor	O		O
DHCP Table	O		O
Packet Statistics	O	O	O
WLAN Station Status	O	O	
Wireless LAN	O	O	
WAN	O		
WiFi WAN			O
LAN	O	O	O
DHCP Server	O		O
NAT	O		O
DDNS	O		O
Firewall	O		O
Content Filter	O		O
Static Route	O		O
Bandwidth Management	O		O
Remote Management	O		O
UPnP	O		O
Logs	O	O	O
Configuration Mode	O	O	O
Operating Mode	O	O	O

Table Key: An O in a mode's column shows that the device mode has the specified feature. The information in this table was correct at the time of writing, although it may be subject to change.

The following table describes the sub-menus.

Table 9   Screens Summary

LINK	TAB	FUNCTION
Status		This screen shows the ZyXEL Device's general device, system and interface status information. Use this screen to access the wizard, and summary statistics tables.
Network		

Table 9 Screens Summary

LINK	TAB	FUNCTION
Wireless LAN	General	Use this screen to configure wireless LAN.
	MAC Filter	Use the MAC filter screen to configure the ZyXEL Device to block access to devices or block the devices from accessing the ZyXEL Device.
	Advanced	This screen allows you to configure advanced wireless settings.
WAN	Internet Connection	This screen allows you to configure ISP parameters, WAN IP address assignment, DNS servers and the WAN MAC address.
	Advanced	Use this screen to configure other advanced properties.
WiFi WAN	Internet Connection	This screen allows you to configure ISP parameters, WiFi WAN IP address assignment, DNS servers and the WiFi WAN MAC address.
	WiFi	Use this screen to enable WLAN, scan for and connect to a wireless network and configure wireless security settings.
	Advanced	Use this screen to configure other advanced properties.
LAN	IP	Use this screen to configure LAN IP address and subnet mask.
	IP Alias	Use this screen to partition your LAN interface into subnets.
	Advanced	Use this screen to enable other advanced properties.
DHCP Server	General	Use this screen to enable the ZyXEL Device's DHCP server.
	Advanced	Use this screen to assign IP addresses to specific individual computers based on their MAC addresses and to have DNS servers assigned by the DHCP server.
	Client List	Use this screen to view current DHCP client information and to always assign an IP address to a MAC address (and host name).
NAT	General	Use this screen to enable NAT.
	Application	Use this screen to configure servers behind the ZyXEL Device.
	Advanced	Use this screen to change your ZyXEL Device's port triggering settings.
DDNS	General	Use this screen to set up dynamic DNS.
Security		
Firewall	General	Use this screen to activate/deactivate the firewall.
	Services	This screen shows a summary of the firewall rules, and allows you to edit/add a firewall rule.
Content Filter	Filter	Use this screen to block certain web features and sites containing certain keywords in the URL.
	Schedule	Use this screen to set the days and times for the ZyXEL Device to perform content filtering.
Management		
Static Route	IP Static Route	Use this screen to configure IP static routes.
Bandwidth MGMT	General	Use this screen to enable bandwidth management.
	Advanced	Use this screen to set the upstrem bandwidth and edit a bandwidth management rule.
	Monitor	Use this screen to view the ZyXEL Device's bandwidth usage and allotments.

Table 9 Screens Summary

LINK	TAB	FUNCTION
Remote MGMT	WWW	Use this screen to configure through which interface(s) and from which IP address(es) users can use HTTP to manage the ZyXEL Device.
	Telnet	Use this screen to configure through which interface(s) and from which IP address(es) users can use Telnet to manage the ZyXEL Device.
	FTP	Use this screen to configure through which interface(s) and from which IP address(es) users can use FTP to access the ZyXEL Device.
	DNS	Use this screen to configure through which interface(s) and from which IP address(es) users can send DNS queries to the ZyXEL Device.
UPnP	General	Use this screen to enable UPnP on the ZyXEL Device.
Maintenance		
System	General	This screen contains administrative.
	Time Setting	Use this screen to change your ZyXEL Device's time and date.
Logs	View Log	Use this screen to view the logs for the categories that you selected.
	Log Settings	Use this screen to change your ZyXEL Device's log settings.
Tools	Firmware	Use this screen to upload firmware to your ZyXEL Device.
	Configuration	Use this screen to backup and restore the configuration or reset the factory defaults to your ZyXEL Device.
	Restart	This screen allows you to reboot the ZyXEL Device without turning the power off.
Config Mode	General	This screen allows you to display or hide the advanced screens or features.
Sys OP Mode	General	This screen allows you to configure and have the ZyXEL Device work as a router, access point or WiFi WAN router.

2.4.5 Summary: Bandwidth Management Monitor

Select the **BW MGMT Monitor (Details...)** hyperlink in **Status** screen. View the bandwidth usage of the WAN configured bandwidth rules. This is also shown as bandwidth usage over the bandwidth budget for each rule. The gray section of the bar represents the percentage of unused bandwidth and the blue color represents the percentage of bandwidth in use.

Figure 10   Summary: BW MGMT Monitor
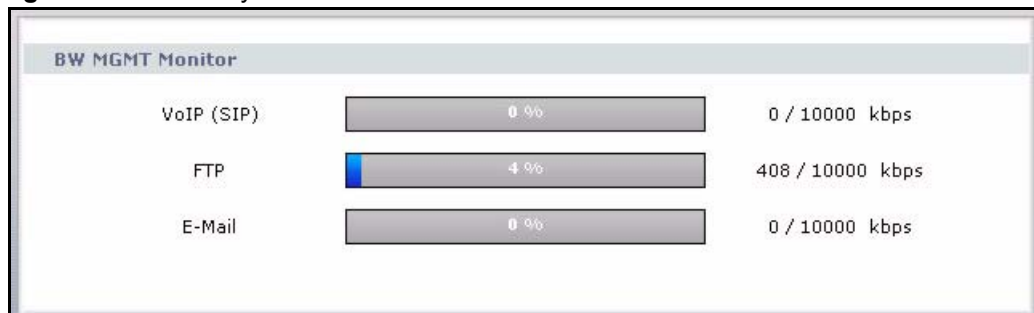
2.4.6 Summary: DHCP Table

DHCP (Dynamic Host Configuration Protocol, RFC 2131 and RFC 2132) allows individual clients to obtain TCP/IP configuration at start-up from a server. You can configure the ZyXEL Device as a DHCP server or disable it. When configured as a server, the ZyXEL Device provides the TCP/IP configuration for the clients. If DHCP service is disabled, you must have another DHCP server on your LAN, or else the computer must be manually configured.

Click the **DHCP Table (Details...)** hyperlink in the **Status** screen. Read-only information here relates to your DHCP status. The DHCP table shows current DHCP client information (including **IP Address**, **Host Name** and **MAC Address**) of all network clients using the ZyXEL Device's DHCP server.

Figure 11   Summary: DHCP Table

The following table describes the labels in this screen.

Table 10   Summary: DHCP Table

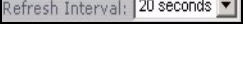|	DESCRIPTION
#	This is the index number of the host computer.
IP Address	This field displays the IP address relative to the # field listed above.
Host Name	This field displays the computer host name.
MAC Address	This field shows the MAC address of the computer with the name in the **Host Name** field.
	Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02.
Refresh	Click **Refresh** to renew the screen.

2.4.7 Summary: Packet Statistics

Click the **Packet Statistics (Details...)** hyperlink in the **Status** screen. Read-only information here includes port status and packet specific statistics. Also provided are "system up time" and "poll interval(s)". The **Poll Interval(s)** field is configurable.

The screen varies depending on the operating mode you select.

Figure 12 Summary: Packet Statistics (Router Mode)

The following table describes the labels in this screen.

Table 11 Summary: Packet Statistics

LABEL	DESCRIPTION
Port	This is the ZyXEL Device's port type.
Status	For the LAN ports, this displays the port speed and duplex setting or **Down** when the line is disconnected.
	For the WAN port, it displays the port speed and duplex setting if you're using Ethernet encapsulation and **Idle** (line (ppp) idle), **Dial** (starting to trigger a call) and **Drop** (dropping a call) if you're using PPPoE or PPTP encapsulation. This field displays **Down** when the line is disconnected.
	For the WLAN or WiFi WAN, it displays the maximum transmission rate when the WLAN or WiFi WAN is enabled and **Down** when the WLAN or WiFi WAN is disabled.
TxPkts	This is the number of transmitted packets on this port.
RxPkts	This is the number of received packets on this port.
Collisions	This is the number of collisions on this port.
Tx B/s	This displays the transmission speed in bytes per second on this port.
Rx B/s	This displays the reception speed in bytes per second on this port.
Up Time	This is the total amount of time the line has been up.
System Up Time	This is the total time the ZyXEL Device has been on.
Poll Interval(s)	Enter the time interval for refreshing statistics in this field.
Set Interval	Click this button to apply the new poll interval you entered in the **Poll Interval(s)** field.
Stop	Click **Stop** to stop refreshing statistics, click **Stop**.

2.4.8 Summary: Wireless Station Status

Click the **WLAN Station Status (Details...)** hyperlink in the **Status** screen. View the wireless stations that are currently associated to the ZyXEL Device in the **Association List** screen.

This screen is not available when the ZyXEL Device is in WiFi WAN router mode.

Figure 13 Summary: Wireless Association List

The following table describes the labels in this screen.

Table 12 Summary: Wireless Association List

LABEL	DESCRIPTION
#	This is the index number of an associated wireless station.
MAC Address	This field displays the MAC address of an associated wireless station.
Association Time	This field displays the time a wireless station first associated with the ZyXEL Device.
Refresh	Click **Refresh** to redisplay the current screen.

CHAPTER 3
Connection Wizard

This chapter provides information on the wizard setup screens in the web configurator.

3.1 Wizard Setup

The web configurator's wizard setup helps you configure your device to access the Internet. Refer to your ISP (Internet Service Provider) checklist in the Quick Start Guide to know what to enter in each field. Leave a field blank if you don't have that information.

Note: The wizard is for setting up Internet access when the ZyXEL Device is in router mode only. If the ZyXEL Device is in AP or WiFi WAN router mode, using the Wizard will reset the operating mode to router mode (the default).

1 After you access the ZyXEL Device web configurator, click the **Go to Wizard setup** hyperlink.

You can click the **Go to Basic setup** or **Go to Advanced setup** hyperlink to skip this wizard setup and configure basic or advanced features accordingly.

Figure 14   Select Wizard or Advanced Mode
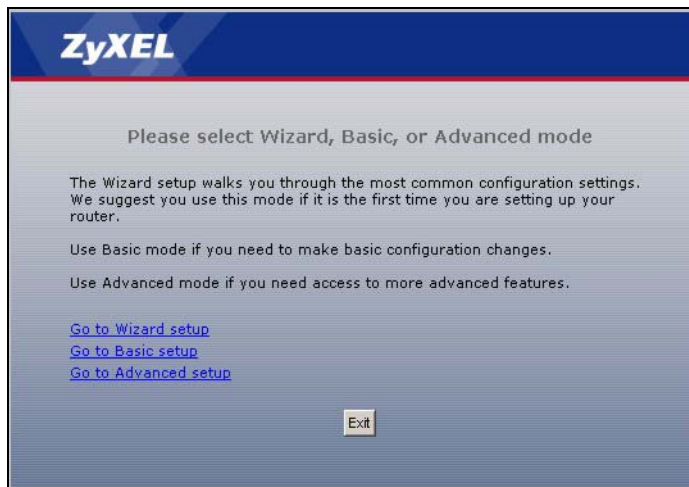
2 Choose your language from the drop-down list box.

3 Click the **Next** button to proceed to the next screen.

Figure 15 Select a Language

4 Read the on-screen information and click **Next**.

Figure 16 Welcome to the Connection Wizard

3.2 Connection Wizard: STEP 1: System Information

System Information contains administrative and system-related information.

3.2.1 System Name

System Name is for identification purposes. However, because some ISPs check this name you should enter your computer's "Computer Name".

- In Windows 95/98 click **Start**, **Settings**, **Control Panel**, **Network**. Click the Identification tab, note the entry for the **Computer Name** field and enter it as the **System Name**.
- In Windows 2000, click **Start**, **Settings** and **Control Panel** and then double-click **System**. Click the **Network Identification** tab and then the **Properties** button. Note the entry for the **Computer name** field and enter it as the **System Name**.
- In Windows XP, click **Start**, **My Computer**, **View system information** and then click the **Computer Name** tab. Note the entry in the **Full computer name** field and enter it as the ZyXEL Device **System Name**.

3.2.2 Domain Name

The **Domain Name** entry is what is propagated to the DHCP clients on the LAN. If you leave this blank, the domain name obtained by DHCP from the ISP is used. While you must enter the host name (System Name) on each individual computer, the domain name can be assigned from the ZyXEL Device via DHCP.

Click **Next** to configure the ZyXEL Device for Internet access.

Figure 17   Wizard Step 1: System Information

The following table describes the labels in this screen.

Table 13   Wizard Step 1: System Information

LABEL	DESCRIPTION
System Name	System Name is a unique name to identify the ZyXEL Device in an Ethernet network. Enter a descriptive name. This name can be up to 30 alphanumeric characters long. Spaces are not allowed, but dashes "-" and underscores "_" are accepted.
Domain Name	Type the domain name (if you know it) here. If you leave this field blank, the ISP may assign a domain name via DHCP. The domain name entered by you is given priority over the ISP assigned domain name.
Back	Click **Back** to display the previous screen.
Next	Click **Next** to proceed to the next screen.
Exit	Click **Exit** to close the wizard screen without saving.

3.3 Connection Wizard: STEP 2: Wireless LAN

Set up your wireless LAN using the following screen.

Figure 18 Wizard Step 2: Wireless LAN

The following table describes the labels in this screen.

Table 14 Wizard Step 2: Wireless LAN

LABEL	DESCRIPTION
Name(SSID)	Enter a descriptive name (up to 32 printable 7-bit ASCII characters) for the wireless LAN.
	If you change this field on the ZyXEL Device, make sure all wireless stations use the same SSID in order to access the network.
Security	Select a **Security** level from the drop-down list box.
	Choose **Auto** to have the ZyXEL Device generate a pre-shared key automatically. A screen pops up displaying the generated pre-shared key after you click **Next**. Click **OK** to continue.
	Choose **None** to have no wireless LAN security configured. If you do not enable any wireless security on your ZyXEL Device, your network is accessible to any wireless networking device that is within range. If you choose this option, skip directly to Section 3.4 on page 59.
	Choose **Basic** security if you want to configure WEP Encryption parameters. If you choose this option, go directly to Section 3.3.1 on page 57.
	Choose **Extend** (WPA-PSK or WPA2-PSK) security to configure a Pre-Shared Key. Choose this option only if your wireless clients support WPA-PSK or WPA2-PSK respectively. If you choose this option, skip directly to Section 3.3.2 on page 58.
Channel Selection	The range of radio frequencies used by IEEE 802.11b/g wireless devices is called a channel.
	This field displays **Auto** which means the ZyXEL Device automatically scans for and selects a channel which is not used by a nearby device.
Back	Click **Back** to display the previous screen.
Next	Click **Next** to proceed to the next screen.
Exit	Click **Exit** to close the wizard screen without saving.

Note: The wireless stations and ZyXEL Device must use the same SSID, channel ID and WEP encryption key (if WEP is enabled), WPA-PSK (if WPA-PSK is enabled) or WPA2-PSK (if WPA2-PSK is enabled) for wireless communication.

3.3.1 Basic(WEP) Security

Choose **Basic(WEP)** to setup WEP Encryption parameters.

Figure 19 Wizard Step 2: Basic(WEP) Security

The following table describes the labels in this screen.

Table 15 Wizard Step 2: Basic(WEP) Security

LABEL	DESCRIPTION
Passphrase	Type a Passphrase (up to 32 printable characters) and click **Generate**. The ZyXEL Device automatically generates a WEP key.
WEP Encryption	Select **64-bit WEP**, **128-bit WEP** or **256-bit WEP** to allow data encryption.
ASCII	Select this option in order to enter ASCII characters as the WEP keys.
HEX	Select this option to enter hexadecimal characters as the WEP keys.
	The preceding "0x" is entered automatically.

Table 15 Wizard Step 2: Basic(WEP) Security

LABEL	DESCRIPTION
Key 1 to Key 4	The WEP keys are used to encrypt data. Both the ZyXEL Device and the wireless stations must use the same WEP key for data transmission.
	If you chose **64-bit WEP**, then enter any 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F").
	If you chose **128-bit WEP**, then enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F").
	If you chose **256-bit WEP**, then enter 29 ASCII characters or 58 hexadecimal characters ("0-9", "A-F").
	You must configure at least one key, only one key can be activated at any one time. The default key is key 1.
Back	Click **Back** to display the previous screen.
Next	Click **Next** to proceed to the next screen.
Exit	Click **Exit** to close the wizard screen without saving.

3.3.2 Extend(WPA-PSK or WPA2-PSK) Security

Choose **Extend(WPA-PSK)** or **Extend(WPA2-PSK)** security in the Wireless LAN setup screen to set up a **Pre-Shared Key**.

Figure 20   Wizard Step 2: Extend(WPA-PSK or WPA2-PSK) Security
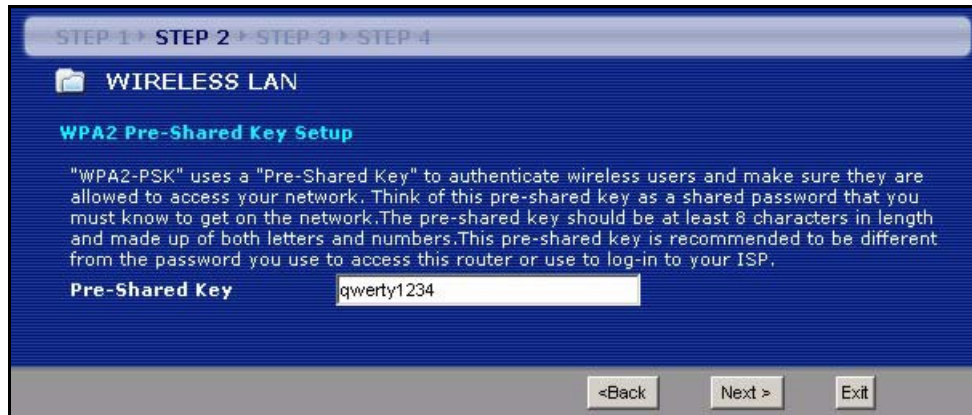
The following table describes the labels in this screen.

Table 16   Wizard Step 2: Extend(WPA-PSK or WPA2-PSK) Security

LABEL	DESCRIPTION
Pre-Shared Key	Type from 8 to 63 case-sensitive ASCII characters. You can set up the most secure wireless connection by configuring WPA in the wireless LAN screens. You need to configure an authentication server to do this.
Back	Click **Back** to display the previous screen.
Next	Click **Next** to proceed to the next screen.
Exit	Click **Exit** to close the wizard screen without saving.

3.4 Connection Wizard: STEP 3: Internet Configuration

The ZyXEL Device offers three Internet connection types. They are **Ethernet**, **PPP over Ethernet** or **PPTP**. The wizard attempts to detect which WAN connection type you are using. If the wizard does not detect a connection type, you must select one from the drop-down list box. Check with your ISP to make sure you use the correct type.

This wizard screen varies according to the connection type that you select.

Figure 21 Wizard Step 3: ISP Parameters.

The following table describes the labels in this screen,

Table 17 Wizard Step 3: ISP Parameters

CONNECTION TYPE	DESCRIPTION
Ethernet	Select the **Ethernet** option when the WAN port is used as a regular Ethernet.
PPPoE	Select the **PPP over Ethernet** option for a dial-up connection. If your ISP gave you a an IP address and/or subnet mask, then select **PPTP**.
PPTP	Select the **PPTP** option for a dial-up connection.

3.4.1 Ethernet Connection

Choose **Ethernet** when the WAN port is used as a regular Ethernet.

Figure 22 Wizard Step 3: Ethernet Connection

3.4.2 PPPoE Connection

Point-to-Point Protocol over Ethernet (PPPoE) functions as a dial-up connection. PPPoE is an IETF (Internet Engineering Task Force) standard specifying how a host personal computer interacts with a broadband modem (for example DSL, cable, wireless, etc.) to achieve access to high-speed data networks.

For the service provider, PPPoE offers an access and authentication method that works with existing access control systems (for instance, RADIUS).

One of the benefits of PPPoE is the ability to let end users access one of multiple network services, a function known as dynamic service selection. This enables the service provider to easily create and offer new IP services for specific users.

Operationally, PPPoE saves significant effort for both the subscriber and the ISP/carrier, as it requires no specific configuration of the broadband modem at the subscriber's site.

By implementing PPPoE directly on the ZyXEL Device (rather than individual computers), the computers on the LAN do not need PPPoE software installed, since the ZyXEL Device does that part of the task. Furthermore, with NAT, all of the LAN's computers will have Internet access.

Refer to the appendix for more information on PPPoE.

Figure 23 Wizard Step 3: PPPoE Connection

The following table describes the labels in this screen.

Table 18 Wizard Step 3: PPPoE Connection

LABEL	DESCRIPTION
ISP Parameter for Internet Access	
Connection Type	Select the **PPP over Ethernet** option for a dial-up connection.
Service Name	Type the name of your service provider.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the user name above.
Back	Click **Back** to return to the previous screen.
Next	Click **Next** to continue.
Exit	Click **Exit** to close the wizard screen without saving.

3.4.3 PPTP Connection

Point-to-Point Tunneling Protocol (PPTP) is a network protocol that enables transfers of data from a remote client to a private server, creating a Virtual Private Network (VPN) using TCP/IP-based networks.

PPTP supports on-demand, multi-protocol, and virtual private networking over public networks, such as the Internet.

Refer to the appendix for more information on PPTP.

Note: The ZyXEL Device supports one PPTP server connection at any given time.

Figure 24   Wizard Step 3: PPTP Connection

The following table describes the fields in this screen

Table 19   Wizard Step 3: PPTP Connection

LABEL	DESCRIPTION
ISP Parameters for Internet Access	
Connection Type	Select **PPTP** from the drop-down list box. To configure a PPTP client, you must configure the **User Name** and **Password** fields for a PPP connection and the PPTP parameters for a PPTP connection.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the User Name above.
PPTP Configuration	
Get automatically from ISP	Select this radio button if your ISP did not assign you a fixed IP address.
Use fixed IP address	Select this radio button, provided by your ISP to give the ZyXEL Device a fixed, unique IP address.
My IP Address	Type the (static) IP address assigned to you by your ISP.
My IP Subnet Mask	Type the subnet mask assigned to you by your ISP (if given).
Server IP Address	Type the IP address of the PPTP server.
Connection ID/ Name	Enter the connection ID or connection name in this field. It must follow the "c:id" and "n:name" format. For example, C:12 or N:My ISP. This field is optional and depends on the requirements of your ISP.
Back	Click **Back** to return to the previous screen.
Next	Click **Next** to continue.
Exit	Click **Exit** to close the wizard screen without saving.

3.4.4 Your IP Address

The following wizard screen allows you to assign a fixed IP address or give the ZyXEL Device an automatically assigned IP address depending on your ISP.

Figure 25   Wizard Step 3: Your IP Address
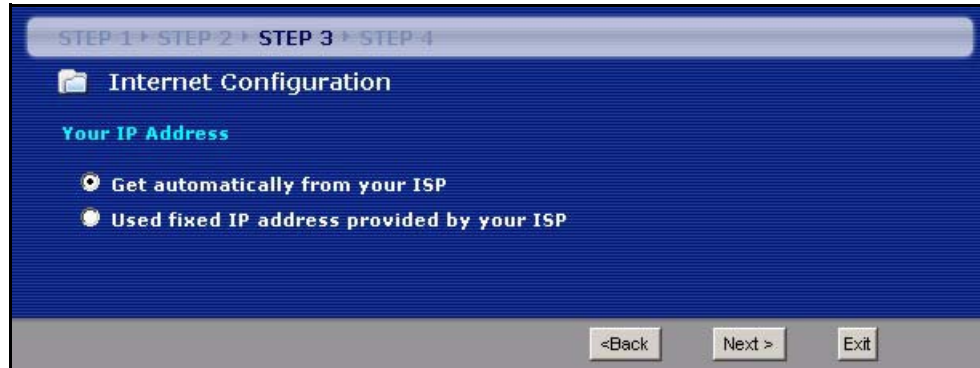
The following table describes the labels in this screen

Table 20   Wizard Step 3: Your IP Address

LABEL	DESCRIPTION
Get automatically from your ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection. If you choose this option, skip directly to section 3.4.9.
Use fixed IP address provided by your ISP	Select this option if you were given IP address and/or DNS server settings by the ISP. The fixed IP address should be in the same subnet as your broadband modem or router.
Back	Click **Back** to return to the previous screen.
Next	Click **Next** to continue.
Exit	Click **Exit** to close the wizard screen without saving.

3.4.5 WAN IP Address Assignment

Every computer on the Internet must have a unique IP address. If your networks are isolated from the Internet, for instance, only between your two branch offices, you can assign any IP addresses to the hosts without problems. However, the Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of IP addresses specifically for private networks.

Table 21   Private IP Address Ranges

10.0.0.0	-	10.255.255.255
172.16.0.0	-	172.31.255.255
192.168.0.0	-	192.168.255.255

You can obtain your IP address from the IANA, from an ISP or have it assigned by a private network. If you belong to a small organization and your Internet access is through an ISP, the ISP can provide you with the Internet addresses for your local networks. On the other hand, if you are part of a much larger organization, you should consult your network administrator for the appropriate IP addresses.

Note: Regardless of your particular situation, do not create an arbitrary IP address; always follow the guidelines above. For more information on address assignment, please refer to RFC 1597, Address Allocation for Private Internets and RFC 1466, Guidelines for Management of IP Address Space.

3.4.6 IP Address and Subnet Mask

Similar to the way houses on a street share a common street name, so too do computers on a LAN share one common network number.

Where you obtain your network number depends on your particular situation. If the ISP or your network administrator assigns you a block of registered IP addresses, follow their instructions in selecting the IP addresses and the subnet mask.

If the ISP did not explicitly give you an IP network number, then most likely you have a single user account and the ISP will assign you a dynamic IP address when the connection is established. The Internet Assigned Number Authority (IANA) reserved this block of addresses specifically for private use; please do not use any other number unless you are told otherwise. Let's say you select 192.168.1.0 as the network number; which covers 254 individual addresses, from 192.168.1.1 to 192.168.1.254 (zero and 255 are reserved). In other words, the first three numbers specify the network number while the last number identifies an individual computer on that network.

Once you have decided on the network number, pick an IP address that is easy to remember, for instance, 192.168.1.1, for your ZyXEL Device, but make sure that no other device on your network is using that IP address.

The subnet mask specifies the network number portion of an IP address. Your ZyXEL Device will compute the subnet mask automatically based on the IP address that you entered. You don't need to change the subnet mask computed by the ZyXEL Device unless you are instructed to do otherwise.

3.4.7 DNS Server Address Assignment

Use DNS (Domain Name System) to map a domain name to its corresponding IP address and vice versa, for instance, the IP address of www.zyxel.com is 204.217.0.2. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it.

The ZyXEL Device can get the DNS server addresses in the following ways.

1 The ISP tells you the DNS server addresses, usually in the form of an information sheet, when you sign up. If your ISP gives you DNS server addresses, enter them in the **DNS Server** fields in the **Wizard** and/or **WAN > Internet Connection** screen.

2 If the ISP did not give you DNS server information, leave the **DNS Server** fields set to **0.0.0.0** in the **Wizard** screen and/or set to **From ISP** in the **WAN > Internet Connection** screen for the ISP to dynamically assign the DNS server IP addresses.

3.4.8 WAN IP and DNS Server Address Assignment

The following wizard screen allows you to assign a fixed WAN IP address and DNS server addresses.

Figure 26   Wizard Step 3: WAN IP and DNS Server Addresses

The following table describes the labels in this screen

Table 22   Wizard Step 3: WAN IP and DNS Server Addresses

LABEL	DESCRIPTION
WAN IP Address Assignment	
My WAN IP Address	Enter your WAN IP address in this field. The WAN IP address should be in the same subnet as your DSL/Cable modem or router.
My WAN IP Subnet Mask	Enter the IP subnet mask in this field.
Gateway IP Address	Enter the gateway IP address in this field.
System DNS Server Address Assignment (if applicable)	
DNS (Domain Name System) is for mapping a domain name to its corresponding IP address and vice versa. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it. The ZyXEL Device uses a system DNS server (in the order you specify here) to resolve domain names for DDNS and the time server.	

Table 22   Wizard Step 3: WAN IP and DNS Server Addresses

LABEL	DESCRIPTION
First DNS Server Second DNS Server Third DNS Server	Enter the DNS server's IP address in the fields provided. If you do not configure a system DNS server, you must use IP addresses when configuring DDNS and the time server.
Back	Click **Back** to return to the previous screen.
Next	Click **Next** to continue.
Exit	Click **Exit** to close the wizard screen without saving.

3.4.9 WAN MAC Address

Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02.

Table 23   Example of Network Properties for LAN Servers with Fixed IP Addresses

Choose an IP address	192.168.1.2-192.168.1.32; 192.168.1.65-192.168.1.254.
Subnet mask	255.255.255.0
Gateway (or default route)	192.168.1.1(ZyXEL Device LAN IP)

This screen allows users to configure the WAN port's MAC address by either using the ZyXEL Device's MAC address, copying the MAC address from a computer on your LAN or manually entering a MAC address. Once it is successfully configured, the address will be copied to the "rom" file (ZyNOS configuration file). It will not change unless you change the setting or upload a different "rom" file. It is advisable to clone the MAC address from a computer on your LAN even if your ISP does not presently require MAC address authentication.

Figure 27   Wizard Step 3: WAN MAC Address
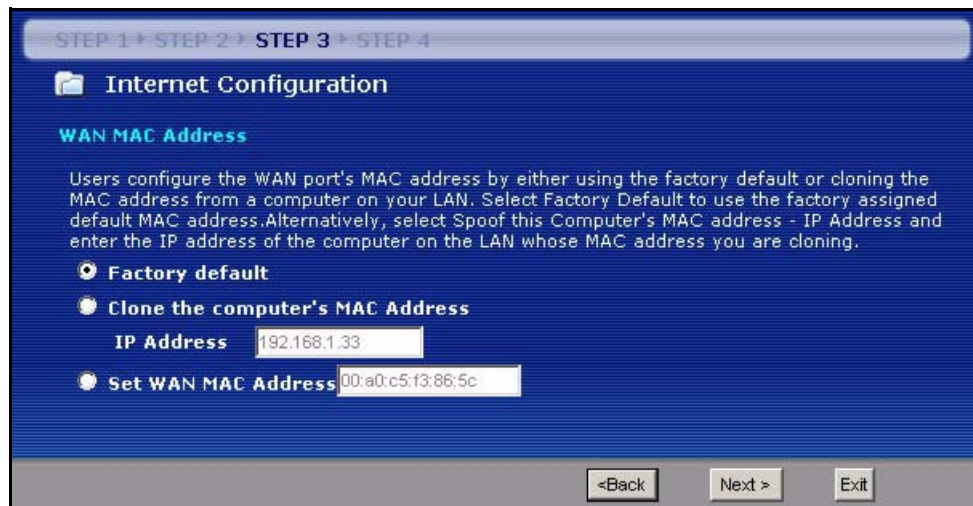
The following table describes the fields in this screen.

Table 24   Wizard Step 3: WAN MAC Address

LABEL	DESCRIPTION
Factory Default	Select **Factory Default** to use the factory assigned default MAC address.
Clone the computer's MAC address	Select this option and enter the IP address of the computer on the LAN whose MAC you are cloning. It is advisable to clone the MAC address from a computer on your LAN even if your ISP does not presently require MAC address authentication.
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
Back	Click **Back** to return to the previous screen.
Next	Click **Next** to continue.
Exit	Click **Exit** to close the wizard screen without saving.

3.5 Connection Wizard: STEP 4: Bandwidth management

Bandwidth management allows you to control the amount of bandwidth going out through the ZyXEL Device's WAN, LAN or WLAN port and prioritize the distribution of the bandwidth according to the traffic type. This helps keep one service from using all of the available bandwidth and shutting out other users.

Figure 28   Wizard Step 4: Bandwidth Management
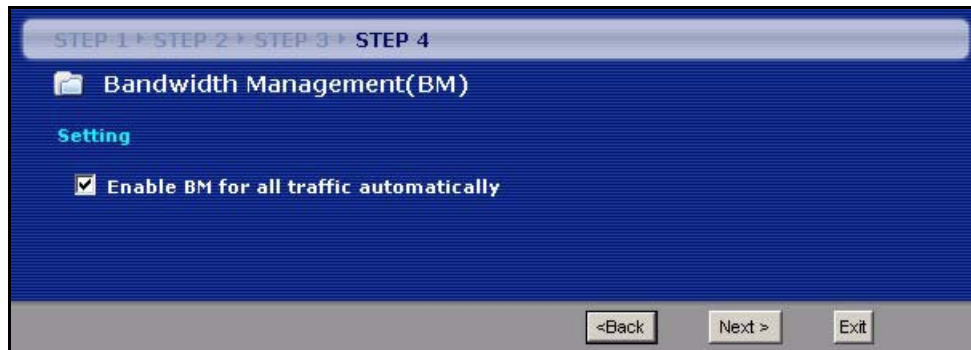
The following fields describe the label in this screen.

Table 25   Wizard Step 4: Bandwidth Management

LABEL	DESCRIPTION
Enable BM for all traffic automatically	Select the check box to have the ZyXEL Device apply bandwidth management to traffic going out through the ZyXEL Device's WAN, LAN or WLAN port. Bandwidth is allocated according to the traffic type automatically. Real-time packets, such as VoIP traffic always get higher priority.
Back	Click **Back** to return to the previous screen.

Table 25   Wizard Step 4: Bandwidth Management

LABEL	DESCRIPTION
Next	Click **Next** to continue.
Exit	Click **Exit** to close the wizard screen without saving.

3.6 Connection Wizard Complete

Click **Apply** to save your configuration.

Figure 29   Connection Wizard Save

Follow the on-screen instructions and click **Finish** to complete the wizard setup.

Figure 30   Connection Wizard Complete
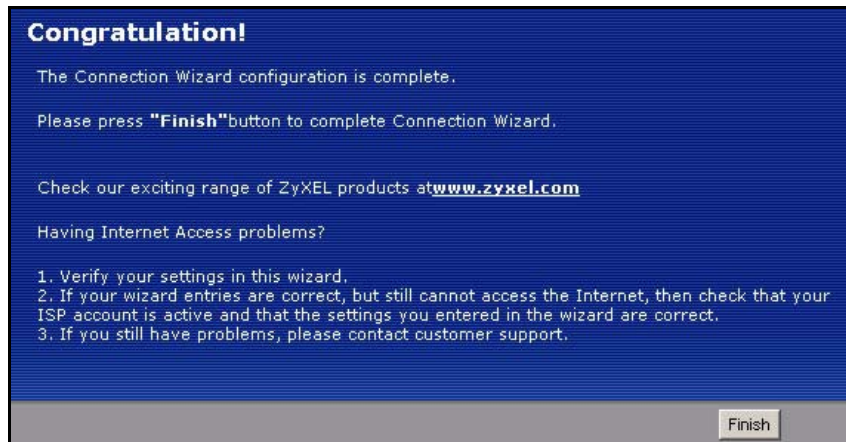
Well done! You have successfully set up your ZyXEL Device to operate on your network and access the Internet.

CHAPTER 4
Wireless LAN

This chapter discusses how to configure the wireless network settings in your ZyXEL Device. See the appendices for more detailed information about wireless networks.

4.1 Wireless Network Overview

The following figure provides an example of a wireless network.

Figure 31 Example of a Wireless Network
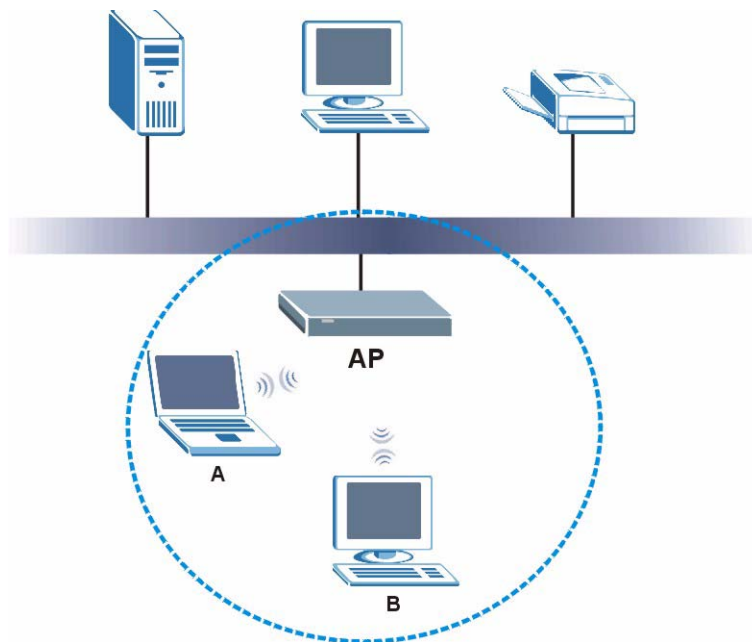
The wireless network is the part in the blue circle. In this wireless network, devices A and B are called wireless clients. The wireless clients use the access point (AP) to interact with other devices (such as the printer) or with the Internet. Your ZyXEL Device is the AP.

Every wireless network must follow these basic guidelines.

- Every wireless client in the same wireless network must use the same SSID.

  The SSID is the name of the wireless network. It stands for Service Set IDentity.

- If two wireless networks overlap, they should use different channels.

  Like radio stations or television channels, each wireless network uses a specific channel, or frequency, to send and receive information.

- Every wireless client in the same wireless network must use security compatible with the AP.

  Security stops unauthorized devices from using the wireless network. It can also protect the information that is sent in the wireless network.

4.2 Wireless Security Overview

The following sections introduce different types of wireless security you can set up in the wireless network.

4.2.1 SSID

Normally, the AP acts like a beacon and regularly broadcasts the SSID in the area. You can hide the SSID instead, in which case the AP does not broadcast the SSID. In addition, you should change the default SSID to something that is difficult to guess.

This type of security is fairly weak, however, because there are ways for unauthorized devices to get the SSID. In addition, unauthorized devices can still see the information that is sent in the wireless network.

4.2.2 MAC Address Filter

Every wireless client has a unique identification number, called a MAC address.[1] A MAC address is usually written using twelve hexadecimal characters[2]; for example, 00A0C5000002 or 00:A0:C5:00:00:02. To get the MAC address for each wireless client, see the appropriate User's Guide or other documentation.

You can use the MAC address filter to tell the AP which wireless clients are allowed or not allowed to use the wireless network. If a wireless client is allowed to use the wireless network, it still has to have the correct settings (SSID, channel, and security). If a wireless client is not allowed to use the wireless network, it does not matter if it has the correct settings.

This type of security does not protect the information that is sent in the wireless network. Furthermore, there are ways for unauthorized devices to get the MAC address of an authorized wireless client. Then, they can use that MAC address to use the wireless network.

4.2.3 User Authentication

You can make every user log in to the wireless network before they can use it. This is called user authentication. However, every wireless client in the wireless network has to support IEEE 802.1x to do this.

---

1. Some wireless devices, such as scanners, can detect wireless networks but cannot use wireless networks. These kinds of wireless devices might not have MAC addresses.

2. Hexadecimal characters are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.

For wireless networks, there are two typical places to store the user names and passwords for each user.

- In the AP: this feature is called a local user database or a local database.
- In a RADIUS server: this is a server used in businesses more than in homes.

If your AP does not provide a local user database and if you do not have a RADIUS server, you cannot set up user names and passwords for your users.

Unauthorized devices can still see the information that is sent in the wireless network, even if they cannot use the wireless network. Furthermore, there are ways for unauthorized wireless users to get a valid user name and password. Then, they can use that user name and password to use the wireless network.

Local user databases also have an additional limitation that is explained in the next section.

4.2.4 Encryption

Wireless networks can use encryption to protect the information that is sent in the wireless network. Encryption is like a secret code. If you do not know the secret code, you cannot understand the message.

The types of encryption you can choose depend on the type of user authentication. (See Section 4.2.3 on page 70 for information about this.)

Table 26   Types of Encryption for Each Type of Authentication

		RADIUS Server
Weakest	No Security	
	Static WEP	
	WPA-PSK	WPA
Strongest	WPA2-PSK	WPA2

For example, if the wireless network has a RADIUS server, you can choose **WPA** or **WPA2**. If users do not log in to the wireless network, you can choose no encryption, **Static WEP**, **WPA-PSK**, or **WPA2-PSK**.

Usually, you should set up the strongest encryption that every wireless client in the wireless network supports. For example, suppose the AP does not have a local user database, and you do not have a RADIUS server. Therefore, there is no user authentication. Suppose the wireless network has two wireless clients. Device A only supports WEP, and device B supports WEP and WPA. Therefore, you should set up **Static WEP** in the wireless network.

Note: It is recommended that wireless networks use **WPA-PSK**, **WPA**, or stronger encryption. IEEE 802.1x and WEP encryption are better than none at all, but it is still possible for unauthorized devices to figure out the original information pretty quickly.

It is not possible to use **WPA-PSK**, **WPA** or stronger encryption with a local user database. In this case, it is better to set up stronger encryption with no authentication than to set up weaker encryption with the local user database.

When you select **WPA2** or **WPA2-PSK** in your ZyXEL Device, you can also select an option (**WPA Compatible**) to support WPA as well. In this case, if some wireless clients support WPA and some support WPA2, you should set up **WPA2-PSK** or **WPA2** (depending on the type of wireless network login) and select the **WPA Compatible** option in the ZyXEL Device.

Many types of encryption use a key to protect the information in the wireless network. The longer the key, the stronger the encryption. Every wireless client in the wireless network must have the same key.

4.3 General Wireless LAN Screen

Note: If you are configuring the ZyXEL Device from a computer connected to the wireless LAN and you change the ZyXEL Device's SSID, channel or security settings, you will lose your wireless connection when you press **Apply** to confirm. You must then change the wireless settings of your computer to match the ZyXEL Device's new settings.

Click **Network** > **Wireless LAN** to open the **General** screen.

Figure 32   Wireless General

The following table describes the general wireless LAN labels in this screen.

Table 27   Wireless General

LABEL	DESCRIPTION
Enable Wireless LAN	Click the check box to activate wireless LAN.
Name(SSID)	(Service Set IDentity) The SSID identifies the Service Set with which a wireless station is associated. Wireless stations associating to the access point (AP) must have the same SSID. Enter a descriptive name (up to 32 printable 7-bit ASCII characters) for the wireless LAN.
Hide SSID	Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.
Channel Selection	Set the operating frequency/channel depending on your particular region.
	Select a channel from the drop-down list box. The options vary depending on whether you are using A or B/G frequency band and the country you are in. This field is not available when you select **Auto Channel Selection**.
	Refer to the Connection Wizard chapter for more information on channels.
Auto Channel Selection	Select the check box to have the ZyXEL Device automatically scan for and select a channel which is not used by another device.
Operating Channel	This displays the channel the ZyXEL Device is currently using.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

See the rest of this chapter for information on the other labels in this screen.

4.3.1 No Security

Select **No Security** to allow wireless stations to communicate with the access points without any data encryption.

Note: If you do not enable any wireless security on your ZyXEL Device, your network is accessible to any wireless networking device that is within range.

Figure 33   Wireless: No Security

The following table describes the labels in this screen.

Table 28   Wireless No Security

LABEL	DESCRIPTION
Security Mode	Choose **No Security** from the drop-down list box.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

4.3.2 WEP Encryption

WEP encryption scrambles the data transmitted between the wireless stations and the access points to keep network communications private. It encrypts unicast and multicast communications in a network. Both the wireless stations and the access points must use the same WEP key.

Your ZyXEL Device allows you to configure up to four 64-bit, 128-bit or 256-bit WEP keys but only one key can be enabled at any one time.

In order to configure and enable WEP encryption; click **Network** > **Wireless LAN** to display the **General** screen. Select **Static WEP** from the **Security Mode** list.

Figure 34 Wireless: Static WEP Encryption

The following table describes the wireless LAN security labels in this screen.

Table 29 Wireless: Static WEP Encryption

LABEL	DESCRIPTION
Passphrase	Enter a passphrase (password phrase) of up to 32 printable characters and click **Generate**. The ZyXEL Device automatically generates four different WEP keys and displays them in the **Key** fields below.
WEP Encryption	Select **64-bit WEP**, **128-bit WEP** or **256-bit WEP** to enable data encryption.
Authentication Method	This field is activated when you select **64-bit WEP**, **128-bit WEP** or **256-bit WEP** in the **WEP Encryption** field. Select **Auto**, **Open System** or **Shared Key** from the drop-down list box.
ASCII	Select this option in order to enter ASCII characters as WEP key.
Hex	Select this option in order to enter hexadecimal characters as a WEP key. The preceding "0x", that identifies a hexadecimal key, is entered automatically.

Table 29   Wireless: Static WEP Encryption

LABEL	DESCRIPTION
Key 1 to Key 4	The WEP keys are used to encrypt data. Both the ZyXEL Device and the wireless stations must use the same WEP key for data transmission. If you chose **64-bit WEP**, then enter any 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F"). If you chose **128-bit WEP**, then enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F"). If you chose **256-bit WEP**, then enter 29 ASCII characters or 58 hexadecimal characters ("0-9", "A-F"). You must configure at least one key, only one key can be activated at any one time. The default key is key 1.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

4.3.3 WPA-PSK/WPA2-PSK

Click **Network** > **Wireless LAN** to display the **General** screen.

Figure 35   Wireless: WPA-PSK/WPA2-PSK

The following table describes the labels in this screen.

Table 30 Wireless: WPA-PSK/WPA2-PSK

LABEL	DESCRIPTION
WPA Compatible	This check box is available only when you select **WPA2-PSK** or **WPA2** in the **Security Mode** field.
	Select the check box to have both WPA2 and WPA wireless clients be able to communicate with the ZyXEL Device even when the ZyXEL Device is using WPA2-PSK or WPA2.
Pre-Shared Key	The encryption mechanisms used for **WPA/WPA2** and **WPA-PSK/WPA2-PSK** are the same. The only difference between the two is that **WPA-PSK/WPA2-PSK** uses a simple common password, instead of user-specific credentials.
	Type a pre-shared key from 8 to 63 case-sensitive ASCII characters (including spaces and symbols).
ReAuthentication Timer (in seconds)	Specify how often wireless stations have to resend usernames and passwords in order to stay connected. Enter a time interval between 10 and 9999 seconds. The default time interval is 1800 seconds (30 minutes).
	Note: If wireless station authentication is done using a RADIUS server, the reauthentication timer on the RADIUS server has priority.
Idle Timeout	The ZyXEL Device automatically disconnects a wireless station from the wired network after a period of inactivity. The wireless station needs to enter the username and password again before access to the wired network is allowed. The default time interval is 3600 seconds (or 1 hour).
Group Key Update Timer	The **Group Key Update Timer** is the rate at which the AP (if using **WPA-PSK/WPA2-PSK** key management) or RADIUS server (if using **WPA/WPA2** key management) sends a new group key out to all clients. The re-keying process is the WPA/WPA2 equivalent of automatically changing the WEP key for an AP and all stations in a WLAN on a periodic basis. Setting of the **Group Key Update Timer** is also supported in **WPA-PSK/WPA2-PSK** mode. The ZyXEL Device default is **1800** seconds (30 minutes).
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

4.3.4 WPA/WPA2

Click **Network** > **Wireless LAN** to display the **General** screen.

Figure 36 Wireless: WPA/WPA2

The following table describes the labels in this screen.

Table 31 Wireless: WPA/WPA2

LABEL	DESCRIPTION
WPA Compatible	This check box is available only when you select **WPA2-PSK** or **WPA2** in the **Security Mode** field.
	Select the check box to have both WPA2 and WPA wireless clients be able to communicate with the ZyXEL Device even when the ZyXEL Device is using WPA2-PSK or WPA2.
ReAuthentication Timer (in seconds)	Specify how often wireless stations have to resend usernames and passwords in order to stay connected. Enter a time interval between 10 and 9999 seconds. The default time interval is 1800 seconds (30 minutes).
	Note: If wireless station authentication is done using a RADIUS server, the reauthentication timer on the RADIUS server has priority.
Idle Timeout	The ZyXEL Device automatically disconnects a wireless station from the wired network after a period of inactivity. The wireless station needs to enter the username and password again before access to the wired network is allowed. The default time interval is 3600 seconds (or 1 hour).

Table 31 Wireless: WPA/WPA2

LABEL	DESCRIPTION
Group Key Update Timer	The **Group Key Update Timer** is the rate at which the AP (if using **WPA-PSK/WPA2-PSK** key management) or RADIUS server (if using **WPA/WPA2** key management) sends a new group key out to all clients. The re-keying process is the WPA/WPA2 equivalent of automatically changing the WEP key for an AP and all stations in a WLAN on a periodic basis. Setting of the **Group Key Update Timer** is also supported in **WPA-PSK/WPA2-PSK** mode. The ZyXEL Device default is **1800** seconds (30 minutes).
Authentication Server	
IP Address	Enter the IP address of the external authentication server in dotted decimal notation.
Port Number	Enter the port number of the external authentication server. The default port number is **1812**. You need not change this value unless your network administrator instructs you to do so with additional information.
Shared Secret	Enter a password (up to 31 alphanumeric characters) as the key to be shared between the external authentication server and the ZyXEL Device. The key must be the same on the external authentication server and your ZyXEL Device. The key is not sent over the network.
Accounting Server	
Active	Select **Yes** from the drop down list box to enable user accounting through an external authentication server.
IP Address	Enter the IP address of the external accounting server in dotted decimal notation.
Port Number	Enter the port number of the external accounting server. The default port number is **1813**. You need not change this value unless your network administrator instructs you to do so with additional information.
Shared Secret	Enter a password (up to 31 alphanumeric characters) as the key to be shared between the external accounting server and the ZyXEL Device. The key must be the same on the external accounting server and your ZyXEL Device. The key is not sent over the network.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

4.4 MAC Filter

The MAC filter screen allows you to configure the ZyXEL Device to give exclusive access to up to 32 devices (Allow) or exclude up to 32 devices from accessing the ZyXEL Device (Deny). Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02. You need to know the MAC address of the devices to configure this screen.

To change your ZyXEL Device's MAC filter settings, click **Network** > **Wireless LAN** > **MAC Filter**. The screen appears as shown.

Figure 37 MAC Address Filter

The following table describes the labels in this menu.

Table 32 MAC Address Filter

LABEL	DESCRIPTION
Active	Select **Yes** from the drop down list box to enable MAC address filtering.
Filter Action	Define the filter action for the list of MAC addresses in the **MAC Address** table.
	Select **Deny** to block access to the ZyXEL Device, MAC addresses not listed will be allowed to access the ZyXEL Device
	Select **Allow** to permit access to the ZyXEL Device, MAC addresses not listed will be denied access to the ZyXEL Device.
Set	This is the index number of the MAC address.
MAC Address	Enter the MAC addresses of the wireless station that are allowed or denied access to the ZyXEL Device in these address fields. Enter the MAC addresses in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

4.5 Wireless LAN Advanced Screen

Click **Network** > **Wireless LAN** > **Advanced**. The screen appears as shown.

Figure 38   Wireless LAN Advanced

The following table describes the labels in this screen.

Table 33   Wireless LAN Advanced

LABEL	DESCRIPTION
Wireless Advanced Setup	
RTS/CTS Threshold	Data with its frame size larger than this value will perform the RTS (Request To Send)/CTS (Clear To Send) handshake.
	If the RTS/CTS value is greater than the **Fragmentation Threshold** value, then the RTS/CTS handshake will never occur as data frames will be fragmented before they reach RTS/CTS size.
	Enter a value between 0 and 2432.
Fragmentation Threshold	It is the maximum data fragment size that can be sent. Enter a value between 256 and 2432.
Output Power	Set the output power of the ZyXEL Device in this field. If there is a high density of APs within an area, decrease the output power of the ZyXEL Device to reduce interference with other APs.
	The options are **100%**, **80%** and **60%**.
802.11 Mode	Select **802.11b** to allow only IEEE 802.11b compliant WLAN devices to associate with the ZyXEL Device.
	Select **802.11g** to allow only IEEE 802.11g compliant WLAN devices to associate with the ZyXEL Device.
	Select **802.11b/g** to allow either IEEE802.11b or IEEE802.11g compliant WLAN devices to associate with the ZyXEL Device. The transmission rate of your ZyXEL Device might be reduced.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

CHAPTER 5
Wireless Tutorial

This chapter gives you examples of how to set up an access point and wireless client for wireless communication using the following parameters. The wireless clients can access the Internet through an AP wirelessly.

5.1 Example Parameters

SSID	SSID_Example3
Channel	Auto
Security	WPA-PSK (Pre-Shared Key: ThisismyWPA-PSKpre-sharedkey)
802.11 mode	IEEE 802.11b/g

An access point (AP) or wireless router is referred to as "AP" and a computer with a wireless network card or USB/PCI adapter is referred to as "wireless client" here.

We use the P-334WH web screens and M-302 utility screens as an example. The screens may vary slightly for different models.

5.2 Configuring the AP

Flow the steps below to configure the wireless settings on your AP.

1 Make sure the ZyXEL Device is set to router mode or access point mode in the **Maintenance > Sys OP Mode** screen.

2 Open the **Wireless LAN > General** screen in the AP's web configurator.

Figure 39 AP: Wireless LAN > General

3 Make sure the **Enable Wireless LAN** check box is selected.

4 Enter **SSID_Example3** as the SSID, select a channel or select **Auto Channel Selection** to have the AP choose a channel which is not used by another AP and display the channel number in the field below after you click **Apply**.

5 Set security mode to **WPA-PSK** and enter **ThisismyWPA-PSKpre-sharedkey** in the **Pre-Shared Key** field. Click **Apply**.

6 Open the **Status** screen.Verify your wireless and wireless security settings under **Device Information** and check if the WLAN connection is up under **Interface Status**.

Figure 40 AP: Status

7 Click the **WLAN Station Status** hyperlink in the AP's **Status** screen. You can see if any wireless client has connected to the AP.

Figure 41 AP: Status: WLAN Station Status

5.3 Configuring the Wireless Client

This section describes how to connect the wireless client to a network.

5.3.1 Connecting to a Wireless LAN

The following sections show you how to join a wireless network using the ZyXEL utility, as in the following diagram. The wireless client is labeled **C** and the access point is labeled **AP**.
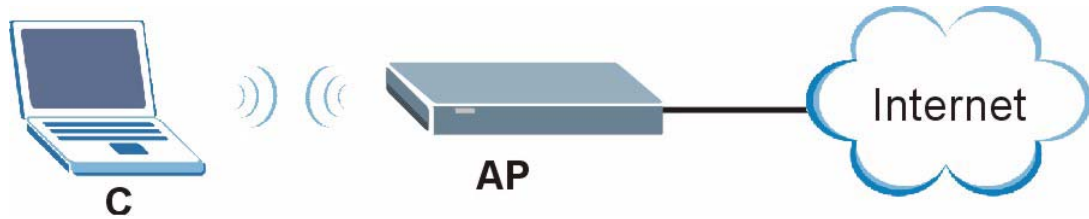
There are three ways to connect the client to an access point.

- Configure nothing and leave the wireless client to automatically scan for and connect to any available network that has no wireless security configured.
- Manually connect to a network.
- Configure a profile to have the wireless client automatically connect to a specific network or peer computer.

This example illustrates how to manually connect your wireless client to an access point (AP) which is configured for WPA-PSK security and connected to the Internet. Before you connect to the access point, you must know its Service Set IDentity (SSID) and WPA-PSK pre-shared key. In this example, the SSID is "SSID_Example3" and the pre-shared key is "ThisismyWPA-PSKpre-sharedkey".

After you install the ZyXEL utility and then insert the wireless client, follow the steps below to connect to a network using the **Site Survey** screen.

1 Open the ZyXEL utility and click the **Site Survey** tab to open the screen shown next.
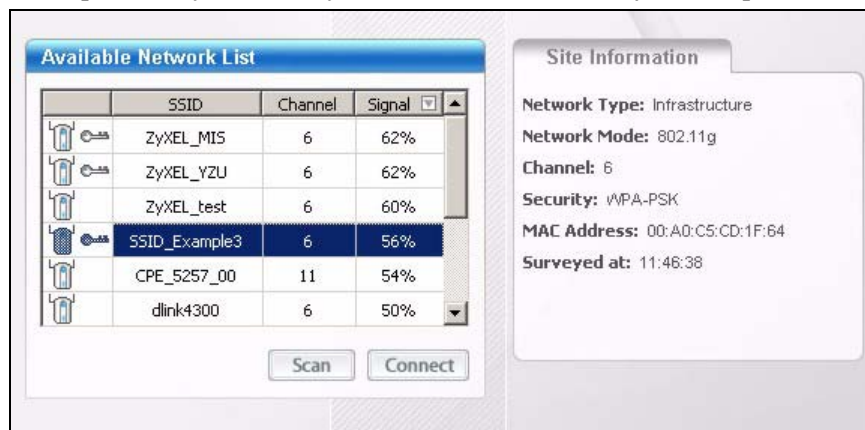
2 The wireless client automatically searches for available wireless networks. Click **Scan** if you want to search again. If no entry displays in the **Available Network List**, that means there is no wireless network available within range. Make sure the AP or peer computer is turned on or move the wireless client closer to the AP or peer computer.

3 When you try to connect to an AP with security configured, a window will pop up prompting you to specify the security settings. Enter the pre-shared key and leave the encryption type at the default setting.

Use the **Next** button to move on to the next screen. You can use the **Back** button at any time to return to the previous screen, or the **Exit** button to return to the **Site Survey** screen.

Figure 42   ZyXEL Utility: Security Settings
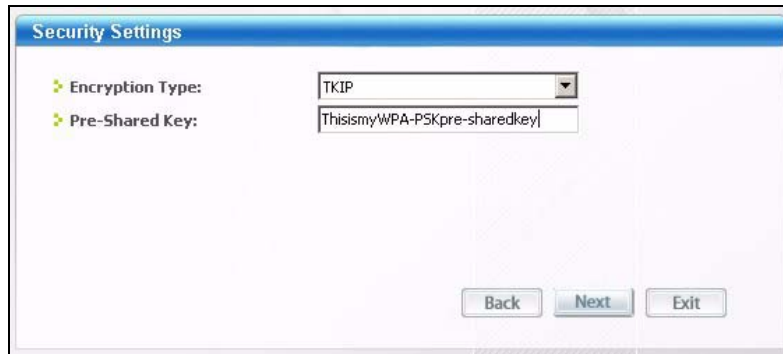
4 The **Confirm Save** window appears. Check your settings and click **Save** to continue.

Figure 43   ZyXEL Utility: Confirm Save
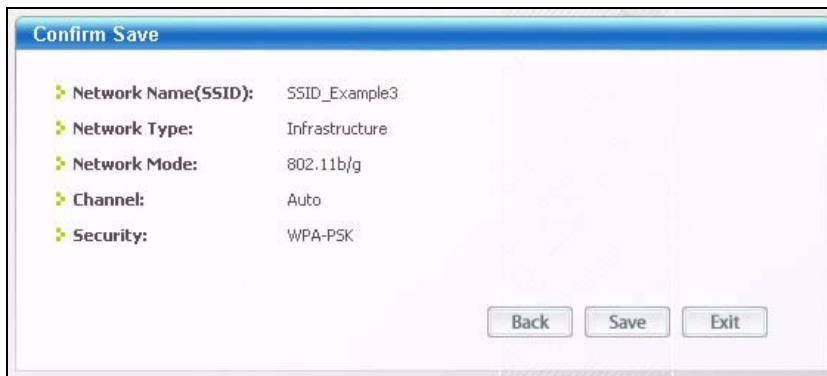
5 The ZyXEL utility returns to the **Link Info** screen while it connects to the wireless network using your settings. When the wireless link is established, the ZyXEL utility icon in the system tray turns green and the **Link Info** screen displays details of the active connection. Check the network information in the **Link Info** screen to verify that you have successfully connected to the selected network. If the wireless client is not connected to a network, the fields in this screen remain blank.

Figure 44 ZyXEL Utility: Link Info
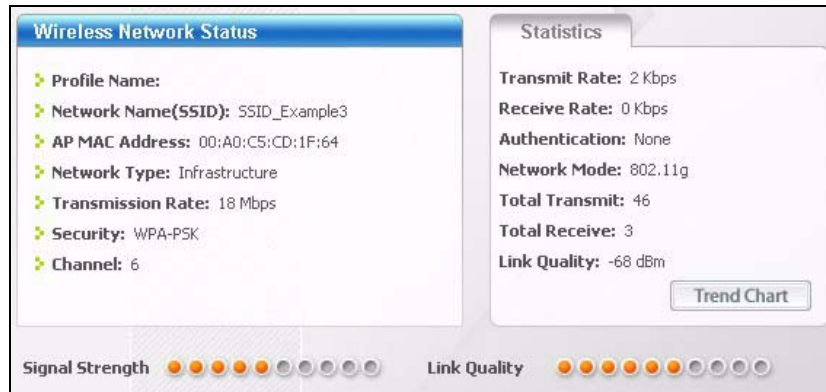
6 Open your Internet browser and enter http://www.zyxel.com or the URL of any other web site in the address bar. If you are able to access the web site, your wireless connection is successfully configured.

If you cannot access the web site, try changing the encryption type in the **Security Settings** screen, check the Troubleshooting section of this User's Guide or contact your network administrator.

5.3.2 Creating and Using a Profile

A profile lets you automatically connect to the same wireless network every time you use the wireless client. You can also configure different profiles for different networks, for example if you connect a notebook computer to wireless networks at home and at work.

This example illustrates how to set up a profile and connect the wireless client to an access point configured for WPA-PSK security. In this example, the SSID is "SSID_Example3", the profile name is "PN_Example3" and the pre-shared key is "ThisismyWPA-PSKpre-sharedkey". You have chosen the profile name "PN_Example3".

1 Open the ZyXEL utility and click the **Profile** tab to open the screen shown next. Click **Add** to configure a new profile.

Figure 45 ZyXEL Utility: Profile
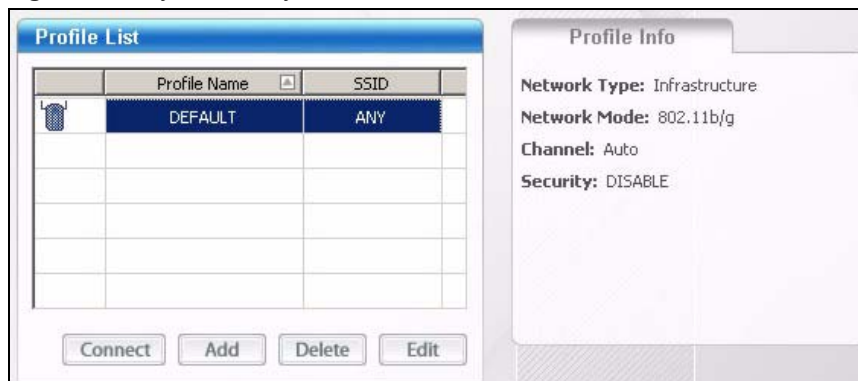
2 The **Add New Profile** screen appears. The wireless client automatically searches for available wireless networks, which are displayed in the **Scan Info** box. Click on **Scan** if

you want to search again. You can also configure your profile for a wireless network that is not in the list.

Figure 46 ZyXEL Utility: Add New Profile
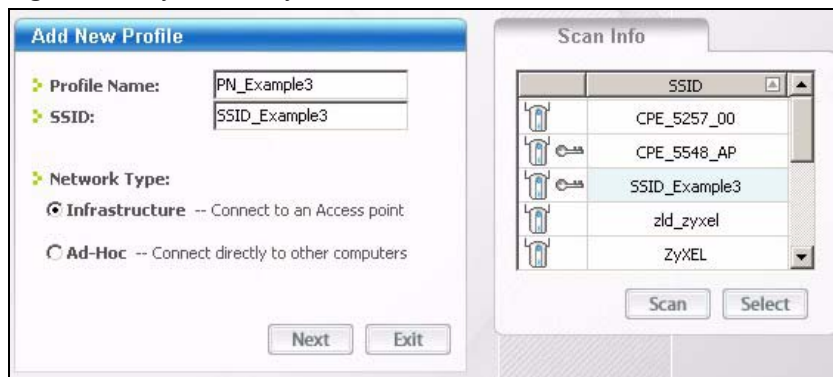
3 Give the profile a descriptive name (of up to 32 printable ASCII characters). Select **Infrastructure** and either manually enter or select the AP's SSID in the **Scan Info** table and click **Select**.

4 Choose the same encryption method as the AP to which you want to connect (In this example, WPA-PSK).

Figure 47 ZyXEL Utility: Profile Security
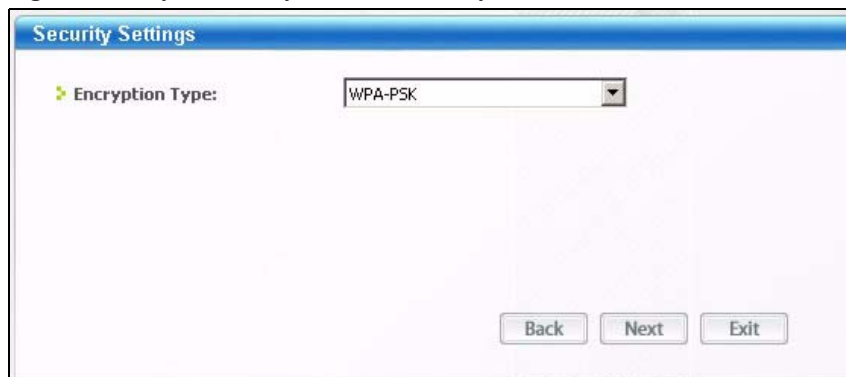
5 This screen varies depending on the encryption method you selected in the previous screen. Enter the pre-shared key and leave the encryption type at the default setting.

Figure 48 ZyXEL Utility: Profile Encryption
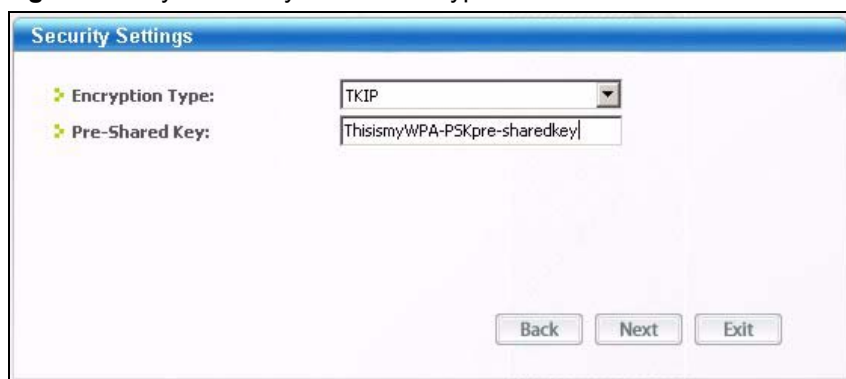
6 In the next screen, leave both boxes checked.

Figure 49 Profile: Wireless Protocol Settings.
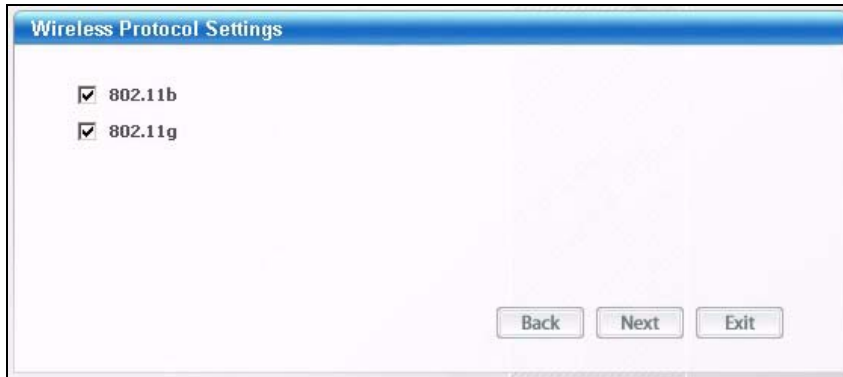
7 Verify the profile settings in the read-only screen. Click **Save** to save and go to the next screen.

Figure 50 Profile: Confirm Save
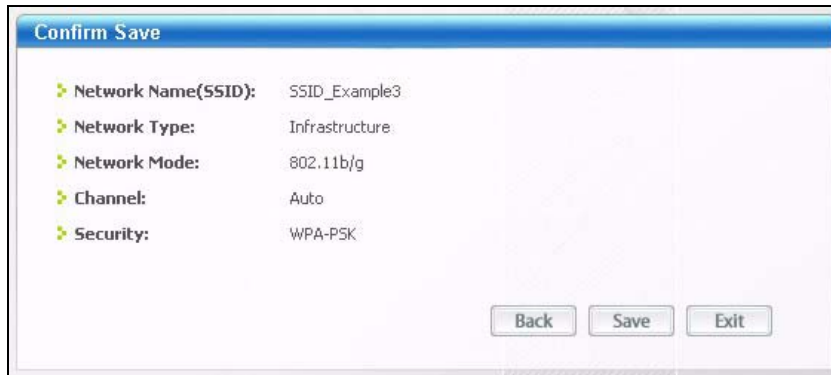
8 Click **Activate Now** to use the new profile immediately. Otherwise, click the **Activate Later** button.

If you clicked **Activate Later**, you can select the profile from the list in the **Profile** screen and click **Connect** to activate it.

Note: Only one profile can be activated and used at any given time.

Figure 51 Profile: Activate

9 When you activate the new profile, the ZyXEL utility returns to the **Link Info** screen while it connects to the AP using your settings. When the wireless link is established, the ZyXEL utility icon in the system tray turns green and the **Link Info** screen displays details of the active connection.

10 Open your Internet browser, enter http://www.zyxel.com or the URL of any other web site in the address bar and press ENTER. If you are able to access the web site, your new profile is successfully configured.

11 If you cannot access the Internet go back to the **Profile** screen, select the profile you are using and click **Edit**. Check the details you entered previously. Also, refer to the Troubleshooting section of this User's Guide or contact your network administrator if necessary.

CHAPTER 6
WAN

This chapter describes how to configure WAN settings.

6.1 WAN Overview

See the chapter about the connection wizard for more information on the fields in the WAN screens.

6.2 WAN MAC Address

The MAC address screen allows users to configure the WAN port's MAC address by either using the factory default or cloning the MAC address from a computer on your LAN. Choose **Factory Default** to select the factory assigned default MAC Address.

Otherwise, click **Clone the computer's MAC address - IP Address** and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to the rom file (ZyNOS configuration file). It will not change unless you change the setting or upload a different ROM file. It is recommended that you clone the MAC address prior to hooking up the WAN Port.

6.3 Multicast

Traditionally, IP packets are transmitted in one of either two ways - Unicast (1 sender - 1 recipient) or Broadcast (1 sender - everybody on the network). Multicast delivers IP packets to a group of hosts on the network - not everybody and not just 1.

IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. IGMP version 2 (RFC 2236) is an improvement over version 1 (RFC 1112) but IGMP version 1 is still in wide use. If you would like to read more detailed information about interoperability between IGMP version 2 and version 1, please see sections 4 and 5 of RFC 2236. The class D IP address is used to identify host groups and can be in the range 224.0.0.0 to 239.255.255.255. The address 224.0.0.0 is not assigned to any group and is used by IP multicast computers. The address 224.0.0.1 is used for query messages and is assigned to the permanent group of all IP hosts (including gateways). All hosts must join the 224.0.0.1 group in order to participate in IGMP. The address 224.0.0.2 is assigned to the multicast routers group.

The ZyXEL Device supports both IGMP version 1 (**IGMP-v1**) and IGMP version 2 (**IGMP-v2**). At start up, the ZyXEL Device queries all directly connected networks to gather group membership. After that, the ZyXEL Device periodically updates this information. IP multicasting can be enabled/disabled on the ZyXEL Device LAN and/or WAN interfaces in the web configurator (**LAN**; **WAN**). Select **None** to disable IP multicasting on these interfaces.

6.4 Internet Connection

To change your ZyXEL Device's Internet access settings, click **Network** > **WAN**. The screen differs by the encapsulation.

6.4.1 Ethernet Encapsulation

The screen shown next is for **Ethernet** encapsulation.

Figure 52   Ethernet Encapsulation

The following table describes the labels in this screen.

Table 34   Ethernet Encapsulation

LABEL	DESCRIPTION
Encapsulation	You must choose the Ethernet option when the WAN port is used as a regular Ethernet.
Service Type	Choose from **Standard**, **Telstra** (RoadRunner Telstra authentication method), **RR-Manager** (Roadrunner Manager authentication method), **RR-Toshiba** (Roadrunner Toshiba authentication method) or **Telia Login**. The following fields do not appear with the **Standard** service type.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the user name above.
Retype to Confirm	Type your password again to make sure that you have entered is correctly.
Login Server IP Address	Type the authentication server IP address here if your ISP gave you one. This field is not available for **Telia Login**.
Login Server (Telia Login only)	Type the domain name of the Telia login server, for example login1.telia.com.
Relogin Every(min) (Telia Login only)	The Telia server logs the ZyXEL Device out if the ZyXEL Device does not log in periodically. Type the number of minutes from 1 to 59 (30 default) for the ZyXEL Device to wait between logins.
WAN IP Address Assignment	
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
IP Address	Enter your WAN IP address in this field if you selected **Use Fixed IP Address**.
IP Subnet Mask	Enter the **IP Subnet Mask** in this field.
Gateway IP Address	Enter a **Gateway IP Address** (if your ISP gave you one) in this field.
DNS Servers	
First DNS Server Second DNS Server Third DNS Server	Select **From ISP** if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The field to the right displays the (read-only) DNS server IP address that the ISP assigns. Select **User-Defined** if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. If you chose **User-Defined**, but leave the IP address set to 0.0.0.0, **User-Defined** changes to **None** after you click **Apply**. If you set a second choice to **User-Defined**, and enter the same IP address, the second **User-Defined** changes to **None** after you click **Apply**. Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IP address of a computer in order to access it.
WAN MAC Address	The MAC address section allows users to configure the WAN port's MAC address by either using the ZyXEL Device's MAC address, copying the MAC address from a computer on your LAN or manually entering a MAC address.
Factory default	Select **Factory default** to use the factory assigned default MAC Address.
Clone the computer's MAC address	Select **Clone the computer's MAC address - IP Address** and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to the rom file (ZyNOS configuration file). It will not change unless you change the setting or upload a different ROM file.

Table 34   Ethernet Encapsulation

LABEL	DESCRIPTION
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.4.2 PPPoE Encapsulation

The ZyXEL Device supports PPPoE (Point-to-Point Protocol over Ethernet). PPPoE is an IETF standard (RFC 2516) specifying how a personal computer (PC) interacts with a broadband modem (DSL, cable, wireless, etc.) connection. The **PPP over Ethernet** option is for a dial-up connection using PPPoE.

For the service provider, PPPoE offers an access and authentication method that works with existing access control systems (for example Radius).

One of the benefits of PPPoE is the ability to let you access one of multiple network services, a function known as dynamic service selection. This enables the service provider to easily create and offer new IP services for individuals.

Operationally, PPPoE saves significant effort for both you and the ISP or carrier, as it requires no specific configuration of the broadband modem at the customer site.

By implementing PPPoE directly on the ZyXEL Device (rather than individual computers), the computers on the LAN do not need PPPoE software installed, since the ZyXEL Device does that part of the task. Furthermore, with NAT, all of the LANs' computers will have access.

The screen shown next is for **PPPoE** encapsulation.

Figure 53 PPPoE Encapsulation

The following table describes the labels in this screen.

Table 35 PPPoE Encapsulation

LABEL	DESCRIPTION
ISP Parameters for Internet Access	
Encapsulation	The **PPP over Ethernet** choice is for a dial-up connection using PPPoE. The ZyXEL Device supports PPPoE (Point-to-Point Protocol over Ethernet). PPPoE is an IETF Draft standard (RFC 2516) specifying how a personal computer (PC) interacts with a broadband modem (i.e. xDSL, cable, wireless, etc.) connection. Operationally, PPPoE saves significant effort for both the end user and ISP/carrier, as it requires no specific configuration of the broadband modem at the customer site. By implementing PPPoE directly on the router rather than individual computers, the computers on the LAN do not need PPPoE software installed, since the router does that part of the task. Further, with NAT, all of the LAN's computers will have access.
Service Name	Type the PPPoE service name provided to you. PPPoE uses a service name to identify and reach the PPPoE server.

Table 35 PPPoE Encapsulation

LABEL	DESCRIPTION
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the user name above.
Retype to Confirm	Type your password again to make sure that you have entered is correctly.
Nailed-Up Connection	Select **Nailed-Up Connection** if you do not want the connection to time out.
Idle Timeout	This value specifies the time in seconds that elapses before the router automatically disconnects from the PPPoE server.
WAN IP Address Assignment	
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
My WAN IP Address	Enter your WAN IP address in this field if you selected **Use Fixed IP Address**.
Remote IP Address	Enter the remote IP address (if your ISP gave you one) in this field.
Remote IP Subnet Mask	Enter the remote IP subnet mask in this field.
DNS Servers	
First DNS Server Second DNS Server Third DNS Server	Select **From ISP** if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The field to the right displays the (read-only) DNS server IP address that the ISP assigns. Select **User-Defined** if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. If you chose **User-Defined**, but leave the IP address set to 0.0.0.0, **User-Defined** changes to **None** after you click **Apply**. If you set a second choice to **User-Defined**, and enter the same IP address, the second **User-Defined** changes to **None** after you click **Apply**. Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IP address of a computer in order to access it.
WAN MAC Address	The MAC address section allows users to configure the WAN port's MAC address by using the ZyXEL Device's MAC address, copying the MAC address from a computer on your LAN or manually entering a MAC address.
Factory default	Select **Factory default** to use the factory assigned default MAC Address.
Clone the computer's MAC address	Select **Clone the computer's MAC address - IP Address** and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to the rom file (ZyNOS configuration file). It will not change unless you change the setting or upload a different ROM file.
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.4.3 PPTP Encapsulation

Point-to-Point Tunneling Protocol (PPTP) is a network protocol that enables secure transfer of data from a remote client to a private server, creating a Virtual Private Network (VPN) using TCP/IP-based networks.

PPTP supports on-demand, multi-protocol and virtual private networking over public networks, such as the Internet.

The screen shown next is for **PPTP** encapsulation.

Figure 54   PPTP Encapsulation

The following table describes the labels in this screen.

Table 36 PPTP Encapsulation

LABEL	DESCRIPTION
ISP Parameters for Internet Access	
Encapsulation	Point-to-Point Tunneling Protocol (PPTP) is a network protocol that enables secure transfer of data from a remote client to a private server, creating a Virtual Private Network (VPN) using TCP/IP-based networks. PPTP supports on-demand, multi-protocol, and virtual private networking over public networks, such as the Internet. The ZyXEL Device supports only one PPTP server connection at any given time. To configure a PPTP client, you must configure the **User Name** and **Password** fields for a PPP connection and the PPTP parameters for a PPTP connection.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the User Name above.
Retype to Confirm	Type your password again to make sure that you have entered is correctly.
Nailed-up Connection	Select **Nailed-Up Connection** if you do not want the connection to time out.
Idle Timeout	This value specifies the time in seconds that elapses before the ZyXEL Device automatically disconnects from the PPTP server.
PPTP Configuration	
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
My IP Address	Type the (static) IP address assigned to you by your ISP.
My IP Subnet Mask	Your ZyXEL Device will automatically calculate the subnet mask based on the IP address that you assign. Unless you are implementing subnetting, use the subnet mask computed by the ZyXEL Device.
Server IP Address	Type the IP address of the PPTP server.
Connection ID/ Name	Type your identification name for the PPTP server.
WAN IP Address Assignment	
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
My WAN IP Address	Enter your WAN IP address in this field if you selected **Use Fixed IP Address**.
Remote IP Address	Enter the remote IP address (if your ISP gave you one) in this field.
Remote IP Subnet Mask	Enter the remote IP subnet mask in this field.
DNS Servers	

Table 36 PPTP Encapsulation

LABEL	DESCRIPTION
First DNS Server Second DNS Server Third DNS Server	Select **From ISP** if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The field to the right displays the (read-only) DNS server IP address that the ISP assigns.
	Select **User-Defined** if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. If you chose **User-Defined**, but leave the IP address set to 0.0.0.0, **User-Defined** changes to **None** after you click **Apply**. If you set a second choice to **User-Defined**, and enter the same IP address, the second **User-Defined** changes to **None** after you click **Apply**.
	Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IP address of a computer in order to access it.
WAN MAC Address	The MAC address section allows users to configure the WAN port's MAC address by either using the ZyXEL Device's MAC address, copying the MAC address from a computer on your LAN or manually entering a MAC address.
Factory default	Select **Factory default** to use the factory assigned default MAC Address.
Clone the computer's MAC address	Select **Clone the computer's MAC address - IP Address** and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to the rom file (ZyNOS configuration file). It will not change unless you change the setting or upload a different ROM file.
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.5 Advanced WAN Screen

To change your ZyXEL Device's advanced WAN settings, click **Network** > **WAN** > **Advanced**. The screen appears as shown.

Figure 55 WAN > Advanced
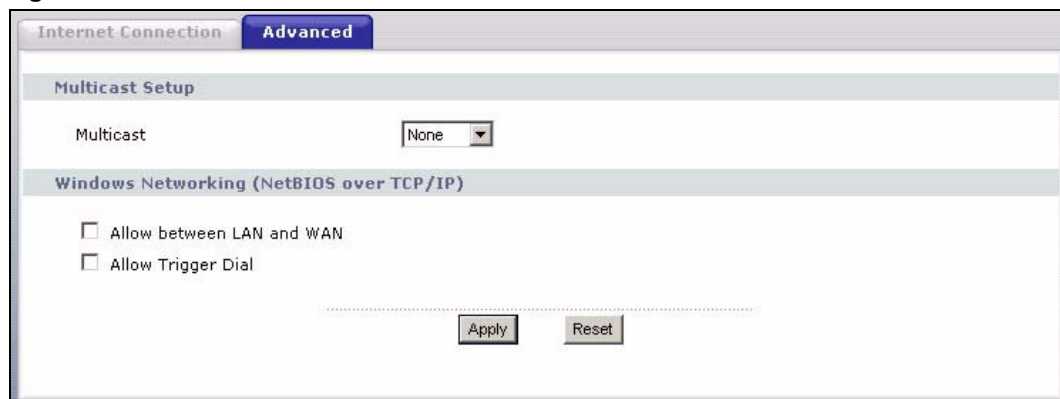
The following table describes the labels in this screen.

Table 37   WAN > Advanced

LABEL	DESCRIPTION
Multicast Setup	
Multicast	Select **IGMP V-1** or **IGMP V-2** or **None**. IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. IGMP version 2 (RFC 2236) is an improvement over version 1 (RFC 1112) but IGMP version 1 is still in wide use. If you would like to read more detailed information about interoperability between IGMP version 2 and version 1, please see sections 4 and 5 of RFC 2236.
Windows Networking (NetBIOS over TCP/IP): NetBIOS (Network Basic Input/Output System) are TCP or UDP broadcast packets that enable a computer to connect to and communicate with a LAN. For some dial-up services such as PPPoE or PPTP, NetBIOS packets cause unwanted calls. However it may sometimes be necessary to allow NetBIOS packets to pass through to the WAN in order to find a computer on the WAN.	
Allow between LAN and WAN	Select this check box to forward NetBIOS packets from the LAN to the WAN and from the WAN to the LAN. If your firewall is enabled with the default policy set to block WAN to LAN traffic, you also need to enable the default WAN to LAN firewall rule that forwards NetBIOS traffic.
	Clear this check box to block all NetBIOS packets going from the LAN to the WAN and from the WAN to the LAN.
Allow Trigger Dial	Select this option to allow NetBIOS packets to initiate calls.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

CHAPTER 7
WiFi WAN

This chapter describes how to configure WiFi WAN settings.

7.1 WiFi WAN Overview

See the chapter about the connection wizard for more information on the fields in the WiFi WAN screens. See the appendices for more detailed information about wireless networks.

7.2 Internet Connection

To change your ZyXEL Device's Internet access settings, click **Network > WiFi WAN**.

Note: You can set the ZyXEL Device to WiFi WAN router mode only when you use Ethernet encapsulation.

Figure 56   WiFi WAN > Internet Connection

The following table describes the labels in this screen.

Table 38   WiFi WAN > Internet Connection

LABEL	DESCRIPTION
Encapsulation	You can use **Ethernet** encapsulation only when the ZyXEL Device is in **WiFi WAN Router** mode.
Service Type	Choose from **Standard**, **Telstra** (RoadRunner Telstra authentication method), **RR-Manager** (Roadrunner Manager authentication method), **RR-Toshiba** (Roadrunner Toshiba authentication method) or **Telia Login**. The following fields do not appear with the **Standard** service type.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the user name above.
Retype to Confirm	Type your password again to make sure that you have entered is correctly.
Login Server IP Address	Type the authentication server IP address here if your ISP gave you one. This field is not available for **Telia Login**.
Login Server (Telia Login only)	Type the domain name of the Telia login server, for example login1.telia.com.

Table 38 WiFi WAN > Internet Connection (continued)

LABEL	DESCRIPTION
Relogin Every(min) (Telia Login only)	The Telia server logs the ZyXEL Device out if the ZyXEL Device does not log in periodically. Type the number of minutes from 1 to 59 (30 default) for the ZyXEL Device to wait between logins.
WAN IP Address Assignment	
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
IP Address	Enter your WAN IP address in this field if you selected **Use Fixed IP Address**.
IP Subnet Mask	Enter the **IP Subnet Mask** in this field.
Gateway IP Address	Enter a **Gateway IP Address** (if your ISP gave you one) in this field.
DNS Servers	
First DNS Server Second DNS Server Third DNS Server	Select **From ISP** if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The field to the right displays the (read-only) DNS server IP address that the ISP assigns.
	Select **User-Defined** if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. If you chose **User-Defined**, but leave the IP address set to 0.0.0.0, **User-Defined** changes to **None** after you click **Apply**. If you set a second choice to **User-Defined**, and enter the same IP address, the second **User-Defined** changes to **None** after you click **Apply**.
	Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IP address of a computer in order to access it.
WAN MAC Address	The MAC address section allows users to configure the WAN port's MAC address by either using the ZyXEL Device's MAC address, copying the MAC address from a computer on your LAN or manually entering a MAC address.
Factory default	Select **Factory default** to use the factory assigned default MAC Address.
Clone the computer's MAC address - IP Address	Select **Clone the computer's MAC address - IP Address** and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to the rom file (ZyNOS configuration file). It will not change unless you change the setting or upload a different ROM file.
Set Wireless WAN MAC Address	Select this option and enter the MAC address you want to use.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

7.3 WiFi Screen

When the ZyXEL Device is set to WiFi WAN router mode, use the **WiFi** screen to connect to a specified wireless network or any available wireless network within range. The ZyXEL Device and the wireless network must use the same wireless and wireless security settings.

Click **Network** > **WiFi WAN > WiFi** to open the **WiFi** screen.

Figure 57 WiFi WAN > WiFi

The following table describes the general wireless LAN labels in this screen.

Table 39 WiFi WAN > WiFi

LABEL	DESCRIPTION
Enable Wireless	Click the check box to activate WiFi WAN.
To associate with any available WiFi network	Select this option to have the ZyXEL Device connect to any available wireless network within range.
User Defined SSID	Select this option to have the ZyXEL Device connect to a wireless network with the SSID you specified in the **Name (SSID)** field.
Name(SSID)	The SSID (Service Set IDentity) identifies the Service Set with which the ZyXEL Device will associate. The ZyXEL Device and the access point (AP) must have the same SSID.
	Enter a descriptive name (up to 32 printable 7-bit ASCII characters) for the wireless network with which the ZyXEL Device will associate. Alternatively, you can double-click an SSID in the text box below to select that network.
Scan	Click this button to have the ZyXEL Device search for available wireless network within transmission range. The SSID and signal strength are then displayed in the text box above.
Security Mode	Use the same security settings as those on the AP with which you want to associate. **Note:** The ZyXEL Device in **WiFi WAN Router** mode supports only WEP encryption, WPA-PSK or WPA2-PSK.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

7.3.1 No Security

If wireless security is not enabled on the access point, select **No Security** to have the ZyXEL Device communicate with the access point without any data encryption.

Figure 58   WiFi: No Security

7.3.2 WEP Encryption

WEP encryption scrambles the data transmitted between the wireless clients and the access points to keep network communications private. It encrypts unicast and multicast communications in a network. Both the ZyXEL Device and the access point must use the same WEP key.

If the access point uses static WEP encryption, select **Static WEP** from the **Security Mode** list.

Your ZyXEL Device allows you to configure up to four 64-bit, 128-bit or 256-bit WEP keys but only one key can be enabled at any one time.

Figure 59 WiFi: Static WEP Encryption
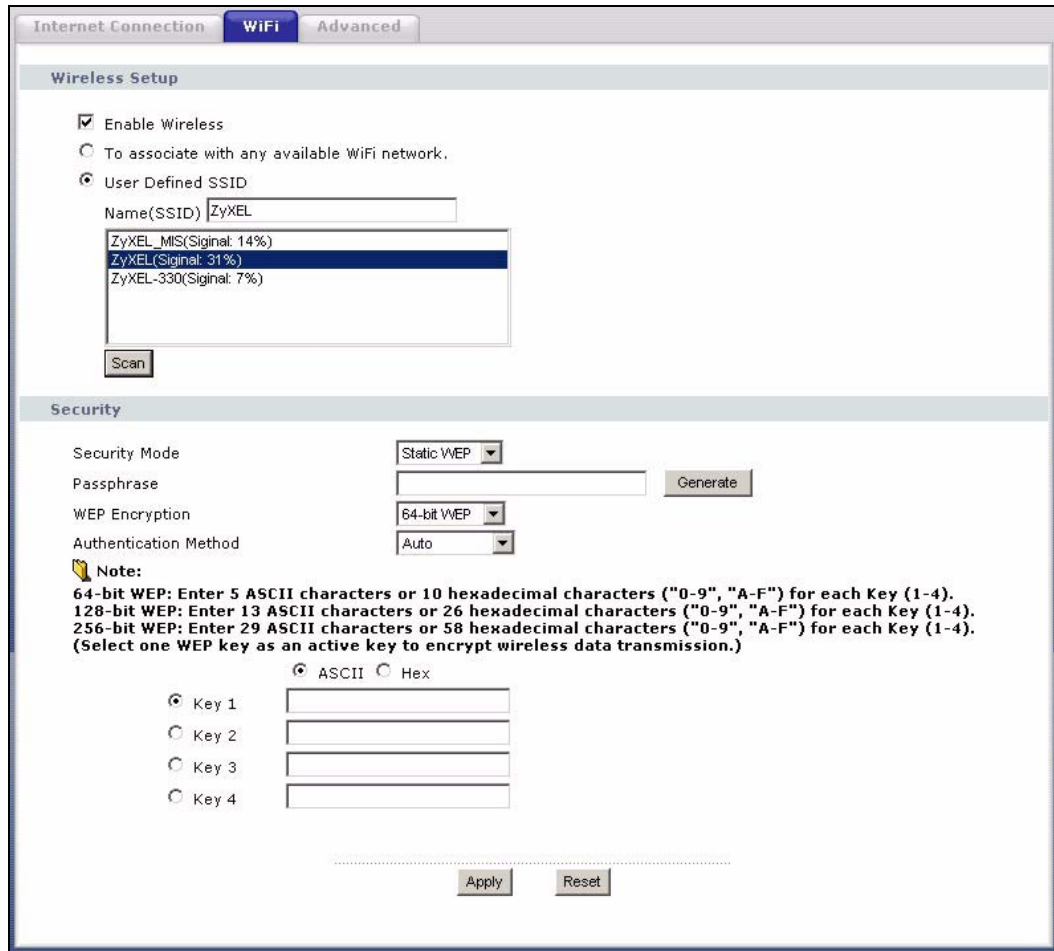
The following table describes the wireless LAN security labels in this screen.

Table 40 WiFi: Static WEP Encryption

LABEL	DESCRIPTION
Passphrase	Enter a passphrase (password phrase) of up to 32 printable characters and click **Generate**. The ZyXEL Device automatically generates four different WEP keys and displays them in the **Key** fields below.
WEP Encryption	Select **64-bit WEP**, **128-bit WEP** or **256-bit WEP** to enable data encryption.
Authentication Method	This field is activated when you select **64-bit WEP**, **128-bit WEP** or **256-bit WEP** in the **WEP Encryption** field. Select **Auto**, **Open System** or **Shared Key** from the drop-down list box.
ASCII	Select this option in order to enter ASCII characters as WEP key.
Hex	Select this option in order to enter hexadecimal characters as a WEP key. The preceding "0x", that identifies a hexadecimal key, is entered automatically.

Table 40   WiFi: Static WEP Encryption

LABEL	DESCRIPTION
Key 1 to Key 4	The WEP keys are used to encrypt data. Both the ZyXEL Device and the access point must use the same WEP key for data transmission.
	If you chose **64-bit WEP**, then enter any 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F").
	If you chose **128-bit WEP**, then enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F").
	If you chose **256-bit WEP**, then enter 29 ASCII characters or 58 hexadecimal characters ("0-9", "A-F").
	You must configure at least one key, only one key can be activated at any one time. The default key is key 1.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

7.3.3 WPA-PSK/WPA2-PSK

If the access point uses WPA-PSK or WPA2-PSK, select **WPA-PSK** or **WPA2-PSK** from the **Security Mode** list.

Figure 60   WiFi: WPA-PSK/WPA2-PSK

The following table describes the labels in this screen.

Table 41   WiFi: WPA-PSK/WPA2-PSK

LABEL	DESCRIPTION
Pre-Shared Key	The encryption mechanisms used for **WPA/WPA2** and **WPA-PSK/WPA2-PSK** are the same. The only difference between the two is that **WPA-PSK/WPA2-PSK** uses a simple common password, instead of user-specific credentials. Type a pre-shared key from 8 to 63 case-sensitive ASCII characters (including spaces and symbols).
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to reload the previous configuration for this screen.

7.4 Advanced WiFi WAN Screen

To change your ZyXEL Device's advanced WiFi WAN settings, click **Network > WiFi WAN > Advanced**. The screen appears as shown.

Figure 61   WiFi WAN > Advanced

The following table describes the labels in this screen.

Table 42   WiFi WAN > Advanced

LABEL	DESCRIPTION
Multicast Setup	
Multicast	Select **IGMP V-1** or **IGMP V-2** or **None**. IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. IGMP version 2 (RFC 2236) is an improvement over version 1 (RFC 1112) but IGMP version 1 is still in wide use. If you would like to read more detailed information about interoperability between IGMP version 2 and version 1, please see sections 4 and 5 of RFC 2236.

Table 42   WiFi WAN > Advanced

LABEL	DESCRIPTION
Windows Networking (NetBIOS over TCP/IP): NetBIOS (Network Basic Input/Output System) are TCP or UDP broadcast packets that enable a computer to connect to and communicate with a LAN. For some dial-up services such as PPPoE or PPTP, NetBIOS packets cause unwanted calls. However it may sometimes be necessary to allow NetBIOS packets to pass through to the WAN in order to find a computer on the WAN.	
Allow between LAN and WAN	Select this check box to forward NetBIOS packets from the LAN to the WAN and from the WAN to the LAN. If your firewall is enabled with the default policy set to block WAN to LAN traffic, you also need to enable the default WAN to LAN firewall rule that forwards NetBIOS traffic. Clear this check box to block all NetBIOS packets going from the LAN to the WAN and from the WAN to the LAN.
Advanced Setup	
RTS/CTS Threshold	Data with its frame size larger than this value will perform the RTS (Request To Send)/CTS (Clear To Send) handshake. If the RTS/CTS value is greater than the **Fragmentation Threshold** value, then the RTS/CTS handshake will never occur as data frames will be fragmented before they reach RTS/CTS size. Enter a value between 0 and 2432.
Fragmentation Threshold	It is the maximum data fragment size that can be sent. Enter a value between 256 and 2432.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

CHAPTER 8
LAN

This chapter describes how to configure LAN settings.

8.1 LAN Overview

Local Area Network (LAN) is a shared communication system to which many computers are attached. The LAN screens can help you configure a LAN DHCP server, manage IP addresses, and partition your physical network into logical networks.

8.1.1 IP Pool Setup

The ZyXEL Device is pre-configured with a pool of 32 IP addresses starting from 192.168.1.33 to 192.168.1.64. This configuration leaves 31 IP addresses (excluding the ZyXEL Device itself) in the lower range for other server computers, for instance, servers for mail, FTP, TFTP, web, etc., that you may have.

8.1.2 System DNS Servers

Refer to the IP address and subnet mask section in the **Connection Wizard** chapter.

8.2 LAN TCP/IP

The ZyXEL Device has built-in DHCP server capability that assigns IP addresses and DNS servers to systems that support DHCP client capability.

8.2.1 Factory LAN Defaults

The LAN parameters of the ZyXEL Device are preset in the factory with the following values:

- IP address of 192.168.1.1 with subnet mask of 255.255.255.0 (24 bits)
- DHCP server enabled with 32 client IP addresses starting from 192.168.1.33.

These parameters should work for the majority of installations. If your ISP gives you explicit DNS server address(es), read the embedded web configurator help regarding what fields need to be configured.

8.2.2 IP Address and Subnet Mask

Refer to the IP address and subnet mask section in the **Connection Wizard** chapter for this information.

8.2.3 Multicast

Traditionally, IP packets are transmitted in one of either two ways - Unicast (1 sender - 1 recipient) or Broadcast (1 sender - everybody on the network). Multicast delivers IP packets to a group of hosts on the network - not everybody and not just 1.

IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. IGMP version 2 (RFC 2236) is an improvement over version 1 (RFC 1112) but IGMP version 1 is still in wide use. If you would like to read more detailed information about interoperability between IGMP version 2 and version 1, please see sections 4 and 5 of RFC 2236. The class D IP address is used to identify host groups and can be in the range 224.0.0.0 to 239.255.255.255. The address 224.0.0.0 is not assigned to any group and is used by IP multicast computers. The address 224.0.0.1 is used for query messages and is assigned to the permanent group of all IP hosts (including gateways). All hosts must join the 224.0.0.1 group in order to participate in IGMP. The address 224.0.0.2 is assigned to the multicast routers group.

The ZyXEL Device supports both IGMP version 1 (**IGMP-v1**) and IGMP version 2 (**IGMP-v2**). At start up, the ZyXEL Device queries all directly connected networks to gather group membership. After that, the ZyXEL Device periodically updates this information. IP multicasting can be enabled/disabled on the ZyXEL Device LAN and/or WAN interfaces in the web configurator (**LAN**; **WAN**). Select **None** to disable IP multicasting on these interfaces.

8.3 LAN IP Screen

Click **Network** > **LAN** to open the **IP** screen.

Figure 62 LAN IP

The following table describes the labels in this screen.

Table 43 LAN IP

LABEL	DESCRIPTION
LAN TCP/IP	
IP Address	Type the IP address of your ZyXEL Device in dotted decimal notation 192.168.1.1 (factory default).
IP Subnet Mask	The subnet mask specifies the network number portion of an IP address. Your ZyXEL Device will automatically calculate the subnet mask based on the IP address that you assign. Unless you are implementing subnetting, use the subnet mask computed by the ZyXEL Device 255.255.255.0.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

8.4 LAN IP Alias

IP alias allows you to partition a physical network into different logical networks over the same Ethernet interface. The ZyXEL Device supports three logical LAN interfaces via its single physical Ethernet interface with the ZyXEL Device itself as the gateway for each LAN network.

To change your ZyXEL Device's IP alias settings, click **Network** > **LAN** > **IP Alias**. The screen appears as shown.

Figure 63   LAN IP Alias

The following table describes the labels in this screen.

Table 44   LAN IP Alias

LABEL	DESCRIPTION
IP Alias 1,2	Select the check box to configure another LAN network for the ZyXEL Device.
IP Address	Enter the IP address of your ZyXEL Device in dotted decimal notation.
IP Subnet Mask	Your ZyXEL Device will automatically calculate the subnet mask based on the IP address that you assign. Unless you are implementing subnetting, use the subnet mask computed by the ZyXEL Device.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

8.5 Advanced LAN Screen

To change your ZyXEL Device's advanced IP settings, click **Network** > **LAN** > **Advanced**. The screen appears as shown.

Figure 64   Advanced LAN
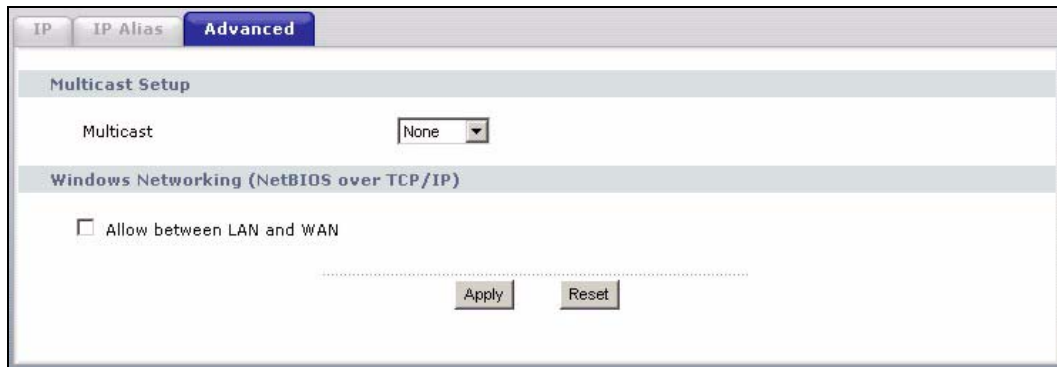
The following table describes the labels in this screen.

Table 45   Advanced LAN

LABEL	DESCRIPTION
Multicast	Select **IGMP V-1** or **IGMP V-2** or **None**. IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. IGMP version 2 (RFC 2236) is an improvement over version 1 (RFC 1112) but IGMP version 1 is still in wide use. If you would like to read more detailed information about interoperability between IGMP version 2 and version 1, please see sections 4 and 5 of RFC 2236.
Windows Networking (NetBIOS over TCP/IP): NetBIOS (Network Basic Input/Output System) are TCP or UDP broadcast packets that enable a computer to connect to and communicate with a LAN. For some dial-up services such as PPPoE or PPTP, NetBIOS packets cause unwanted calls. However it may sometimes be necessary to allow NetBIOS packets to pass through to the WAN in order to find a computer on the WAN.	

Table 45 Advanced LAN

LABEL	DESCRIPTION
Allow between LAN and WAN	Select this check box to forward NetBIOS packets from the LAN to the WAN and from the WAN to the LAN. If your firewall is enabled with the default policy set to block WAN to LAN traffic, you also need to enable the default WAN to LAN firewall rule that forwards NetBIOS traffic. Clear this check box to block all NetBIOS packets going from the LAN to the WAN and from the WAN to the LAN.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

CHAPTER 9
DHCP Server

9.1 DHCP

DHCP (Dynamic Host Configuration Protocol, RFC 2131 and RFC 2132) allows individual clients to obtain TCP/IP configuration at start-up from a server. You can configure the ZyXEL Device as a DHCP server or disable it. When configured as a server, the ZyXEL Device provides the TCP/IP configuration for the clients. If DHCP service is disabled, you must have another DHCP server on your LAN, or else the computer must be manually configured.

9.2 DHCP Server General Screen

Click **Network** > **DHCP Server**. The following screen displays.

Figure 65   DHCP Server General

The following table describes the labels in this screen.

Table 46   DHCP Server General

LABEL	DESCRIPTION
Enable DHCP Server	DHCP (Dynamic Host Configuration Protocol, RFC 2131 and RFC 2132) allows individual clients (computers) to obtain TCP/IP configuration at startup from a server. Leave the **Enable DHCP Server** check box selected unless your ISP instructs you to do otherwise. Clear it to disable the ZyXEL Device acting as a DHCP server. When configured as a server, the ZyXEL Device provides TCP/IP configuration for the clients. If not, DHCP service is disabled and you must have another DHCP server on your LAN, or else the computers must be manually configured. When set as a server, fill in the following four fields.
IP Pool Starting Address	This field specifies the first of the contiguous addresses in the IP address pool.
Pool Size	This field specifies the size, or count of the IP address pool.

Table 46 DHCP Server General

LABEL	DESCRIPTION
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

9.3 DHCP Server Advanced Screen

This screen allows you to assign IP addresses on the LAN to specific individual computers based on their MAC addresses. You can also use this screen to configure the DNS server information that the ZyXEL Device sends to the DHCP clients.

Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02.

To change your ZyXEL Device's static DHCP settings, click **Network** > **DHCP Server** > **Advanced**. The following screen displays.

Figure 66   DHCP Server Advanced

The following table describes the labels in this screen.

Table 47   DHCP Server Advanced

LABEL	DESCRIPTION
#	This is the index number of the static IP table entry (row).
MAC Address	Type the MAC address (with colons) of a computer on your LAN.
IP Address	Type the LAN IP address of a computer on your LAN.
DNS Servers Assigned by DHCP Server The ZyXEL Device passes a DNS (Domain Name System) server IP address (in the order you specify here) to the DHCP clients. The ZyXEL Device only passes this information to the LAN DHCP clients when you select the **Enable DHCP Server** check box. When you clear the **Enable DHCP Server** check box, DHCP service is disabled and you must have another DHCP sever on your LAN, or else the computers must have their DNS server addresses manually configured.	
First DNS Server Second DNS Server Third DNS Server	Select **From ISP** if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The field to the right displays the (read-only) DNS server IP address that the ISP assigns. Select **User-Defined** if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. If you chose **User-Defined**, but leave the IP address set to 0.0.0.0, **User-Defined** changes to **None** after you click **Apply**. If you set a second choice to **User-Defined**, and enter the same IP address, the second **User-Defined** changes to **None** after you click **Apply**. Select **DNS Relay** to have the ZyXEL Device act as a DNS proxy. The ZyXEL Device's LAN IP address displays in the field to the right (read-only). The ZyXEL Device tells the DHCP clients on the LAN that the ZyXEL Device itself is the DNS server. When a computer on the LAN sends a DNS query to the ZyXEL Device, the ZyXEL Device forwards the query to the ZyXEL Device's system DNS server (configured in the **WAN > Internet Connection** screen) and relays the response back to the computer. You can only select **DNS Relay** for one of the three servers; if you select **DNS Relay** for a second or third DNS server, that choice changes to **None** after you click **Apply**. Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IP address of a computer in order to access it.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

9.4 Client List Screen

The DHCP table shows current DHCP client information (including **IP Address**, **Host Name** and **MAC Address**) of all network clients using the ZyXEL Device's DHCP server.

Configure this screen to always assign an IP address to a MAC address (and host name). Click **Network** > **DHCP Server** > **Client List**.

Note: You can also view a read-only client list by clicking the **DHCP Table (Details...)** hyperlink in the **Status** screen.

The following screen displays.

Figure 67 Client List

The following table describes the labels in this screen.

Table 48 Client List

LABEL	DESCRIPTION
#	This is the index number of the host computer.
IP Address	This field displays the IP address relative to the # field listed above.
Host Name	This field displays the computer host name.
MAC Address	The MAC (Media Access Control) or Ethernet address on a LAN (Local Area Network) is unique to your computer (six pairs of hexadecimal notation). A network interface card such as an Ethernet adapter has a hardwired address that is assigned at the factory. This address follows an industry standard that ensures no other adapter has a similar address.
Reserve	Select this check box to have the ZyXEL Device always assign this IP address to this MAC address (and host name). After you click **Apply**, the MAC address and IP address also display in the **Advanced** screen (where you can edit them).
Refresh	Click **Refresh** to reload the DHCP table.

C H A P T E R **10**

Network Address Translation (NAT)

This chapter discusses how to configure NAT on the ZyXEL Device.

10.1 NAT Overview

NAT (Network Address Translation - NAT, RFC 1631) is the translation of the IP address of a host in a packet. For example, the source address of an outgoing packet, used within one network is changed to a different IP address known within another network.

10.2 Using NAT

Note: You must create a firewall rule in addition to setting up NAT, to allow traffic from the WAN to be forwarded through the ZyXEL Device.

10.2.1 Port Forwarding: Services and Port Numbers

A port forwarding set is a list of inside (behind NAT on the LAN) servers, for example, web or FTP, that you can make accessible to the outside world even though NAT makes your whole inside network appear as a single machine to the outside world.

Use the **Application** screen to forward incoming service requests to the server(s) on your local network. You may enter a single port number or a range of port numbers to be forwarded, and the local IP address of the desired server. The port number identifies a service; for example, web service is on port 80 and FTP on port 21. In some cases, such as for unknown services or where one server can support more than one service (for example both FTP and web service), it might be better to specify a range of port numbers.

In addition to the servers for specified services, NAT supports a default server. A service request that does not have a server explicitly designated for it is forwarded to the default server. If the default is not defined, the service request is simply discarded.

Note: Many residential broadband ISP accounts do not allow you to run any server processes (such as a Web or FTP server) from your location. Your ISP may periodically check for servers and may suspend your account if it discovers any active services at your location. If you are unsure, refer to your ISP.

10.2.2 Configuring Servers Behind Port Forwarding (Example)

Let's say you want to assign ports 21-25 to one FTP, Telnet and SMTP server (**A** in the example), port 80 to another (**B** in the example) and assign a default server IP address of 192.168.1.35 to a third (**C** in the example). You assign the LAN IP addresses and the ISP assigns the WAN IP address. The NAT network appears as a single host on the Internet

Figure 68   Multiple Servers Behind NAT Example
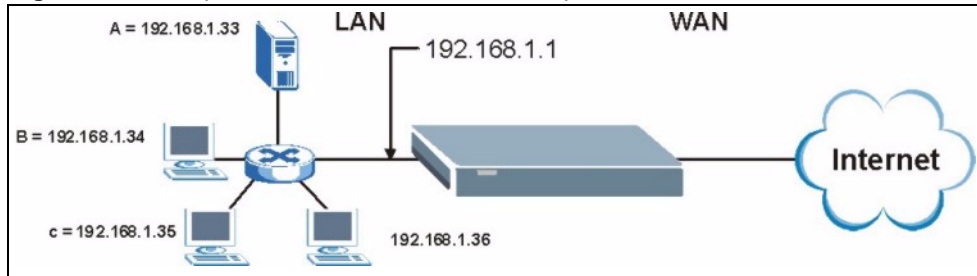
10.3 General NAT Screen

Click **Network > NAT** to open the **General** screen.

Figure 69   NAT General
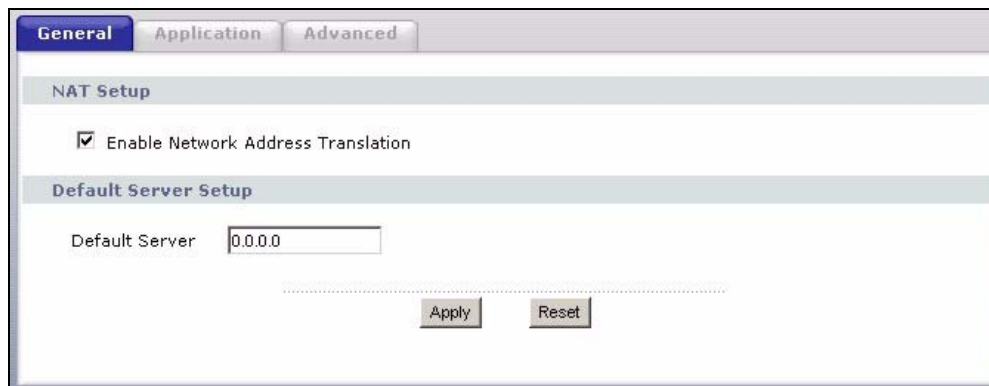
The following table describes the labels in this screen.

Table 49   NAT General

LABEL	DESCRIPTION
Network Address Translation	Network Address Translation (NAT) allows the translation of an Internet protocol address used within one network (for example a private IP address used in a local network) to a different IP address known within another network (for example a public IP address used on the Internet).
	Select the check box to enable NAT.
Default Server	In addition to the servers for specified services, NAT supports a default server. A default server receives packets from ports that are not specified in the **Application** screen.
	If you do not assign a **Default Server** IP address, the ZyXEL Device discards all packets received for ports that are not specified in the **Application** screen or remote management.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

10.4 NAT Application Screen

Port forwarding allows you to define the local servers to which the incoming services will be forwarded. To change your ZyXEL Device's port forwarding settings, click **Network > NAT > Application**. The screen appears as shown.

Note: If you do not assign a **Default Server** IP address in the **NAT > General** screen, the ZyXEL Device discards all packets received for ports that are not specified in this screen or remote management.

Refer to for port numbers commonly used for particular services.

Figure 70 NAT Application
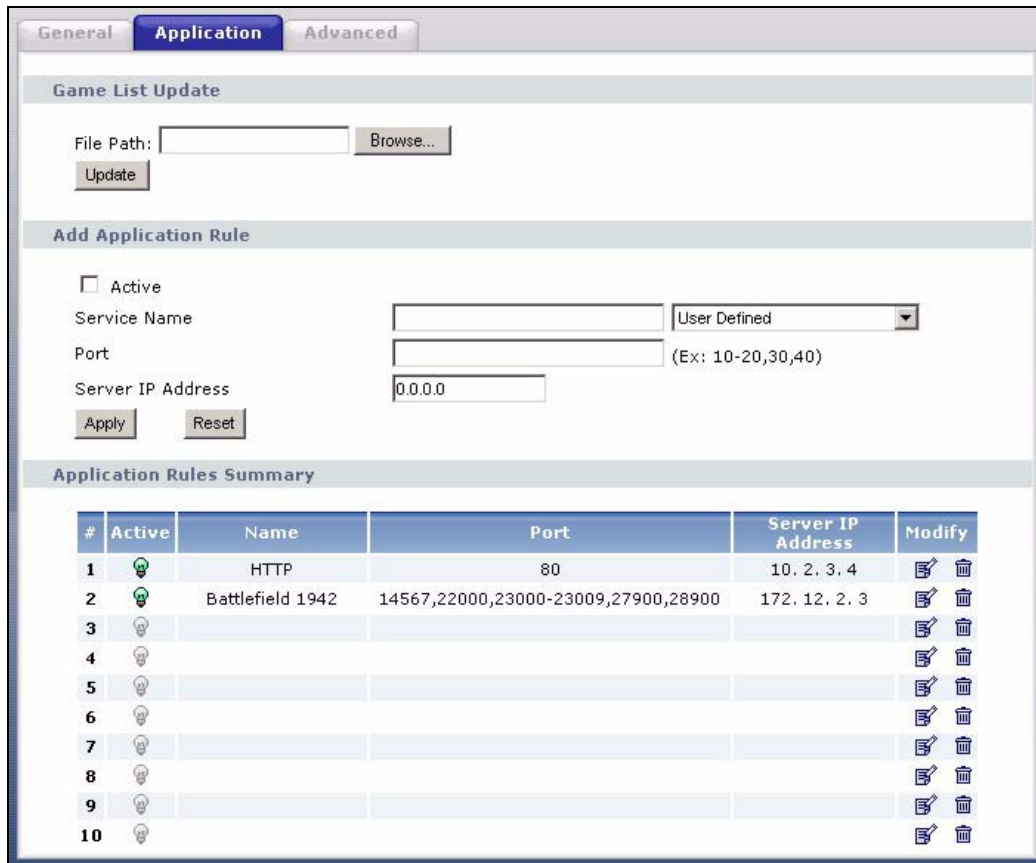
The following table describes the labels in this screen.

Table 50 NAT Application

LABEL	DESCRIPTION
Game List Update	A game list includes the pre-defined service name(s) and port number(s). You can edit and upload it to the ZyXEL Device to replace the existing entries in the second field next to **Service Name**.
File Path	Type in the location of the file you want to upload in this field or click **Browse...** to find it.
Browse...	Click **Browse...** to find the.txt file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.
Update	Click **Update** to begin the upload process. This process may take up to two minutes.
Add Application Rule	
Active	Select the check box to enable this rule and the requested service can be forwarded to the host with a specified internal IP address. Clear the checkbox to disallow forwarding of these ports to an inside server without having to delete the entry.

Table 50 NAT Application (continued)

LABEL	DESCRIPTION
Service Name	Type a name (of up to 31 printable characters) to identify this rule in the first field next to **Service Name**. Otherwise, select a predefined service in the second field next to **Service Name**. The predefined service name and port number(s) will display in the **Service Name** and **Port** fields.
Port	Type a port number(s) to be forwarded. To specify a range of ports, enter a hyphen (-) between the first port and the last port, such as 10-20. To specify two or more non-consecutive port numbers, separate them by a comma without spaces, such as 123,567.
Server IP Address	Type the inside IP address of the server that receives packets from the port(s) specified in the **Port** field.
Apply	Click **Apply** to save your changes to the **Application Rules Summary** table.
Reset	Click **Reset** to not save and return your new changes in the **Service Name** and **Port** fields to the previous one.
Application Rules Summary	
#	This is the number of an individual port forwarding server entry.
Active	This icon is turned on when the rule is enabled.
Name	This field displays a name to identify this rule.
Port	This field displays the port number(s).
Server IP Address	This field displays the inside IP address of the server.
Modify	Click the **Edit** icon to display and modify an existing rule setting in the fields under **Add Application Rule**. Click the **Remove** icon to delete a rule.

10.4.1 Game List Example

Here is an example game list text file. The index number, service name and associated port(s) are specified by semi-colons (no spaces). Use the name=xxx (where xxx is the service name) to create a new service. Port range can be separated with a hyphen (-) (no spaces). Multiple (non-consecutive) ports can be separated by commas.

Figure 71   Game List Example

```
version=1
1;name=Battlefield 1942;port=14567,22000,23000-23009,27900,28900
2;name=Call of Duty;port=28960
3;name=Civilization IV;port=2056
4;name=Diablo I and II;port=6112-6119,4000
5;name=Doom 3;port=27666
6;name=F.E.A.R;port=27888
7;name=Final Fantasy XI;port=25,80,110,443,50000-65535
8;name=Guild Wars;port=6112,80
9;name=Half Life;port=6003,7002,27005,27010,27011,27015
10;name=Jedi Knight III: Jedi Academy;port=28060-28062,28070-28081
11;name=Need for Speed: Hot Pursuit 2;port=1230,8511-
8512,27900,28900,61200-61230
12;name=Neverwinter Nights;port=5120-5300,6500,27900,28900
13;name=Quake 2;port=27910
14;name=Quake 3;port=27660,27960
15;name=Rainbow Six 3: Raven Shield;port=7777-7787,8777-8787
16;name=Serious Sam II;port=25600-25605
17;name=Silent Hunter III;port=17997-18003
18;name=Soldier of Fortune II;port=20100-20112
19;name=Starcraft;port=6112-6119,4000
20;name=Star Trek: Elite Force II;port=29250,29256
21;name=SWAT 4;port=10480-10483
22;name=Warcraft II and III;port=6112-6119,4000
23;name=World of Warcraft;port=3724
```

10.5 Trigger Port Forwarding

Some services use a dedicated range of ports on the client side and a dedicated range of ports on the server side. With regular port forwarding you set a forwarding port in NAT to forward a service (coming in from the server on the WAN) to the IP address of a computer on the client side (LAN). The problem is that port forwarding only forwards a service to a single LAN IP address. In order to use the same service on a different LAN computer, you have to manually replace the LAN computer's IP address in the forwarding port with another LAN computer's IP address.

Trigger port forwarding solves this problem by allowing computers on the LAN to dynamically take turns using the service. The ZyXEL Device records the IP address of a LAN computer that sends traffic to the WAN to request a service with a specific port number and protocol (a "trigger" port). When the ZyXEL Device's WAN port receives a response with a specific port number and protocol ("incoming" port), the ZyXEL Device forwards the traffic to the LAN IP address of the computer that sent the request. After that computer's connection for that service closes, another computer on the LAN can use the service in the same manner. This way you do not need to configure a new IP address each time you want a different LAN computer to use the application.

10.5.1 Trigger Port Forwarding Example

The following is an example of trigger port forwarding.

Figure 72   Trigger Port Forwarding Process: Example
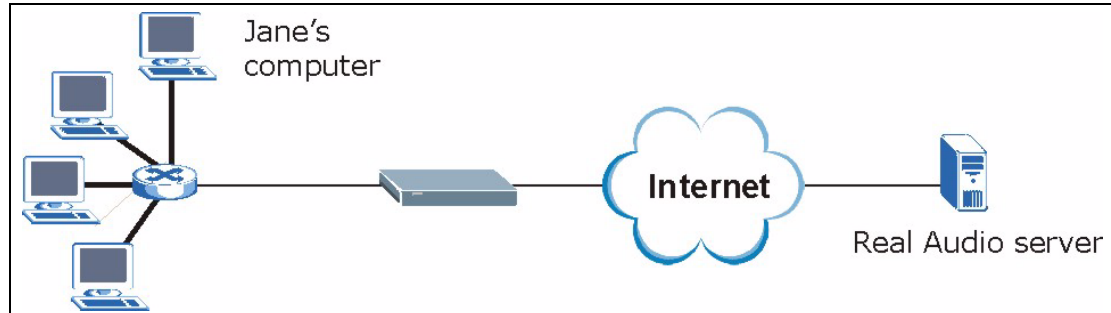
1 Jane requests a file from the Real Audio server (port 7070).

2 Port 7070 is a "trigger" port and causes the ZyXEL Device to record Jane's computer IP address. The ZyXEL Device associates Jane's computer IP address with the "incoming" port range of 6970-7170.

3 The Real Audio server responds using a port number ranging between 6970-7170.

4 The ZyXEL Device forwards the traffic to Jane's computer IP address.

5 Only Jane can connect to the Real Audio server until the connection is closed or times out. The ZyXEL Device times out in three minutes with UDP (User Datagram Protocol), or two hours with TCP/IP (Transfer Control Protocol/Internet Protocol).

10.5.2 Two Points To Remember About Trigger Ports

1 Trigger events only happen on data that is going coming from inside the ZyXEL Device and going to the outside.

2 If an application needs a continuous data stream, that port (range) will be tied up so that another computer on the LAN can't trigger it.

10.6 NAT Advanced Screen

To change your ZyXEL Device's trigger port settings, click **Network > NAT** > **Advanced**. The screen appears as shown.

Note: Only one LAN computer can use a trigger port (range) at a time.

Figure 73 NAT Advanced

The following table describes the labels in this screen.

Table 51 NAT Advanced

LABEL	DESCRIPTION
Max NAT/Firewall Session Per User	Type a number ranging from 1 to 2048 to limit the number of NAT/firewall sessions that a host can create.
	When computers use peer to peer applications, such as file sharing applications, they may use a large number of NAT sessions. If you do not limit the number of NAT sessions a single client can establish, this can result in all of the available NAT sessions being used. In this case, no additional NAT sessions can be established, and users may not be able to access the Internet.
	Each NAT session establishes a corresponding firewall session. Use this field to limit the number of NAT/firewall sessions each client computer can establish through the ZyXEL Device.
	If your network has a small number of clients using peer to peer applications, you can raise this number to ensure that their performance is not degraded by the number of NAT sessions they can establish. If your network has a large number of users using peer to peer applications, you can lower this number to ensure no single client is using all of the available NAT sessions.
#	This is the rule index number (read-only).
Name	Type a unique name (up to 15 characters) for identification purposes. All characters are permitted - including spaces.

Table 51 NAT Advanced

LABEL	DESCRIPTION
Incoming	Incoming is a port (or a range of ports) that a server on the WAN uses when it sends out a particular service. The ZyXEL Device forwards the traffic with this port (or range of ports) to the client computer on the LAN that requested the service.
Start Port	Type a port number or the starting port number in a range of port numbers.
End Port	Type a port number or the ending port number in a range of port numbers.
Trigger	The trigger port is a port (or a range of ports) that causes (or triggers) the ZyXEL Device to record the IP address of the LAN computer that sent the traffic to a server on the WAN.
Start Port	Type a port number or the starting port number in a range of port numbers.
End Port	Type a port number or the ending port number in a range of port numbers.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

Chapter 10 Network Address Translation (NAT)

CHAPTER 11
Dynamic DNS

11.1 Dynamic DNS Introduction

Dynamic DNS allows you to update your current dynamic IP address with one or many dynamic DNS services so that anyone can contact you (in NetMeeting, CU-SeeMe, etc.). You can also access your FTP server or Web site on your own computer using a domain name (for instance myhost.dhs.org, where myhost is a name of your choice) that will never change instead of using an IP address that changes each time you reconnect. Your friends or relatives will always be able to call you even if they don't know your IP address.

First of all, you need to have registered a dynamic DNS account with www.dyndns.org. This is for people with a dynamic IP from their ISP or DHCP server that would still like to have a domain name. The Dynamic DNS service provider will give you a password or key.

11.1.1 DynDNS Wildcard

Enabling the wildcard feature for your host causes *.yourhost.dyndns.org to be aliased to the same IP address as yourhost.dyndns.org. This feature is useful if you want to be able to use, for example, www.yourhost.dyndns.org and still reach your hostname.

Note: If you have a private WAN IP address, then you cannot use Dynamic DNS.

11.2 Dynamic DNS Screen

To change your ZyXEL Device's DDNS, click **Network > DDNS**. The screen appears as shown.

Figure 74   Dynamic DNS

The following table describes the labels in this screen.

Table 52   Dynamic DNS

LABEL	DESCRIPTION
Enable Dynamic DNS	Select this check box to use dynamic DNS.
Service Provider	Select the name of your Dynamic DNS service provider.
Dynamic DNS Type	Select the type of service that you are registered for from your Dynamic DNS service provider.
Host Name	Enter a host names in the field provided. You can specify up to two host names in the field separated by a comma (",").
User Name	Enter your user name.
Password	Enter the password assigned to you.
Enable Wildcard Option	Select the check box to enable DynDNS Wildcard.
Enable off line option	This option is available when **CustomDNS** is selected in the **DDNS Type** field. Check with your Dynamic DNS service provider to have traffic redirected to a URL (that you can specify) while you are off line.
IP Address Update Policy:	
Use WAN IP Address	Select this option to update the IP address of the host name(s) to the WAN IP address.
Dynamic DNS server auto detect IP Address	Select this option to update the IP address of the host name(s) automatically by the DDNS server. It is recommended that you select this option.
Use specified IP Address	Type the IP address of the host name(s). Use this if you have a static IP address.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

CHAPTER 12
Firewall

This chapter gives some background information on firewalls and explains how to get started with the ZyXEL Device firewall.

12.1 Introduction to Firewall

12.1.1 What is a Firewall?

Originally, the term *firewall* referred to a construction technique designed to prevent the spread of fire from one room to another. The networking term "firewall" is a system or group of systems that enforces an access-control policy between two networks. It may also be defined as a mechanism used to protect a trusted network from an untrusted network. Of course, firewalls cannot solve every security problem. A firewall is one of the mechanisms used to establish a network security perimeter in support of a network security policy. It should never be the only mechanism or method employed. For a firewall to guard effectively, you must design and deploy it appropriately. This requires integrating the firewall into a broad information-security policy. In addition, specific policies must be implemented within the firewall itself.

12.1.2 Stateful Inspection Firewall

Stateful inspection firewalls restrict access by screening data packets against defined access rules. They make access control decisions based on IP address and protocol. They also "inspect" the session data to assure the integrity of the connection and to adapt to dynamic protocols. These firewalls generally provide the best speed and transparency; however, they may lack the granular application level access control or caching that some proxies support. Firewalls, of one type or another, have become an integral part of standard security solutions for enterprises.

12.1.3 About the ZyXEL Device Firewall

The ZyXEL Device firewall is a stateful inspection firewall and is designed to protect against Denial of Service attacks when activated (click the **General** tab under **Firewall** and then click the **Enable Firewall** check box). The ZyXEL Device's purpose is to allow a private Local Area Network (LAN) to be securely connected to the Internet. The ZyXEL Device can be used to prevent theft, destruction and modification of data, as well as log events, which may be important to the security of your network.

The ZyXEL Device is installed between the LAN and a broadband modem connecting to the Internet. This allows it to act as a secure gateway for all data passing between the Internet and the LAN.

The ZyXEL Device has one Ethernet WAN port and four Ethernet LAN ports, which are used to physically separate the network into two areas.The WAN (Wide Area Network) port attaches to the broadband (cable or DSL) modem to the Internet.

The LAN (Local Area Network) port attaches to a network of computers, which needs security from the outside world. These computers will have access to Internet services such as e-mail, FTP and the World Wide Web. However, "inbound access" is not allowed (by default) unless the remote host is authorized to use a specific service.

12.1.4 Guidelines For Enhancing Security With Your Firewall

1 Change the default password via web configurator.

2 Think about access control before you connect to the network in any way, including attaching a modem to the port.

3 Limit who can access your router.

4 Don't enable any local service (such as SNMP or NTP) that you don't use. Any enabled service could present a potential security risk. A determined hacker might be able to find creative ways to misuse the enabled services to access the firewall or the network.

5 For local services that are enabled, protect against misuse. Protect by configuring the services to communicate only with specific peers, and protect by configuring rules to block packets for the services at specific interfaces.

6 Protect against IP spoofing by making sure the firewall is active.

7 Keep the firewall in a secured (locked) room.

12.2 Triangle Routes

If an alternate gateway on the LAN has an IP address in the same subnet as the ZyXEL Device's LAN IP address, return traffic may not go through the ZyXEL Device. This is called an asymmetrical or "triangle" route. This causes the ZyXEL Device to reset the connection, as the connection has not been acknowledged.

You can have the ZyXEL Device permit the use of asymmetrical route topology on the network (not reset the connection).

Allowing asymmetrical routes may let traffic from the WAN go directly to the LAN without passing through the ZyXEL Device. A better solution is to use IP alias to put the ZyXEL Device and the backup gateway on separate subnets.

12.2.1 Triangle Routes and IP Alias

You can use IP alias instead of allowing triangle routes. IP Alias allow you to partition your network into logical sections over the same interface.

By putting your LAN and Gateway **A** in different subnets, all returning network traffic must pass through the ZyXEL Device to your LAN. The following steps describe such a scenario.

1 A computer on the LAN initiates a connection by sending a SYN packet to a receiving server on the WAN.

2 The ZyXEL Device reroutes the packet to Gateway **A**, which is in **Subnet 2**.

3 The reply from the WAN goes to the ZyXEL Device.

4 The ZyXEL Device then sends it to the computer on the LAN in **Subnet 1**.

Figure 75 Using IP Alias to Solve the Triangle Route Problem
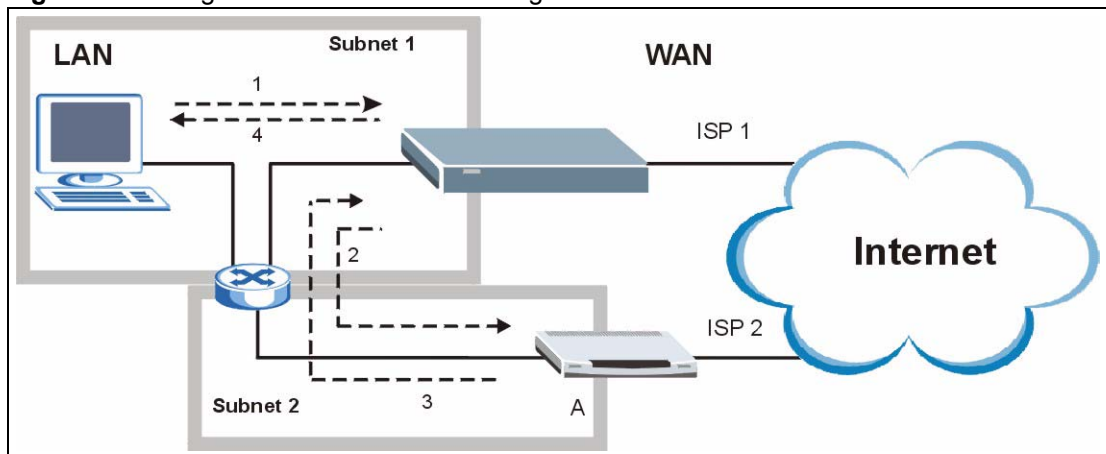
12.3 General Firewall Screen

Click **Security** > **Firewall** to open the **General** screen.

Figure 76 General
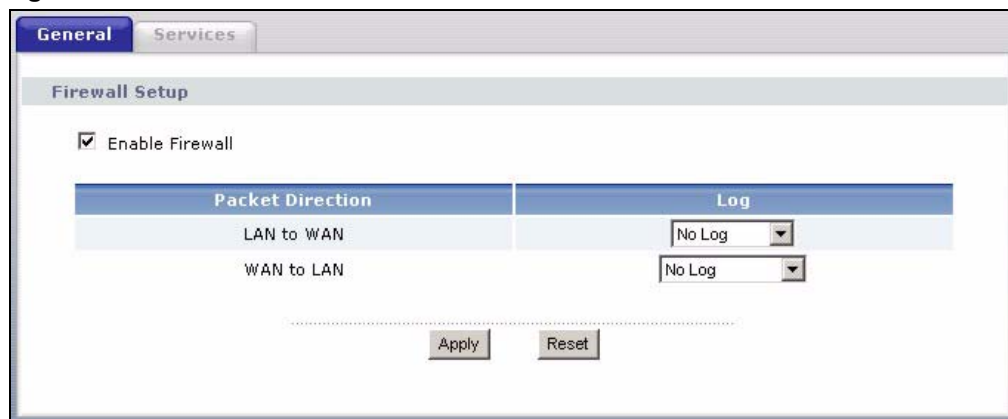
The following table describes the labels in this screen.

Table 53 Firewall General

LABEL	DESCRIPTION
Enable Firewall	Select this check box to activate the firewall. The ZyXEL Device performs access control and protects against Denial of Service (DoS) attacks when the firewall is activated.
Packet Direction	This is the direction of travel of packets.
	Firewall rules are grouped based on the direction of travel of packets to which they apply.
Log	Select whether to create a log for packets that are traveling in the selected direction when the packets are blocked or forwarded.
	To log packets related to firewall rules, make sure that **Access Control** under **Log** is selected in the **Logs** > **Log Settings** screen.
Apply	Click **Apply** to save the settings.
Reset	Click **Reset** to start configuring this screen again.

12.4 Services Screen

Click **Security** > **Firewall** > **Services**. The screen appears as shown next.

If an outside user attempts to probe an unsupported port on your ZyXEL Device, an ICMP response packet is automatically returned. This allows the outside user to know the ZyXEL Device exists. Use this screen to prevent the ICMP response packet from being sent. This keeps outsiders from discovering your ZyXEL Device when unsupported ports are probed.

You can also use this screen to enable service blocking, enter/delete/modify the services you want to block and the date/time you want to block them.

Figure 77 Firewall Services

The following table describes the labels in this screen.

Table 54 Firewall Services

LABEL	DESCRIPTION
ICMP	Internet Control Message Protocol is a message control and error-reporting protocol between a host server and a gateway to the Internet. ICMP uses Internet Protocol (IP) datagrams, but the messages are processed by the TCP/IP software and directly apparent to the application user.
Respond to Ping on	The ZyXEL Device will not respond to any incoming Ping requests when **Disable** is selected. Select **LAN** to reply to incoming LAN Ping requests. Select **WAN** to reply to incoming WAN Ping requests. Otherwise select **LAN & WAN** to reply to both incoming LAN and WAN Ping requests.

Table 54 Firewall Services

LABEL	DESCRIPTION
Do not respond to requests for unauthorized services	Select this option to prevent hackers from finding the ZyXEL Device by probing for unused ports. If you select this option, the ZyXEL Device will not respond to port request(s) for unused ports, thus leaving the unused ports and the ZyXEL Device unseen. By default this option is not selected and the ZyXEL Device will reply with an ICMP Port Unreachable packet for a port probe on its unused UDP ports, and a TCP Reset packet for a port probe on its unused TCP ports.
	Note that the probing packets must first traverse the ZyXEL Device's firewall mechanism before reaching this anti-probing mechanism. Therefore if the firewall mechanism blocks a probing packet, the ZyXEL Device reacts based on the firewall policy, which by default, is to send a TCP reset packet for a blocked TCP packet. You can use the command "sys firewall tcprst rst [on|off]" to change this policy. When the firewall mechanism blocks a UDP packet, it drops the packet without sending a response packet.
Enable Services Blocking	Select this check box to enable this feature.
Available Services	This is a list of pre-defined services (ports) you may prohibit your LAN computers from using. Select the port you want to block using the drop-down list and click **Add** to add the port to the **Blocked Services** field.
Blocked Services	This is a list of services (ports) that will be inaccessible to computers on your LAN once you enable service blocking.
Custom Port	A custom port is a service that is not available in the pre-defined **Available Services** list and you must define using the next two fields.
Type	Choose the IP port (**TCP** or **UDP**) that defines your customized port from the drop down list box.
Port Number	Enter the port number range that defines the service. For example, if you want to define the Gnutella service, then select **TCP** type and enter a port range from 6345 to 6349.
Add	Select a service from the **Available Services** drop-down list and then click **Add** to add a service to the **Blocked Services**
Delete	Select a service from the **Blocked Services** list and then click **Delete** to remove this service from the list.
Clear All	Click **Clear All** to empty the **Blocked Services**.
Day to Block:	Select a check box to configure which days of the week (or everyday) you want service blocking to be active.
Time of Day to Block (24-Hour Format)	Select the time of day you want service blocking to take effect. Configure blocking to take effect all day by selecting **All Day**. You can also configure specific times by selecting **From** and entering the start time in the **Start (hour)** and **Start (min)** fields and the end time in the **End (hour)** and **End (min)** fields. Enter times in 24-hour format, for example, "3:00pm" should be entered as "15:00".
Bypass Triangle Route	Select this check box to have the ZyXEL Device firewall ignore the use of triangle route topology on the network.
Max NAT/Firewall Session Per User	Type a number ranging from 1 to 2048 to limit the number of NAT/firewall sessions that a host can create.
Apply	Click **Apply** to save the settings.
Reset	Click **Reset** to start configuring this screen again.

CHAPTER 13
Content Filtering

This chapter provides a brief overview of content filtering using the embedded web GUI.

13.1 Introduction to Content Filtering

Internet content filtering allows you to create and enforce Internet access policies tailored to their needs. Content filtering is the ability to block certain web features or specific URL keywords.

13.2 Restrict Web Features

The ZyXEL Device can block web features such as ActiveX controls, Java applets, cookies and disable web proxies.

13.3 Days and Times

The ZyXEL Device also allows you to define time periods and days during which the ZyXEL Device performs content filtering.

13.4 Filter Screen

Click **Security** > **Content Filter** to open the **Filter** screen.

Figure 78 Content Filter: Filter

The following table describes the labels in this screen.

Table 55 Content Filter: Filter

LABEL	DESCRIPTION
Trusted Computer IP Address	To enable this feature, type an IP address of any one of the computers in your network that you want to have as a trusted computer. This allows the trusted computer to have full access to all features that are configured to be blocked by content filtering. Leave this field blank to have no trusted computers.
Restrict Web Features	Select the box(es) to restrict a feature. When you download a page containing a restricted feature, that part of the web page will appear blank or grayed out.
ActiveX	A tool for building dynamic and active Web pages and distributed object applications. When you visit an ActiveX Web site, ActiveX controls are downloaded to your browser, where they remain in case you visit the site again.
Java	A programming language and development environment for building downloadable Web components or Internet and intranet business applications of all kinds.
Cookies	Used by Web servers to track usage and provide service based on ID.
Web Proxy	A server that acts as an intermediary between a user and the Internet to provide security, administrative control, and caching service. When a proxy server is located on the WAN it is possible for LAN users to circumvent content filtering by pointing to this proxy server.

Table 55 Content Filter: Filter

LABEL	DESCRIPTION
Enable URL Keyword Blocking	The ZyXEL Device can block Web sites with URLs that contain certain keywords in the domain name or IP address. For example, if the keyword "bad" was enabled, all sites containing this keyword in the domain name or IP address will be blocked, e.g., URL http://www.website.com/bad.html would be blocked. Select this check box to enable this feature.
Keyword	Type a keyword in this field. You may use any character (up to 64 characters). Wildcards are not allowed. You can also enter a numerical IP address.
Keyword List	This list displays the keywords already added.
Add	Click **Add** after you have typed a keyword. Repeat this procedure to add other keywords. Up to 64 keywords are allowed. When you try to access a web page containing a keyword, you will get a message telling you that the content filter is blocking this request.
Delete	Highlight a keyword in the lower box and click **Delete** to remove it. The keyword disappears from the text box after you click **Apply**.
Clear All	Click this button to remove all of the listed keywords.
Message to display when a site is blocked.	
Denied Access Message	Enter a message to be displayed when a user tries to access a restricted web site. The default message is Please contact your network administrator!!
Apply	Click **Apply** to save your changes.
Reset	Click **Reset** to begin configuring this screen afresh

13.5 Schedule

Click **Security** > **Content Filter** > **Schedule**. The following screen displays.

Figure 79 Content Filter: Schedule

The following table describes the labels in this screen.

Table 56 Content Filter: Schedule

LABEL	DESCRIPTION
Day to Block	Select check boxes for the days that you want the ZyXEL Device to perform content filtering. Select the **Everyday** check box to have content filtering turned on all days of the week.
Time of Day to Block (24-Hour Format)	**Time of Day to Block** allows the administrator to define during which time periods content filtering is enabled. **Time of Day to Block** restrictions only apply to the keywords (see above). Restrict web server data, such as ActiveX, Java, Cookies and Web Proxy are not affected.
	Select **All Day** to have content filtering always active on the days selected in **Day to Block** with time of day limitations not enforced.
	Select **From** and enter the time period, in 24-hour format, during which content filtering will be enforced.
Apply	Click **Apply** to save your customized settings and exit this screen.
Reset	Click **Reset** to begin configuring this screen afresh

13.6 Customizing Keyword Blocking URL Checking

You can use commands to set how much of a website's URL the content filter is to check for keyword blocking. See the appendices for information on how to access and use the command interpreter.

13.6.1 Domain Name or IP Address URL Checking

By default, the ZyXEL Device checks the URL's domain name or IP address when performing keyword blocking.

This means that the ZyXEL Device checks the characters that come before the first slash in the URL.

For example, with the URL www.zyxel.com.tw/news/pressroom.php, content filtering only searches for keywords within www.zyxel.com.tw.

13.6.2 Full Path URL Checking

Full path URL checking has the ZyXEL Device check the characters that come before the last slash in the URL.

For example, with the URL www.zyxel.com.tw/news/pressroom.php, full path URL checking searches for keywords within www.zyxel.com.tw/news/.

Use the `ip urlfilter customize actionFlags 6 [disable | enable]` command to extend (or not extend) the keyword blocking search to include the URL's full path.

13.6.3 File Name URL Checking

Filename URL checking has the ZyXEL Device check all of the characters in the URL.

For example, filename URL checking searches for keywords within the URL www.zyxel.com.tw/news/pressroom.php.

Use the `ip urlfilter customize actionFlags 8 [disable | enable]` command to extend (or not extend) the keyword blocking search to include the URL's complete filename.

C HAPTER 14
Static Route Screens

This chapter shows you how to configure static routes for your ZyXEL Device.

14.1 Static Route Overview

Each remote node specifies only the network to which the gateway is directly connected, and the ZyXEL Device has no knowledge of the networks beyond. For instance, the ZyXEL Device knows about network **N2** in the following figure through remote node router **R1**. However, the ZyXEL Device is unable to route a packet to network **N3** because it doesn't know that there is a route through the same remote node router **R1** (via gateway router **R2**). The static routes are for you to tell the ZyXEL Device about the networks beyond the remote nodes.

Figure 80   Example of Static Routing Topology
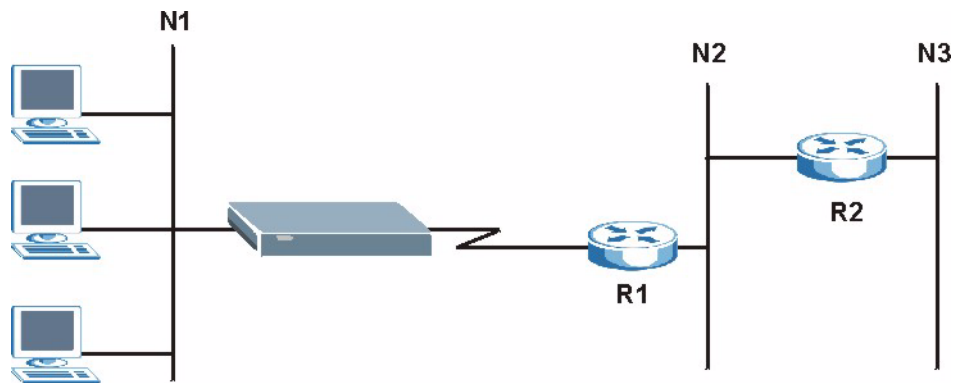
14.2 IP Static Route Screen

Click **Management** > **Static Route** to open the **IP Static Route** screen. The following screen displays.

Figure 81   IP Static Route

The following table describes the labels in this screen.

Table 57   IP Static Route

LABEL	DESCRIPTION
#	This is the index number of an individual static route. The first entry is for the default route and not editable.
Name	This is the name that describes or identifies this route.
Active	This icon is turned on when this static route is active. Click the **Edit** icon under **Modify** and select the **Active** checkbox in the **Static Route Setup** screen to enable the static route. Clear the checkbox to disable this static route without having to delete the entry.
Destination	This parameter specifies the IP network address of the final destination. Routing is always based on network number.
Gateway	This is the IP address of the gateway. The gateway is an immediate neighbor of your ZyXEL Device that will forward the packet to the destination. On the LAN, the gateway must be a router on the same segment as your ZyXEL Device; over the WAN, the gateway must be the IP address of one of the remote nodes.
Modify	Click the **Edit** icon to open the static route setup screen. Modify a static route or create a new static route in the **Static Route Setup** screen. Click the **Remove** icon to delete a static route.

14.2.1 Static Route Setup Screen

To edit a static route, click the edit icon under **Modify**. The following screen displays. Fill in the required information for each static route.

Figure 82   Static Route Setup

The following table describes the labels in this screen.

Table 58   Static Route Setup

LABEL	DESCRIPTION
Route Name	Enter the name of the IP static route. Leave this field blank to delete this static route.
Active	This field allows you to activate/deactivate this static route.
Private	This parameter determines if the ZyXEL Device will include this route to a remote node in its RIP broadcasts. Select this check box to keep this route private and not included in RIP broadcasts. Clear this checkbox to propagate this route to other hosts through RIP broadcasts.
Destination IP Address	This parameter specifies the IP network address of the final destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID.
IP Subnet Mask	Enter the IP subnet mask here.
Gateway IP Address	Enter the IP address of the gateway. The gateway is an immediate neighbor of your ZyXEL Device that will forward the packet to the destination. On the LAN, the gateway must be a router on the same segment as your ZyXEL Device; over the WAN, the gateway must be the IP address of one of the Remote Nodes.
Metric	Metric represents the "cost" of transmission for routing purposes. IP routing uses hop count as the measurement of cost, with a minimum of 1 for directly connected networks. Enter a number that approximates the cost for this link. The number need not be precise, but it must be between 1 and 15. In practice, 2 or 3 is usually a good number.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to return to the previous screen and not save your changes.

C H A P T E R **15**

Bandwidth Management

This chapter contains information about configuring bandwidth management, editing rules and viewing the ZyXEL Device's bandwidth management logs.

15.1 Bandwidth Management Overview

ZyXEL's Bandwidth Management allows you to specify bandwidth management rules based on an application and/or subnet. You can allocate specific amounts of bandwidth capacity (bandwidth budgets) to different bandwidth rules.

The ZyXEL Device applies bandwidth management to traffic that it forwards out through an interface. The ZyXEL Device does not control the bandwidth of traffic that comes into an interface.

Bandwidth management applies to all traffic flowing out of the router, regardless of the traffic's source.

Traffic redirect or IP alias may cause LAN-to-LAN traffic to pass through the ZyXEL Device and be managed by bandwidth management.

- The sum of the bandwidth allotments that apply to the WAN interface (LAN to WAN, WLAN to WAN, WAN to WAN / ZyXEL Device) must be less than or equal to the **Upstream Bandwidth** that you configure in the **Bandwidth Management Advanced** screen.
- The sum of the bandwidth allotments that apply to the LAN port (WAN to LAN, WLAN to LAN, LAN to LAN / ZyXEL Device) must be less than or equal to 100,000 kbps (you cannot configure the bandwidth budget for the LAN port).
- The sum of the bandwidth allotments that apply to the WLAN port (LAN to WLAN, WAN to WLAN, WLAN to WLAN / ZyXEL Device) must be less than or equal to 54,000 kbps (you cannot configure the bandwidth budget for the WLAN port).

15.2 Application-based Bandwidth Management

You can create bandwidth classes based on individual applications (like VoIP, Web, FTP, E-mail and Video for example).

15.3 Subnet-based Bandwidth Management

You can create bandwidth classes based on subnets.

The following figure shows LAN subnets. You could configure one bandwidth class for subnet **A** and another for subnet **B**.

Figure 83   Subnet-based Bandwidth Management Example
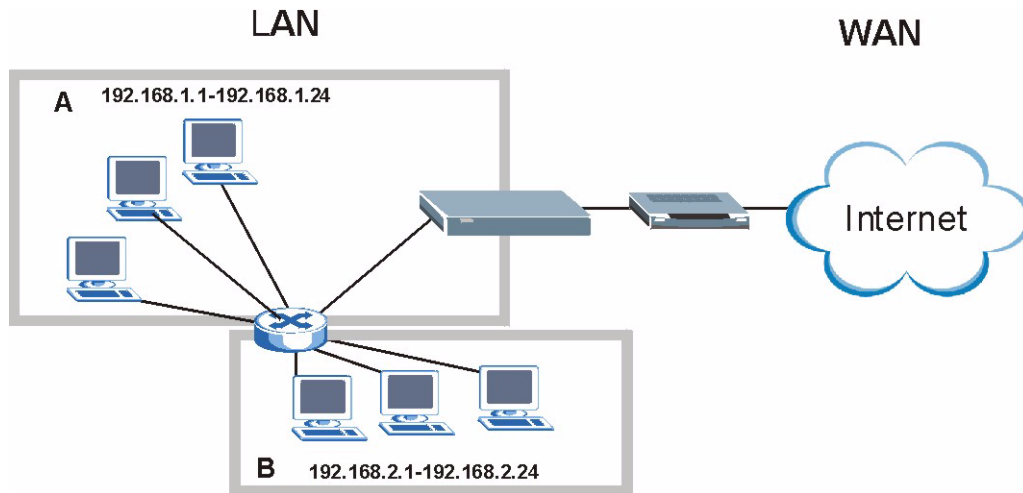
15.4 Application and Subnet-based Bandwidth Management

You could also create bandwidth classes based on a combination of a subnet and an application. The following example table shows bandwidth allocations for application specific traffic from separate LAN subnets.

Table 59   Application and Subnet-based Bandwidth Management Example

	FROM SUBNET A	FROM SUBNET B
VoIP	64 Kbps	64 Kbps
Web	64 Kbps	64 Kbps
FTP	64 Kbps	64 Kbps
E-mail	64 Kbps	64 Kbps
Video	64 Kbps	64 Kbps

15.5 Bandwidth Management Priorities

The following table describes the priorities that you can apply to traffic that the ZyXEL Device forwards out through an interface.

Table 60 Bandwidth Management Priorities

PRIORITY LEVELS: TRAFFIC WITH A HIGHER PRIORITY GETS THROUGH FASTER WHILE TRAFFIC WITH A LOWER PRIORITY IS DROPPED IF THE NETWORK IS CONGESTED.	
High	Typically used for voice traffic or video that is especially sensitive to jitter (jitter is the variations in delay).
Mid	Typically used for "excellent effort" or better than best effort and would include important business traffic that can tolerate some delay.
Low	This is typically used for non-critical "background" traffic such as bulk transfers that are allowed but that should not affect other applications and users.

15.6 Predefined Bandwidth Management Services

The following is a description of the services that you can select and to which you can apply media bandwidth management using the wizard screens.

Table 61 Media Bandwidth Management Setup: Services

SERVICE	DESCRIPTION
Xbox Live	This is Microsoft's online gaming service that lets you play multiplayer Xbox games on the Internet via broadband technology. Xbox Live uses port 3074.
VoIP (SIP)	Sending voice signals over the Internet is called Voice over IP or VoIP. Session Initiated Protocol (SIP) is an internationally recognized standard for implementing VoIP. SIP is an application-layer control (signaling) protocol that handles the setting up, altering and tearing down of voice and multimedia sessions over the Internet. SIP is transported primarily over UDP but can also be transported over TCP, using the default port number 5060.
FTP	File Transfer Program enables fast transfer of files, including large files that may not be possible by e-mail. FTP uses port number 21.
E-Mail	Electronic mail consists of messages sent through a computer network to specific groups or individuals. Here are some default ports for e-mail: POP3 - port 110 IMAP - port 143 SMTP - port 25 HTTP - port 80
eMule	These programs use advanced file sharing applications relying on central servers to search for files. They use default port 4662.
BitTorrent	BitTorrent is a free P2P (peer-to-peer) sharing tool allowing you to distribute large software and media files using ports 6881 to 6889. BitTorrent requires you to search for a file with a searching engine yourself. It distributes files by corporation and trading, that is, the client downloads the file in small pieces and share the pieces with other peers to get other half of the file.

Table 61 Media Bandwidth Management Setup: Services (continued)

SERVICE	DESCRIPTION
MSN Webcam	MSN messenger allows you to chat online and send instant messages. If you use MSN messenger and also have a webcam, you can send your image/photo in real-time along with messages
WWW	The World Wide Web (WWW) is an Internet system to distribute graphical, hyper-linked information, based on Hyper Text Transfer Protocol (HTTP) - a client/server protocol for the World Wide Web. The Web is not synonymous with the Internet; rather, it is just one service on the Internet. Other services on the Internet include Internet Relay Chat and Newsgroups. The Web is accessed through use of a browser.

15.6.1 Services and Port Numbers

The commonly used services and port numbers are shown in the following table. Please refer to RFC 1700 for further information about port numbers. Next to the name of the service, two fields appear in brackets. The first field indicates the IP protocol type (TCP, UDP, or ICMP). The second field indicates the IP port number that defines the service. (Note that there may be more than one IP protocol type. For example, look at the **DNS** service. **(UDP/TCP:53)** means UDP port 53 and TCP port 53.

Table 62 Commonly Used Services

SERVICE	DESCRIPTION
AIM/New-ICQ(TCP:5190)	AOL's Internet Messenger service, used as a listening port by ICQ.
AUTH(TCP:113)	Authentication protocol used by some servers.
BGP(TCP:179)	Border Gateway Protocol.
BOOTP_CLIENT(UDP:68)	DHCP Client.
BOOTP_SERVER(UDP:67)	DHCP Server.
CU-SEEME(TCP/UDP:7648, 24032)	A popular videoconferencing solution from White Pines Software.
DNS(UDP/TCP:53)	Domain Name Server, a service that matches web names (e.g. www.zyxel.com) to IP numbers.
FINGER(TCP:79)	Finger is a UNIX or Internet related command that can be used to find out if a user is logged on.
FTP(TCP:20.21)	File Transfer Program, a program to enable fast transfer of files, including large files that may not be possible by e-mail.
H.323(TCP:1720)	NetMeeting uses this protocol.
HTTP(TCP:80)	Hyper Text Transfer Protocol - a client/server protocol for the world wide web.
HTTPS(TCP:443)	HTTPS is a secured http session often used in e-commerce.
ICQ(UDP:4000)	This is a popular Internet chat program.
IKE(UDP:500)	The Internet Key Exchange algorithm is used for key distribution and management.
IPSEC_TUNNEL(AH:0)	The IPSEC AH (Authentication Header) tunneling protocol uses this service.

Table 62 Commonly Used Services

SERVICE	DESCRIPTION
IPSEC_TUNNEL(ESP:0)	The IPSEC ESP (Encapsulation Security Protocol) tunneling protocol uses this service.
IRC(TCP/UDP:6667)	This is another popular Internet chat program.
MSN Messenger(TCP:1863)	Microsoft Networks' messenger service uses this protocol.
MULTICAST(IGMP:0)	Internet Group Multicast Protocol is used when sending packets to a specific group of hosts.
NEW-ICQ(TCP:5190)	An Internet chat program.
NEWS(TCP:144)	A protocol for news groups.
NFS(UDP:2049)	Network File System - NFS is a client/server distributed file service that provides transparent file sharing for network environments.
NNTP(TCP:119)	Network News Transport Protocol is the delivery mechanism for the USENET newsgroup service.
PING(ICMP:0)	Packet INternet Groper is a protocol that sends out ICMP echo requests to test whether or not a remote host is reachable.
POP3(TCP:110)	Post Office Protocol version 3 lets a client computer get e-mail from a POP3 server through a temporary connection (TCP/IP or other).
PPTP(TCP:1723)	Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the control channel.
PPTP_TUNNEL(GRE:0)	Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the data channel.
RCMD(TCP:512)	Remote Command Service.
REAL_AUDIO(TCP:7070)	A streaming audio service that enables real time sound over the web.
REXEC(TCP:514)	Remote Execution Daemon.
RLOGIN(TCP:513)	Remote Login.
RTELNET(TCP:107)	Remote Telnet.
RTSP(TCP/UDP:554)	The Real Time Streaming (media control) Protocol (RTSP) is a remote control for multimedia on the Internet.
SFTP(TCP:115)	Simple File Transfer Protocol.
SMTP(TCP:25)	Simple Mail Transfer Protocol is the message-exchange standard for the Internet. SMTP enables you to move messages from one e-mail server to another.
SNMP(TCP/UDP:161)	Simple Network Management Program.
SNMP-TRAPS(TCP/UDP:162)	Traps for use with the SNMP (RFC:1215).
SQL-NET(TCP:1521)	Structured Query Language is an interface to access data on many different types of database systems, including mainframes, midrange systems, UNIX systems and network servers.
SSH(TCP/UDP:22)	Secure Shell Remote Login Program.
STRM WORKS(UDP:1558)	Stream Works Protocol.
SYSLOG(UDP:514)	Syslog allows you to send system logs to a UNIX server.
TACACS(UDP:49)	Login Host Protocol used for (Terminal Access Controller Access Control System).

Table 62   Commonly Used Services

SERVICE	DESCRIPTION
TELNET(TCP:23)	Telnet is the login and terminal emulation protocol common on the Internet and in UNIX environments. It operates over TCP/IP networks. Its primary function is to allow users to log into remote host systems.
TFTP(UDP:69)	Trivial File Transfer Protocol is an Internet file transfer protocol similar to FTP, but uses the UDP (User Datagram Protocol) rather than TCP (Transmission Control Protocol).
VDOLIVE(TCP:7000)	Another videoconferencing solution.

15.7 Default Bandwidth Management Classes and Priorities

If you enable bandwidth management but do not configure a rule for critical traffic like VoIP, the voice traffic may then get delayed due to insufficient bandwidth. With the automatic traffic classifier feature activated, the ZyXEL Device automatically assigns a default bandwidth management class and priority to traffic that does not match any of the user-defined rules. The traffic is classified based on the traffic type. Real-time traffic always gets higher priority over other traffic.

The following table shows you the priorities between the three default classes (**AutoClass_H**, **AutoClass_M** and **Default Class**) and user-defined rules. 6 is the highest priority.

Table 63   Bandwidth Management Priority with Default Classes

CLASS TYPE	PRIORITY
User-defined with high priority	6
AutoClass_H	5
User-defined with medium priority	4
AutoClass_M	3
User-defined with low priority	2
Default Class	1

15.8 Bandwidth Management General Configuration

Click **Management > Bandwidth MGMT** to open the bandwidth management **General** screen.

Figure 84   Bandwidth Management: General

The following table describes the labels in this screen.

Table 64   Bandwidth Management: General

LABEL	DESCRIPTION
Enable Bandwidth Management	Select this check box to have the ZyXEL Device apply bandwidth management.
	Enable bandwidth management to give traffic that matches a bandwidth rule priority over traffic that does not match a bandwidth rule.
	Enabling bandwidth management also allows you to control the maximum or minimum amounts of bandwidth that can be used by traffic that matches a bandwidth rule.
Enable Automatic Traffic Classifier	This field is only applicable when you select the **Enable Bandwidth Management** check box.
	Select this check box to have the ZyXEL Device base on the default bandwidth classes to apply bandwidth management. Real-time packets, such as VoIP traffic always get higher priority.
Apply	Click **Apply** to save your customized settings.
Reset	Click **Reset** to begin configuring this screen afresh.

15.9 Bandwidth Management Advanced Configuration

Click **Management** > **Bandwidth MGMT** > **Advanced** to open the bandwidth management **Advanced** screen.

Figure 85   Bandwidth Management: Advanced

The following table describes the labels in this screen.

Table 65   Bandwidth Management: Advanced

	DESCRIPTION
Upstream Bandwidth (kbps)	Enter the amount of bandwidth in kbps (2 to 100,000) that you want to allocate for traffic. 20 kbps to 20,000 kbps is recommended. The recommendation is to set this speed to be equal to or less than the speed of the broadband device connected to the WAN port. For example, set the speed to 1000 Kbps (or less) if the broadband device connected to the WAN port has an upstream speed of 1000 Kbps.
Application List	Use this table to allocate specific amounts of bandwidth based on the pre-defined service.
#	This is the number of an individual bandwidth management rule.
Enable	Select this check box to have the ZyXEL Device apply this bandwidth management rule.
Service	This is the name of the service.
Priority	Select a priority from the drop down list box. Choose **High**, **Mid** or **Low**.
Advanced Setting	Click the **Edit** icon to open the **Rule Configuration** screen where you can modify the rule.
User-defined Service	Use this table to allocate specific amounts of bandwidth to specific applications and/or subnets.
#	This is the number of an individual bandwidth management rule.
Enable	Select this check box to have the ZyXEL Device apply this bandwidth management rule.
Direction	Select **To LAN** to apply bandwidth management to traffic that the ZyXEL Device forwards to the LAN. Select **To WAN** to apply bandwidth management to traffic that the ZyXEL Device forwards to the WAN. Select **To WLAN** to apply bandwidth management to traffic that the ZyXEL Device forwards to the WLAN.
Service Name	Enter a descriptive name of up to 19 alphanumeric characters, including spaces.
Priority	Select a priority from the drop down list box. Choose **High**, **Mid** or **Low**.
Modify	Click the **Edit** icon to open the **Rule Configuration** screen. Modify an existing rule or create a new rule in the **Rule Configuration** screen. See Section 15.9.2 on page 161 for more information. Click the **Remove** icon to delete a rule.
Apply	Click **Apply** to save your customized settings.
Reset	Click **Reset** to begin configuring this screen afresh.

15.9.1 Rule Configuration with the Pre-defined Service

To edit a bandwidth management rule for the pre-defined service in the ZyXEL Device, click the **Edit** icon in the **Application List** table of the **Advanced** screen. The following screen displays.

Figure 86   Bandwidth Management Rule Configuration: Pre-defined Service

The following table describes the labels in this screen.

Table 66   Bandwidth Management Rule Configuration: Pre-defined Service

LABEL	DESCRIPTION
#	This is the number of an individual bandwidth management rule.
Enable	Select an interface's check box to enable bandwidth management on that interface.
Direction	These read-only labels represent the physical interfaces. Bandwidth management applies to all traffic flowing out of the router through the interface, regardless of the traffic's source.
	Traffic redirect or IP alias may cause LAN-to-LAN traffic to pass through the ZyXEL Device and be managed by bandwidth management.
Bandwidth	Select **Maximum Bandwidth** or **Minimum Bandwidth** and specify the maximum or minimum bandwidth allowed for the rule in kilobits per second.
Destination Port	This is the port number of the destination. See Table 62 on page 154 for some common services and port numbers.
Source Port	This is the port number of the source. See Table 62 on page 154 for some common services and port numbers.
Protocol	This is the protocol (**TCP** or **UDP**) used for the service.
OK	Click **OK** to save your customized settings.
Cancel	Click **Cancel** to exit this screen without saving.

15.9.2 Rule Configuration with the User-defined Service

In addition to the pre-defined services, if you want to edit a bandwidth management rule for other applications and/or subnets, click the **Edit** icon in the **User-defined Service** table of the **Advanced** screen. The following screen displays.

Figure 87   Bandwidth Management Rule Configuration: User-defined Service

The following table describes the labels in this screen.

Table 67   Bandwidth Management Rule Configuration: User-defined Service

LABEL	DESCRIPTION
BW Budget	Select **Maximum Bandwidth** or **Minimum Bandwidth** and specify the maximum or minimum bandwidth allowed for the rule in kilobits per second.
Destination Address	Enter the destination IP address in dotted decimal notation.
Destination Subnet Netmask	Enter the destination subnet mask. This field is N/A if you do not specify a **Destination Address**. Refer to the appendices for more information on IP subnetting.
Destination Port	Enter the port number of the destination. See Table 62 on page 154 for some common services and port numbers.
Source Address	Enter the source IP address in dotted decimal notation.
Source Subnet Netmask	Enter the destination subnet mask. This field is N/A if you do not specify a **Source Address**. Refer to the appendices for more information on IP subnetting.
Source Port	Enter the port number of the source. See Table 62 on page 154 for some common services and port numbers.
Protocol	Select the protocol (**TCP** or **UDP**) or select **User defined** and enter the protocol (service type) number.
OK	Click **OK** to save your customized settings.
Cancel	Click **Cancel** to exit this screen without saving.

15.10 Bandwidth Management Monitor

Click **Management > Bandwidth MGMT** > **Monitor** to open the bandwidth management **Monitor** screen. View the bandwidth usage of the WAN configured bandwidth rules. This is also shown as bandwidth usage over the bandwidth budget for each rule. The gray section of the bar represents the percentage of unused bandwidth and the blue color represents the percentage of bandwidth in use.

Figure 88 Bandwidth Management: Monitor
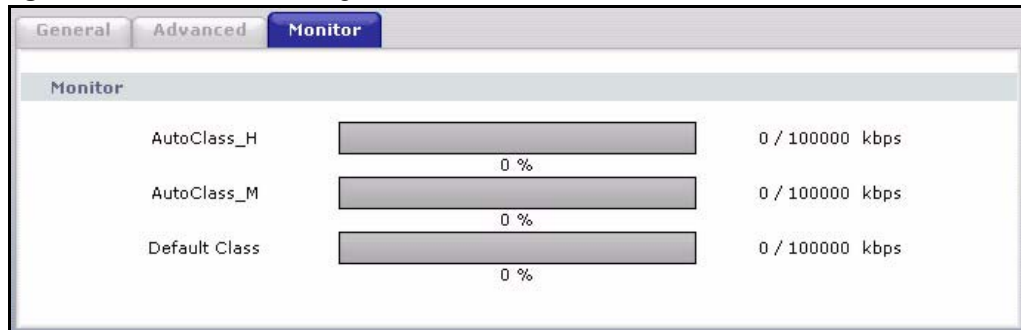
C H A P T E R **16**

Remote Management Screens

This chapter provides information on the Remote Management screens.

16.1 Remote Management Overview

Remote management allows you to determine which services/protocols can access which ZyXEL Device interface (if any) from which computers.

Note: When you configure remote management to allow management from the WAN, you still need to configure a firewall rule to allow access. See the firewall chapters for details on configuring firewall rules.

You may manage your ZyXEL Device from a remote location via:

- Internet (WAN only)
- ALL (LAN and WAN)
- LAN only
- Neither (Disable).

Note: When you choose **WAN** or **LAN & WAN**, you still need to configure a firewall rule to allow access.

To disable remote management of a service, select **Disable** in the corresponding **Server Access** field.

You may only have one remote management session running at a time. The ZyXEL Device automatically disconnects a remote management session of lower priority when another remote management session of higher priority starts. The priorities for the different types of remote management sessions are as follows.

1 Telnet

2 HTTP

16.1.1 Remote Management Limitations

Remote management over LAN or WAN will not work when:

1 You have disabled that service in one of the remote management screens.

2 The IP address in the **Secured Client IP Address** field does not match the client IP address. If it does not match, the ZyXEL Device will disconnect the session immediately.

3 There is already another remote management session with an equal or higher priority running. You may only have one remote management session running at one time.

4 There is a firewall rule that blocks it.

16.1.2 Remote Management and NAT

When NAT is enabled:

- Use the ZyXEL Device's WAN IP address when configuring from the WAN.
- Use the ZyXEL Device's LAN IP address when configuring from the LAN.

16.1.3 System Timeout

There is a default system management idle timeout of five minutes (three hundred seconds). The ZyXEL Device automatically logs you out if the management session remains idle for longer than this timeout period. The management session does not time out when a statistics screen is polling. You can change the timeout period in the **System** screen

16.2 WWW Screen

To change your ZyXEL Device's World Wide Web settings, click **Management** > **Remote MGMT** to display the **WWW** screen.

Figure 89 WWW Remote Management

The following table describes the labels in this screen.

Table 68 WWW Remote Management

LABEL	DESCRIPTION
Server Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.

Table 68   WWW Remote Management

LABEL	DESCRIPTION
Secured Client IP Address	A secured client is a "trusted" computer that is allowed to communicate with the ZyXEL Device using this service.
	Select **All** to allow any computer to access the ZyXEL Device using this service.
	Choose **Selected** to just allow the computer with the IP address that you specify to access the ZyXEL Device using this service.
Apply	Click **Apply** to save your customized settings and exit this screen.
Reset	Click **Reset** to begin configuring this screen afresh.

16.3 Telnet

You can configure your ZyXEL Device for remote Telnet access as shown next. The administrator uses Telnet from a computer on a remote network to access the ZyXEL Device.

Figure 90   Telnet Configuration on a TCP/IP Network
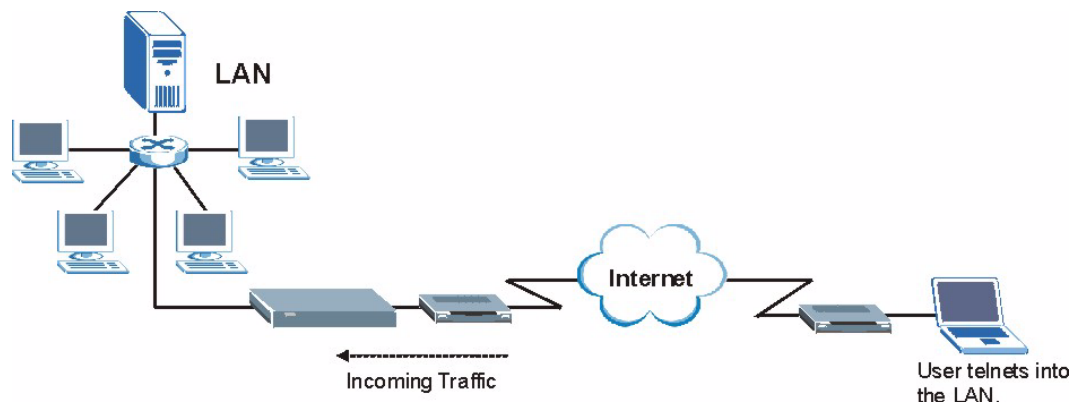
16.4 Telnet Screen

To change your ZyXEL Device's Telnet settings, click **Management** > **Remote MGMT** > **Telnet**. The following screen displays.

Figure 91   Telnet Remote Management

The following table describes the labels in this screen.

Table 69   Telnet Remote Management

LABEL	DESCRIPTION
Server Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.
Secured Client IP Address	A secured client is a "trusted" computer that is allowed to communicate with the ZyXEL Device using this service.
	Select **All** to allow any computer to access the ZyXEL Device using this service.
	Choose **Selected** to just allow the computer with the IP address that you specify to access the ZyXEL Device using this service.
Apply	Click **Apply** to save your customized settings and exit this screen.
Reset	Click **Reset** to begin configuring this screen afresh.

16.5 FTP Screen

You can upload and download the ZyXEL Device's firmware and configuration files using FTP, please see the chapter on firmware and configuration file maintenance for details. To use this feature, your computer must have an FTP client.

To change your ZyXEL Device's FTP settings, click **Management** > **Remote MGMT** > **FTP**. The screen appears as shown.

Figure 92 FTP Remote Management

The following table describes the labels in this screen.

Table 70 FTP Remote Management

LABEL	DESCRIPTION
Server Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.
Secured Client IP Address	A secured client is a "trusted" computer that is allowed to communicate with the ZyXEL Device using this service.
	Select **All** to allow any computer to access the ZyXEL Device using this service.
	Choose **Selected** to just allow the computer with the IP address that you specify to access the ZyXEL Device using this service.
Apply	Click **Apply** to save your customized settings and exit this screen.
Reset	Click **Reset** to begin configuring this screen afresh.

16.6 DNS Screen

Use DNS (Domain Name System) to map a domain name to its corresponding IP address and vice versa. Refer to the chapter on Wizard Setup for background information.

To change your ZyXEL Device's DNS settings, click **Management** > **Remote MGMT** > **DNS**. The screen appears as shown.

Figure 93 DNS Remote Management
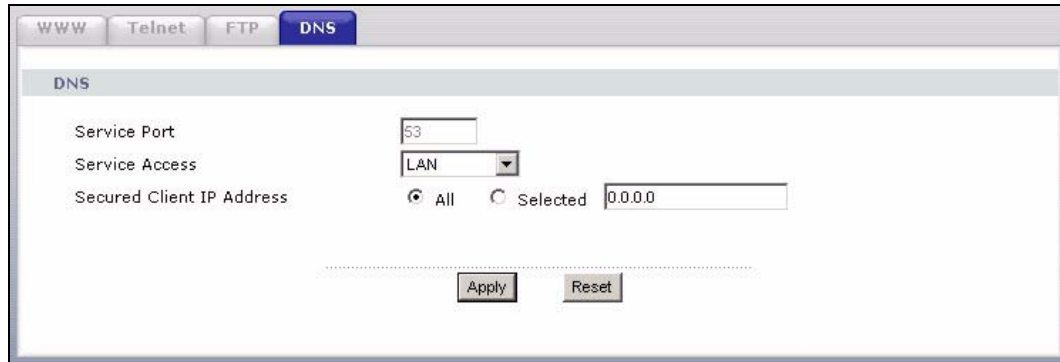
The following table describes the labels in this screen.

Table 71 DNS Remote Management

LABEL	DESCRIPTION
Server Port	The DNS service port number is 53 and cannot be changed here.
Server Access	Select the interface(s) through which a computer may send DNS queries to the ZyXEL Device.
Secured Client IP Address	A secured client is a "trusted" computer that is allowed to send DNS queries to the ZyXEL Device. Select **All** to allow any computer to send DNS queries to the ZyXEL Device. Choose **Selected** to just allow the computer with the IP address that you specify to send DNS queries to the ZyXEL Device.
Apply	Click **Apply** to save your customized settings and exit this screen.
Reset	Click **Reset** to begin configuring this screen afresh.

CHAPTER 17
UPNP

This chapter introduces the Universal Plug and Play feature.

17.1 Universal Plug and Play Overview

Universal Plug and Play (UPnP) is a distributed, open networking standard that uses TCP/IP for simple peer-to-peer network connectivity between devices. A UPnP device can dynamically join a network, obtain an IP address, convey its capabilities and learn about other devices on the network. In turn, a device can leave a network smoothly and automatically when it is no longer in use.

17.1.1 How Do I Know If I'm Using UPnP?

UPnP hardware is identified as an icon in the Network Connections folder (Windows XP). Each UPnP compatible device installed on your network will appear as a separate icon. Selecting the icon of a UPnP device will allow you to access the information and properties of that device.

17.1.2 NAT Traversal

UPnP NAT traversal automates the process of allowing an application to operate through NAT. UPnP network devices can automatically configure network addressing, announce their presence in the network to other UPnP devices and enable exchange of simple product and service descriptions. NAT traversal allows the following:

1 Dynamic port mapping

2 Learning public IP addresses

3 Assigning lease times to mappings

Windows Messenger is an example of an application that supports NAT traversal and UPnP.

See the chapter on SUA/NAT for further information about NAT.

17.1.3 Cautions with UPnP

The automated nature of NAT traversal applications in establishing their own services and opening firewall ports may present network security issues. Network information and configuration may also be obtained and modified by users in some network environments.

When a UPnP device joins a network, it announces its presence with a multicast message. For security reasons, the ZyXEL Device allows multicast messages on the LAN only.

All UPnP-enabled devices may communicate freely with each other without additional configuration. Disable UPnP if this is not your intention.

17.2 UPnP and ZyXEL

ZyXEL has achieved UPnP certification from the Universal Plug and Play Forum UPnP™ Implementers Corp. (UIC). ZyXEL's UPnP implementation supports Internet Gateway Device (IGD) 1.0.

See the following sections for examples of installing and using UPnP.

17.3 UPnP Screen

Click the **UPnP** link under **Management** to display the UPnP screen.

Figure 94   Configuring UPnP

The following table describes the labels in this screen.

Table 72   Configuring UPnP

LABEL	DESCRIPTION
Enable the Universal Plug and Play (UPnP) feature	Select this checkbox to activate UPnP. Be aware that anyone could use a UPnP application to open the web configurator's login screen without entering the ZyXEL Device's IP address (although you must still enter the password to access the web configurator).
Allow users to make configuration changes through UPnP	Select this check box to allow UPnP-enabled applications to automatically configure the ZyXEL Device so that they can communicate through the ZyXEL Device, for example by using NAT traversal, UPnP applications automatically reserve a NAT forwarding port in order to communicate with another UPnP enabled device; this eliminates the need to manually configure port forwarding for the UPnP enabled application.

Table 72 Configuring UPnP

LABEL	DESCRIPTION
Allow UPnP to pass through Firewall	UPnP broadcasts are only allowed on the LAN. If you block LAN-to-LAN/ZyXEL Device traffic using the firewall, then you need to select this check box to allow UPnP-enabled traffic to pass through the firewall. This setting remains active until you disable UPnP. Clear this check box if you do not want to create a hole in the firewall for UPnP application packets (for example, MSN packets).
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

17.4 Installing UPnP in Windows Example

This section shows how to install UPnP in Windows Me and Windows XP.

17.4.1 Installing UPnP in Windows Me

Follow the steps below to install UPnP in Windows Me.

1 Click **Start** and **Control Panel**. Double-click **Add/Remove Programs**.

2 Click on the **Windows Setup** tab and select **Communication** in the **Components** selection box. Click **Details**.
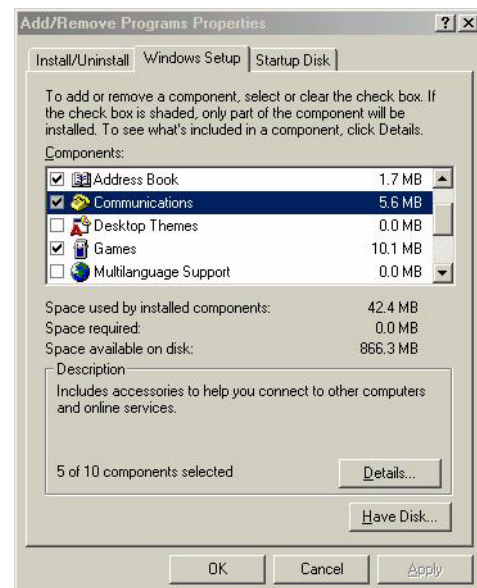
3 In the **Communications** window, select the **Universal Plug and Play** check box in the **Components** selection box.

4 Click **OK** to go back to the **Add/Remove Programs Properties** window and click **Next**.

5 Restart the computer when prompted.
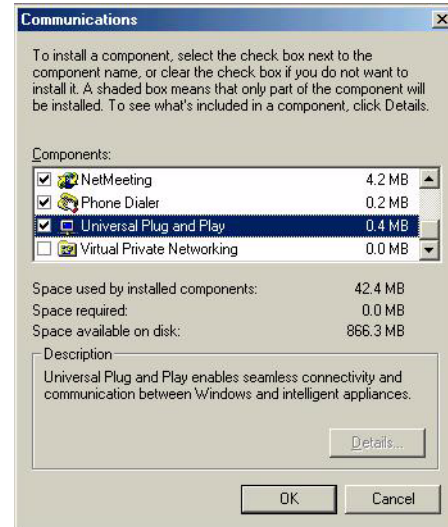
17.4.2 Installing UPnP in Windows XP

Follow the steps below to install UPnP in Windows XP.

1 Click **Start** and **Control Panel**.

2 Double-click **Network Connections**.

3 In the **Network Connections** window, click **Advanced** in the main menu and select **Optional Networking Components …**The **Windows Optional Networking Components Wizard** window displays.

4 Select **Networking Service** in the **Components** selection box and click **Details**.
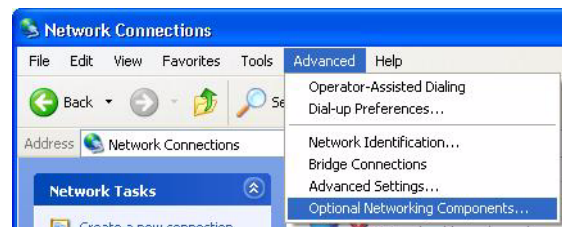
5 In the **Networking Services** window, select the **Universal Plug and Play** check box.

6 Click **OK** to go back to the **Windows Optional Networking Component Wizard** window and click **Next**.
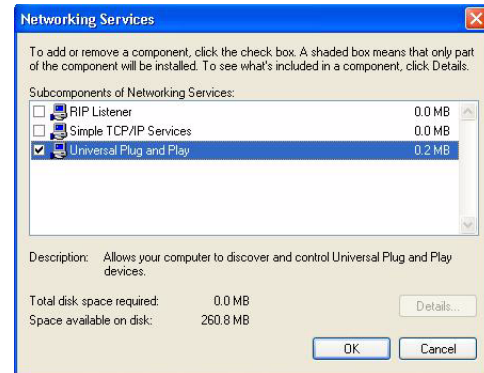
17.5 Using UPnP in Windows XP Example

This section shows you how to use the UPnP feature in Windows XP. You must already have UPnP installed in Windows XP and UPnP activated on the ZyXEL device.

Make sure the computer is connected to a LAN port of the ZyXEL device. Turn on your computer and the ZyXEL device.

17.5.1 Auto-discover Your UPnP-enabled Network Device

1 Click **Start** and **Control Panel**. Double-click **Network Connections**. An icon displays under Internet Gateway.

2 Right-click the icon and select **Properties**.

3 In the **Internet Connection Properties** window, click **Settings** to see the port mappings that were automatically created.

4 You may edit or delete the port mappings or click **Add** to manually add port mappings.

Note: When the UPnP-enabled device is disconnected from your computer, all port mappings will be deleted automatically.

5 Select the **Show icon in notification area when connected** check box and click **OK**. An icon displays in the system tray

6 Double-click the icon to display your current Internet connection status.

17.5.2 Web Configurator Easy Access

With UPnP, you can access the web-based configurator on the ZyXEL device without finding out the IP address of the ZyXEL device first. This is helpful if you do not know the IP address of the ZyXEL device.

Follow the steps below to access the web configurator.

1 Click **Start** and then **Control Panel**.

2 Double-click **Network Connections**.

3 Select **My Network Places** under **Other Places**.

4 An icon with the description for each UPnP-enabled device displays under **Local Network**.

5 Right-click the icon for your ZyXEL device and select **Invoke**.
The web configurator login screen displays.

6 Right-click the icon for your ZyXEL device and select **Properties**. A properties window displays with basic information about the ZyXEL device.

17.5.3 Web Configurator Easy Access

With UPnP, you can access the web-based configurator on the ZyXEL device without finding out the IP address of the ZyXEL device first. This is helpful if you do not know the IP address of the ZyXEL device.

Follow the steps below to access the web configurator.

1 Click **Start** and then **Control Panel**.

2 Double-click **Network Connections**.

3 Select **My Network Places** under **Other Places**.

4 An icon with the description for each UPnP-enabled device displays under **Local Network**.

5 Right-click the icon for your ZyXEL device and select **Invoke**. The web configurator login screen displays.

6 Right-click the icon for your ZyXEL device and select **Properties**. A properties window displays with basic information about the ZyXEL device.

CHAPTER 18
System

This chapter provides information on the System screens.
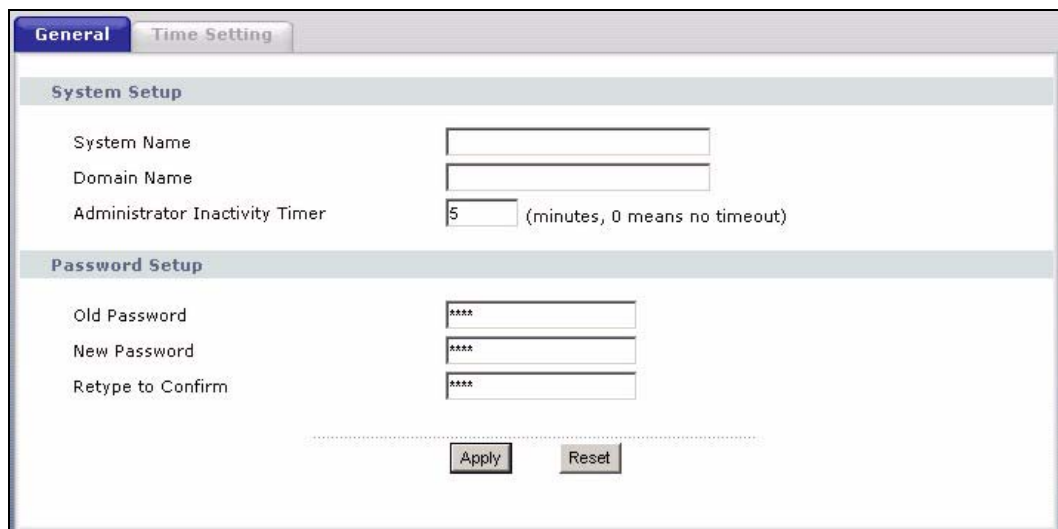
18.1 System Overview

See the chapter about wizard setup for more information on the next few screens.

18.2 System General Screen

Click **Maintenance** > **System**. The following screen displays.

Figure 95 System General

The following table describes the labels in this screen.

Table 73   System General

LABEL	DESCRIPTION
System Name	System Name is a unique name to identify the ZyXEL Device in an Ethernet network. It is recommended you enter your computer's "Computer name" in this field (see the chapter about wizard setup for how to find your computer's name). This name can be up to 30 alphanumeric characters long. Spaces are not allowed, but dashes "-" and underscores "_" are accepted.
Domain Name	Enter the domain name (if you know it) here. If you leave this field blank, the ISP may assign a domain name via DHCP. The domain name entered by you is given priority over the ISP assigned domain name.
Administrator Inactivity Timer	Type how many minutes a management session can be left idle before the session times out. The default is 5 minutes. After it times out you have to log in with your password again. Very long idle timeouts may have security risks. A value of "0" means a management session never times out, no matter how long it has been left idle (not recommended).
Password Setup	Change your ZyXEL Device's password (recommended) using the fields as shown.
Old Password	Type the default password or the existing password you use to access the system in this field.
New Password	Type your new system password (up to 30 characters). Note that as you type a password, the screen displays an asterisk (*) for each character you type.
Retype to Confirm	Type the new password again in this field.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

18.3 Time Setting Screen

To change your ZyXEL Device's time and date, click **Maintenance** > **System** > **Time Setting**. The screen appears as shown. Use this screen to configure the ZyXEL Device's time based on your local time zone.

Figure 96 Time Setting

The following table describes the labels in this screen.

Table 74 Time Setting

LABEL	DESCRIPTION
Current Time and Date	
Current Time	This field displays the time of your ZyXEL Device. Each time you reload this page, the ZyXEL Device synchronizes the time with the time server.
Current Date	This field displays the date of your ZyXEL Device. Each time you reload this page, the ZyXEL Device synchronizes the date with the time server.
Time and Date Setup	
Manual	Select this radio button to enter the time and date manually. If you configure a new time and date, Time Zone and Daylight Saving at the same time, the new time and date you entered has priority and the Time Zone and Daylight Saving settings do not affect it.
New Time (hh:mm:ss)	This field displays the last updated time from the time server or the last time configured manually. When you set **Time and Date Setup** to **Manual**, enter the new time in this field and then click **Apply**.

Table 74 Time Setting

| LABEL	DESCRIPTION
New Date (yyyy/mm/dd)	This field displays the last updated date from the time server or the last date configured manually. When you set **Time and Date Setup** to **Manual**, enter the new date in this field and then click **Apply**.
Get from Time Server	Select this radio button to have the ZyXEL Device get the time and date from the time server you specified below.
Auto	Select **Auto** to have the ZyXEL Device automatically search for an available time server and synchronize the date and time with the time server after you click **Apply**.
User Defined Time Server Address	Select **User Defined Time Server Address** and enter the IP address or URL (up to 20 extended ASCII characters in length) of your time server. Check with your ISP/network administrator if you are unsure of this information.
Time Zone Setup	
Time Zone	Choose the time zone of your location. This will set the time difference between your time zone and Greenwich Mean Time (GMT).
Daylight Savings	Daylight saving is a period from late spring to early fall when many countries set their clocks ahead of normal local time by one hour to give more daytime light in the evening. Select this option if you use Daylight Saving Time.
Start Date	Configure the day and time when Daylight Saving Time starts if you selected **Daylight Savings**. The **o'clock** field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time starts in most parts of the United States on the first Sunday of April. Each time zone in the United States starts using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **First**, **Sunday**, **April** and type 2 in the **o'clock** field. Daylight Saving Time starts in the European Union on the last Sunday of March. All of the time zones in the European Union start using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **March**. The time you type in the **o'clock** field depends on your time zone. In Germany for instance, you would type 2 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).
End Date	Configure the day and time when Daylight Saving Time ends if you selected **Daylight Savings**. The **o'clock** field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time ends in the United States on the last Sunday of October. Each time zone in the United States stops using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **Last**, **Sunday**, **October** and type 2 in the **o'clock** field. Daylight Saving Time ends in the European Union on the last Sunday of October. All of the time zones in the European Union stop using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **October**. The time you type in the **o'clock** field depends on your time zone. In Germany for instance, you would type 2 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

CHAPTER 19
Logs

This chapter contains information about configuring general log settings and viewing the ZyXEL Device's logs. Refer to the appendices for example log message explanations.

19.1 View Log

The web configurator allows you to look at all of the ZyXEL Device's logs in one location.

Click **Maintenance** > **Logs** to open the **View Log** screen.

Use the **View Log** screen to see the logs for the categories that you selected in the **Log Settings** screen (see Section 19.2 on page 182). Options include logs about system maintenance, system errors, access control, allowed or blocked web sites, blocked web features (such as ActiveX controls, Java and cookies), attacks (such as DoS) and IPSec.

Log entries in red indicate system error logs. The log wraps around and deletes the old entries after it fills. Click a column heading to sort the entries. A triangle indicates ascending or descending sort order.

Figure 97 View Log

#	Time ▽	Message	Source	Destination	Note
1	04/06/2006 14:28:47	Successful WEB login	192.168.1.33		User:admin
2	04/06/2006 14:18:15	Time synchronization successful			
3	04/06/2006 14:18:15	Time initialized by NTP server: ntp3.cs.wisc.edu	128.105.37.11:123	172.23.23.114:123	
4	04/06/2006 14:17:13	Time synchronization successful			
5	04/06/2006 14:17:13	Time initialized by NTP server: ntp3.cs.wisc.edu	128.105.37.11:123	172.23.23.114:123	
6	04/06/2006 06:11:52	Time synchronization successful			
7	04/06/2006 06:11:52	Time initialized by NTP server: time1.stupi.se	192.36.143.150:123	172.23.23.114:123	
8	01/01/2000 04:50:52	WAN interface gets IP:172.23.23.114			WAN1
9	01/01/2000 04:23:06	Successful WEB login	192.168.1.33		User:admin
10	01/01/2000 03:43:10	Waiting content filter server (66.35.255.70) timeout!	192.168.1.33:3241	202.43.201.234:80	tw.f172.mail.yahoo.com
11	01/01/2000 03:42:02	Waiting content filter server (66.35.255.70) timeout!	192.168.1.33:3188	203.84.196.97:80	tw.yimg.com

The following table describes the labels in this screen.

Table 75 View Logs

LABEL	DESCRIPTION
Display	The categories that you select in the **Log Settings** page (see Section 19.2 on page 182) display in the drop-down list box. Select a category of logs to view; select **All Logs** to view logs from all of the log categories that you selected in the **Log Settings** page.
Time	This field displays the time the log was recorded. See the chapter on system maintenance and information to configure the ZyXEL Device's time and date.
Message	This field states the reason for the log.
Source	This field lists the source IP address and the port number of the incoming packet.
Destination	This field lists the destination IP address and the port number of the incoming packet.
Note	This field displays additional information about the log entry.
Email Log Now	Click **Email Log Now** to send the log screen to the e-mail address specified in the **Log Settings** page (make sure that you have first filled in the **Address Info** fields in **Log Settings**).
Refresh	Click **Refresh** to renew the log screen.
Clear Log	Click **Clear Log** to delete all the logs.

19.2 Log Settings

You can configure the ZyXEL Device's general log settings in one location.

Click **Maintenance** > **Logs** > **Log Settings** to open the **Log Settings** screen.

Use the **Log Settings** screen to configure to where the ZyXEL Device is to send logs; the schedule for when the ZyXEL Device is to send the logs and which logs and/or immediate alerts the ZyXEL Device to send.

An alert is a type of log that warrants more serious attention. They include system errors, attacks (access control) and attempted access to blocked web sites or web sites with restricted web features such as cookies, active X and so on. Some categories such as **System Errors** consist of both logs and alerts. You may differentiate them by their color in the **View Log** screen. Alerts display in red and logs display in black.

Alerts are e-mailed as soon as they happen. Logs may be e-mailed as soon as the log is full (see **Log Schedule**). Selecting many alert and/or log categories (especially **Access Control**) may result in many e-mails being sent

Figure 98 Log Settings

The following table describes the labels in this screen.

Table 76 Log Settings

LABEL	DESCRIPTION
E-mail Log Settings	
Mail Server	Enter the server name or the IP address of the mail server for the e-mail addresses specified below. If this field is left blank, logs and alert messages will not be sent via E-mail.
Mail Subject	Type a title that you want to be in the subject line of the log e-mail message that the ZyXEL Device sends. Not all ZyXEL Device models have this field.
Send Log To	The ZyXEL Device sends logs to the e-mail address specified in this field. If this field is left blank, the ZyXEL Device does not send logs via e-mail.

Table 76 Log Settings

LABEL	DESCRIPTION
Send Alerts To	Alerts are real-time notifications that are sent as soon as an event, such as a DoS attack, system error, or forbidden web access attempt occurs. Enter the E-mail address where the alert messages will be sent. Alerts include system errors, attacks and attempted access to blocked web sites. If this field is left blank, alert messages will not be sent via E-mail.
SMTP Authentication	SMTP (Simple Mail Transfer Protocol) is the message-exchange standard for the Internet. SMTP enables you to move messages from one e-mail server to another. Select the check box to activate SMTP authentication. If mail server authentication is needed but this feature is disabled, you will not receive the e-mail logs.
User Name	Enter the user name (up to 31 characters) (usually the user name of a mail account).
Password	Enter the password associated with the user name above.
Log Schedule	This drop-down menu is used to configure the frequency of log messages being sent as E-mail: • **Daily** • **Weekly** • **Hourly** • **When Log is Full** • **None**. If you select **Weekly** or **Daily**, specify a time of day when the E-mail should be sent. If you select **Weekly**, then also specify which day of the week the E-mail should be sent. If you select **When Log is Full**, an alert is sent when the log fills up. If you select **None**, no log messages are sent.
Day for Sending Log	Use the drop down list box to select which day of the week to send the logs.
Time for Sending Log	Enter the time of the day in 24-hour format (for example 23:00 equals 11:00 pm) to send the logs.
Clear log after sending mail	Select the checkbox to delete all the logs after the ZyXEL Device sends an E-mail of the logs.
Syslog Logging	The ZyXEL Device sends a log to an external syslog server.
Active	Click **Active** to enable syslog logging.
Syslog Server IP Address	Enter the server name or IP address of the syslog server that will log the selected categories of logs.
Log Facility	Select a location from the drop down list box. The log facility allows you to log the messages to different files in the syslog server. Refer to the syslog server manual for more information.
Log	Select the categories of logs that you want to record.
Send Immediate Alert	Select log categories for which you want the ZyXEL Device to send E-mail alerts immediately.
Apply	Click **Apply** to save your changes.
Reset	Click **Reset** to begin configuring this screen afresh.

C H A P T E R   20
Tools

This chapter shows you how to upload a new firmware, upload or save backup configuration files and restart the ZyXEL Device.

20.1 Firmware Upload Screen

Find firmware at www.zyxel.com in a file that (usually) uses the system model name with a "*.bin" extension, e.g., "ZyXEL Device.bin". The upload process uses HTTP (Hypertext Transfer Protocol) and may take up to two minutes. After a successful upload, the system will reboot. See the Firmware and Configuration File Maintenance chapter for upgrading firmware using FTP/TFTP commands.

Click **Maintenance > Tools**. Follow the instructions in this screen to upload firmware to your ZyXEL Device.

Figure 99   Maintenance Firmware Upload

The following table describes the labels in this screen.

Table 77   Maintenance Firmware Upload

LABEL	DESCRIPTION
File Path	Type in the location of the file you want to upload in this field or click **Browse...** to find it.
Browse...	Click **Browse...** to find the .bin file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.
Upload	Click **Upload** to begin the upload process. This process may take up to two minutes.

Note: Do not turn off the ZyXEL Device while firmware upload is in progress!

After you see the **Firmware Upload In Process** screen, wait two minutes before logging into the ZyXEL Device again.

Figure 100   Upload Warning

The ZyXEL Device automatically restarts in this time causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

Figure 101   Network Temporarily Disconnected
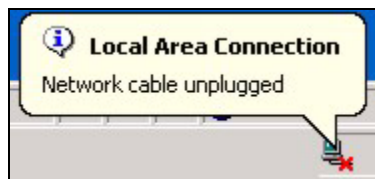
After two minutes, log in again and check your new firmware version in the **Status** screen.

If the upload was not successful, the following screen will appear. Click **Return** to go back to the **Firmware** screen.

Figure 102   Upload Error Message

20.2 Configuration Screen

See the Firmware and Configuration File Maintenance chapter for transferring configuration files using FTP/TFTP commands.

Click **Maintenance > Tools** > **Configuration**. Information related to factory defaults, backup configuration, and restoring configuration appears as shown next.

Figure 103 Configuration

20.2.1 Backup Configuration

Backup configuration allows you to back up (save) the ZyXEL Device's current configuration to a file on your computer. Once your ZyXEL Device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes. The backup configuration file will be useful in case you need to return to your previous settings.

Click **Backup** to save the ZyXEL Device's current configuration to your computer

20.2.2 Restore Configuration

Restore configuration allows you to upload a new or previously saved configuration file from your computer to your ZyXEL Device.

Table 78 Maintenance Restore Configuration

LABEL	DESCRIPTION
File Path	Type in the location of the file you want to upload in this field or click **Browse...** to find it.
Browse...	Click **Browse...** to find the file you want to upload. Remember that you must decompress compressed (.ZIP) files before you can upload them.
Upload	Click **Upload** to begin the upload process.

Note: Do not turn off the ZyXEL Device while configuration file upload is in progress

After you see a "configuration upload successful" screen, you must then wait one minute before logging into the ZyXEL Device again.

Figure 104   Configuration Restore Successful

The ZyXEL Device automatically restarts in this time causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

Figure 105   Temporarily Disconnected
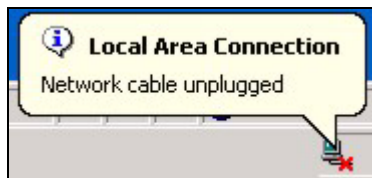
If you uploaded the default configuration file you may need to change the IP address of your computer to be in the same subnet as that of the default ZyXEL Device IP address (192.168.1.1). See your Quick Start Guide for details on how to set up your computer's IP address.

If the upload was not successful, the following screen will appear. Click **Return** to go back to the **Configuration** screen.

Figure 106   Configuration Restore Error

20.2.3 Back to Factory Defaults

Pressing the **Reset** button in this section clears all user-entered configuration information and returns the ZyXEL Device to its factory defaults.

You can also press the **RESET** button on the rear panel to reset the factory defaults of your ZyXEL Device. Refer to the chapter about introducing the web configurator for more information on the **RESET** button.

20.3 Restart Screen

System restart allows you to reboot the ZyXEL Device without turning the power off.

Click **Maintenance > Tools** > **Restart**. Click **Restart** to have the ZyXEL Device reboot. This does not affect the ZyXEL Device's configuration.

Figure 107   System Restart
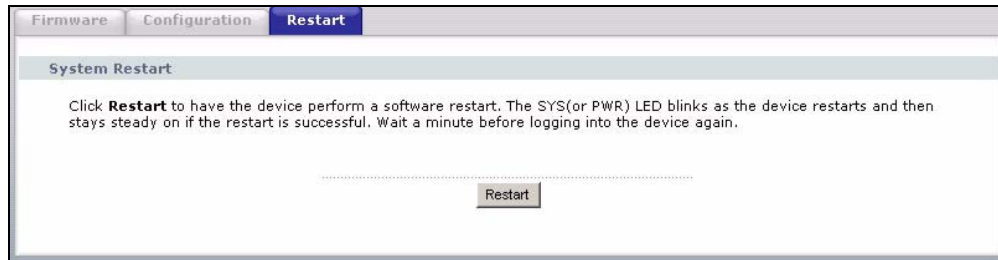
CHAPTER 21
Configuration Mode

Click **Maintenance > Config Mode** to open the following screen. This screen allows you to hide or display the advanced screens of some feaures or the advanced features, such as MAC filter or static route. **Basic** is selected by default and you cannot see the advanced screens or features. If you want to view and configure all screens including the advanced ones, select **Advanced** and click **Apply**.

Figure 108   Config Mode
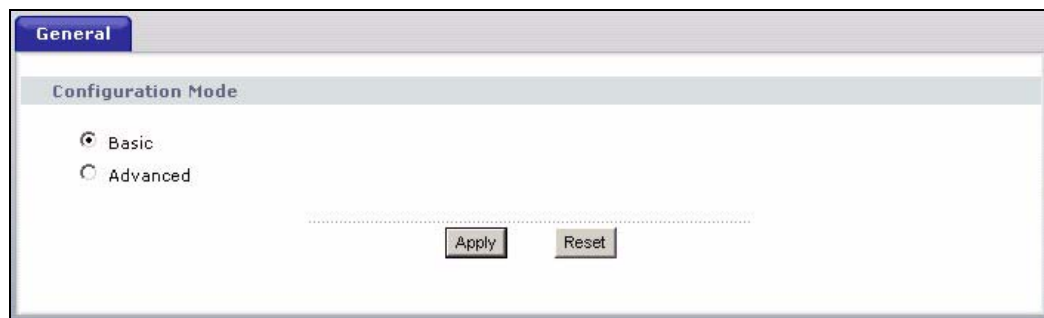
The following table includes the screens that you can view and configure only when you select **Advanced**.

Table 79   Config Mode: Advanced Screens

CATEGORY	LINK	TAB
Network	Wireless LAN	MAC Filter
		Advanced
	WAN	Advanced
	WiFi WAN	Advanced
	LAN	IP Alias
		Advanced
	DHCP Server	Advanced
	NAT	Advanced
Security	Firewall	Services
	Content Filter	Schedule

Table 79   Config Mode: Advanced Screens

CATEGORY	LINK	TAB
Management	Static Route	IP Static Route
	Bandwidth MGMT	Advanced
		Monitor
	Remote MGMT	Telnet
		FTP
		DNS
Maintenance	Logs	Log Settings

CHAPTER 22
Troubleshooting

This chapter covers potential problems and the corresponding remedies.

22.1 Problems Starting Up the ZyXEL Device

Table 80   Troubleshooting Starting Up Your ZyXEL Device

PROBLEM	CORRECTIVE ACTION
None of the LEDs turn on when I turn on the ZyXEL Device.	Make sure that the ZyXEL Device's power adaptor is connected to the ZyXEL Device and plugged in to an appropriate power source. Make sure that the ZyXEL Device and the power source are both turned on. Turn the ZyXEL Device off and on. If the error persists, you may have a hardware problem. In this case, you should contact your vendor.

22.2 Problems with the LAN

Table 81   Troubleshooting the LAN

PROBLEM	CORRECTIVE ACTION
The LAN LEDs do not turn on.	Check your Ethernet cable connections (refer to the Quick Start Guide for details). Check for faulty Ethernet cables.
	Make sure your computer's Ethernet card is working properly.
I cannot access the ZyXEL Device from the LAN.	Make sure that the IP address and the subnet mask of the ZyXEL Device and your computer(s) are on the same subnet.

22.3 Problems with the WAN

Table 82   Troubleshooting the WAN

PROBLEM	CORRECTIVE ACTION
The WAN LED is off.	When the ZyXEL Device is in router mode, check the connections between the ZyXEL Device WAN port and the cable/DSL modem or Ethernet jack. Check whether your cable/DSL device requires a crossover or straight-through cable.
I cannot get a WAN IP address from the ISP.	Click WAN to verify your settings. The username and password apply to PPPoE and PPPoA encapsulation only. Make sure that you have entered the correct **Service Type**, **User Name** and **Password** (be sure to use the correct casing). Refer to the WAN chapter.
I cannot access the Internet.	Make sure the ZyXEL Device is turned on and connected to the network. Verify your WAN settings. Refer to the chapter on WAN setup. Make sure you entered the correct user name and password. If the ZyXEL Device is in AP mode, make sure the ZyXEL Device is connected to a modem or router. If the ZyXEL Device is in WiFi WAN router mode, make sure the ZyXEL Device is NOT connected to a modem or router. The ZyXEL Device and AP or wireless router should use the same wireless and wireless security settings.
The Internet connection disconnects.	If you use PPPoE encapsulation, check the idle time-out setting. Refer to the Chapter 6 on page 93. Contact your ISP.

22.4 Problems Accessing the ZyXEL Device

Table 83   Troubleshooting Accessing the ZyXEL Device

PROBLEM	CORRECTIVE ACTION
I cannot access the ZyXEL Device.	The username is "admin". The default password is "1234". The **Password** and **Username** fields are case-sensitive. Make sure that you enter the correct password and username using the proper casing.
	If you have changed the password and have now forgotten it, you will need to upload the default configuration file. This restores all of the factory defaults including the password.
I cannot access the web configurator.	Make sure that there is not a Telnet console session running.
	Use the ZyXEL Device's WAN IP address when configuring from the WAN. Refer to the instructions on checking your WAN connection.
	Use the ZyXEL Device's LAN IP address when configuring from the LAN. Refer to for instructions on checking your LAN connection.
	Check that you have enabled web service access. If you have configured a secured client IP address, your computer's IP address must match it. Refer to the chapter on remote management for details.
	Your computer's and the ZyXEL Device's IP addresses must be on the same subnet for LAN access.
	If you changed the ZyXEL Device's LAN IP address, then enter the new one as the URL.
	See the following section to check that pop-up windows, JavaScripts and Java permissions are allowed.

22.5 Problems with Restricted Web Pages and Keyword Blocking

Table 84   Troubleshooting Restricted Web Pages and Keyword Blocking

PROBLEM	CORRECTIVE ACTION
Access to a web page with a URL containing a forbidden keyword is not blocked.	Make sure that you select the **Enable URL Keyword Blocking** check box in the Content Filtering screen. Make sure that the keywords that you type are listed in the **Keyword List**.
	If a keyword that is listed in the **Keyword List** is not blocked when it is found in a URL, customize the keyword blocking using commands. See the Customizing Keyword Blocking URL Checking section in the Content Filter chapter.

22.6 Problems with the Password

Table 85   Troubleshooting the Password

PROBLEM	CORRECTIVE ACTION
Cannot access the ZyXEL Device.	The password field is case sensitive. Make sure that you enter the correct password using the proper casing.
	Use the Reset button to restore the factory default configuration file. This will restore all of the factory defaults including the password; see section 2.3 for details.

22.7 Problems with Remote Management

Table 86   Troubleshooting Telnet

PROBLEM	CORRECTIVE ACTION
Cannot access the ZyXEL Device from the LAN or WAN.	Refer to Chapter 16 on page 163 for scenarios when remote management may not be possible.
	When NAT is enabled: • Use the ZyXEL Device's WAN IP address when configuring from the WAN. • Use the ZyXEL Device's LAN IP address when configuring from the LAN.

22.7.1 Pop-up Windows, JavaScripts and Java Permissions

In order to use the web configurator you need to allow:

- Web browser pop-up windows from your device.
- JavaScripts (enabled by default).
- Java permissions (enabled by default).

Note: Internet Explorer 6 screens are used here. Screens for other Internet Explorer versions may vary.

22.7.1.1 Internet Explorer Pop-up Blockers

You may have to disable pop-up blocking to log into your device.

Either disable pop-up blocking (enabled by default in Windows XP SP (Service Pack) 2) or allow pop-up blocking and create an exception for your device's IP address.

22.7.1.1.1 *Disable pop-up Blockers*

1 In Internet Explorer, select **Tools**, **Pop-up Blocker** and then select **Turn Off Pop-up Blocker**.

Figure 109 Pop-up Blocker
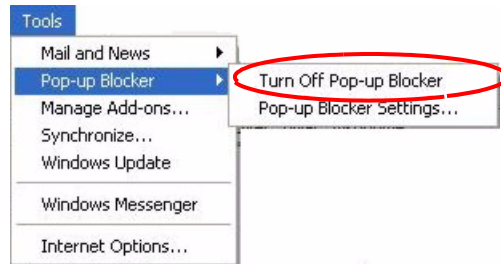
You can also check if pop-up blocking is disabled in the **Pop-up Blocker** section in the **Privacy** tab.

1 In Internet Explorer, select **Tools**, **Internet Options**, **Privacy**.

2 Clear the **Block pop-ups** check box in the **Pop-up Blocker** section of the screen. This disables any web pop-up blockers you may have enabled.

Figure 110 Internet Options
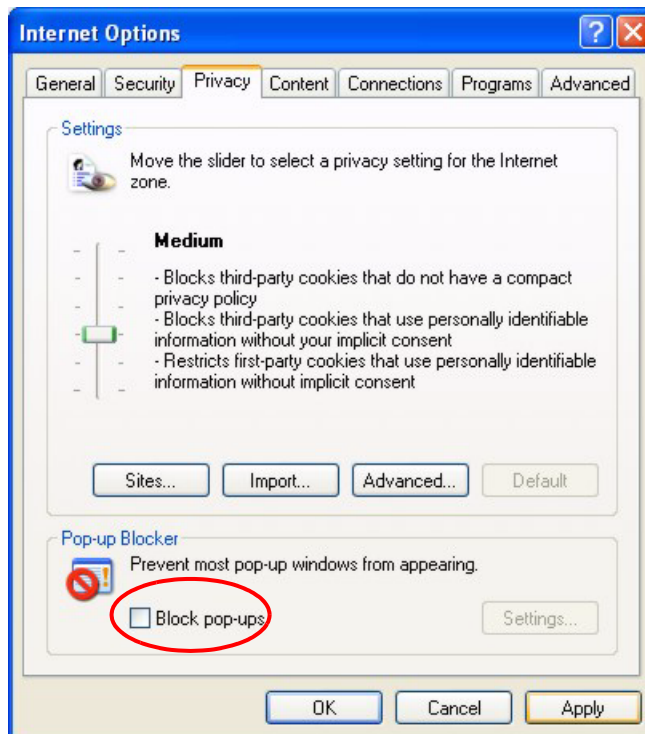
3 Click **Apply** to save this setting.

22.7.1.1.2 Enable pop-up Blockers with Exceptions

Alternatively, if you only want to allow pop-up windows from your device, see the following steps.

1 In Internet Explorer, select **Tools**, **Internet Options** and then the **Privacy** tab.

2 Select **Settings…**to open the **Pop-up Blocker Settings** screen.

Figure 111   Internet Options
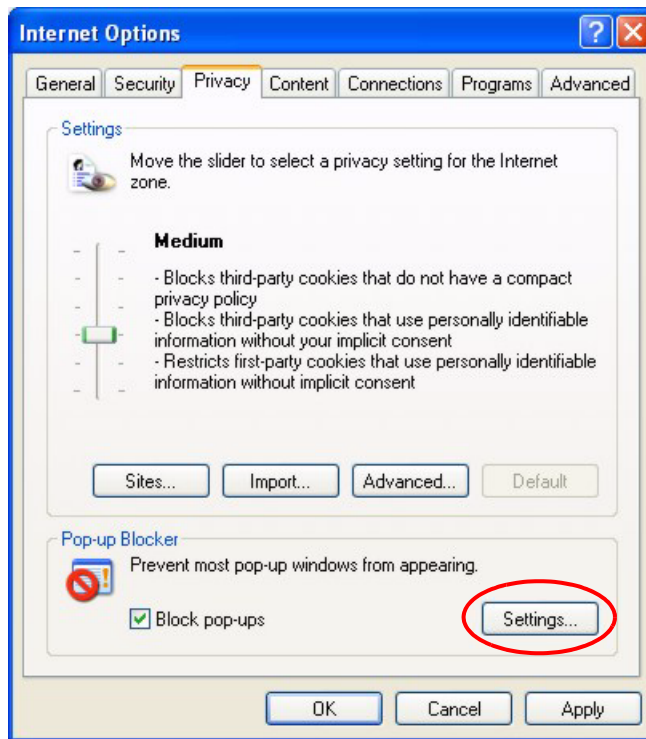
3 Type the IP address of your device (the web page that you do not want to have blocked) with the prefix "http://". For example, http://192.168.1.1.

4 Click **Add** to move the IP address to the list of **Allowed sites**.

Note: If you change the IP address of your device, make sure that the new address matches the address you type in the **Pop-up Blocker Settings** screen.

Figure 112 Pop-up Blocker Settings

5 Click **Close** to return to the **Privacy** screen.

6 Click **Apply** to save this setting.

22.7.1.2 JavaScripts

If pages of the web configurator do not display properly in Internet Explorer, check that JavaScripts are allowed.

1 In Internet Explorer, click **Tools**, **Internet Options** and then the **Security** tab.

Figure 113   Internet Options
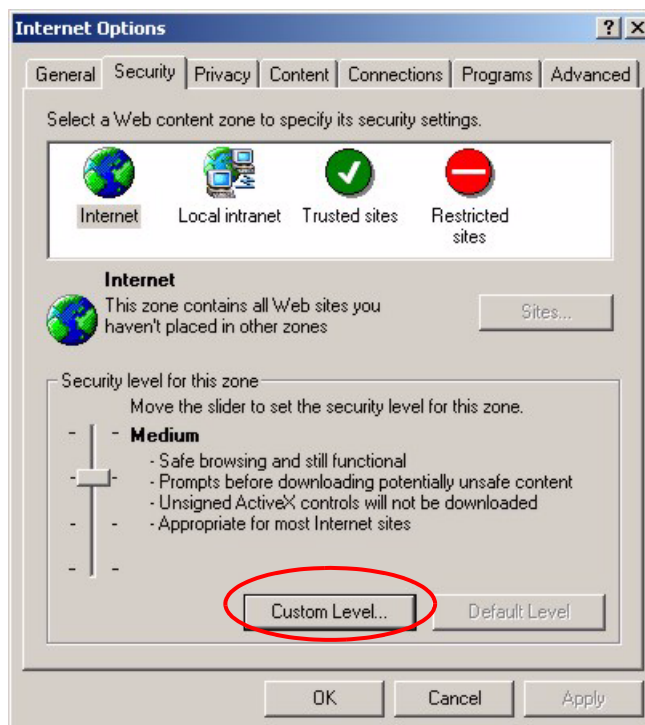
2 Click the **Custom Level...** button.

3 Scroll down to **Scripting**.

4 Under **Active scripting** make sure that **Enable** is selected (the default).

5 Under **Scripting of Java applets** make sure that **Enable** is selected (the default).

6 Click **OK** to close the window.

Figure 114 Security Settings - Java Scripting
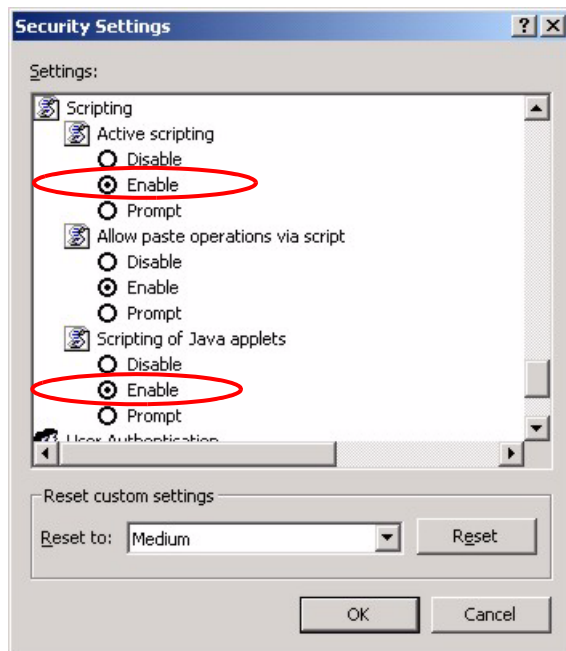
22.7.1.3 Java Permissions

1 From Internet Explorer, click **Tools**, **Internet Options** and then the **Security** tab.

2 Click the **Custom Level...** button.

3 Scroll down to **Microsoft VM**.

4 Under **Java permissions** make sure that a safety level is selected.

5 Click **OK** to close the window.

Figure 115 Security Settings - Java
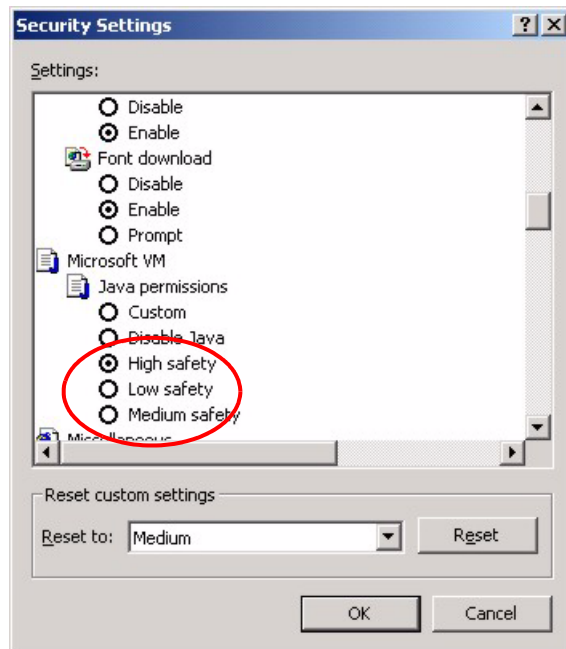
22.7.1.3.1 JAVA (Sun)

1 From Internet Explorer, click **Tools**, **Internet Options** and then the **Advanced** tab.

2 Make sure that **Use Java 2 for <applet>** under **Java (Sun)** is selected.

3 Click **OK** to close the window.

Figure 116 Java (Sun)
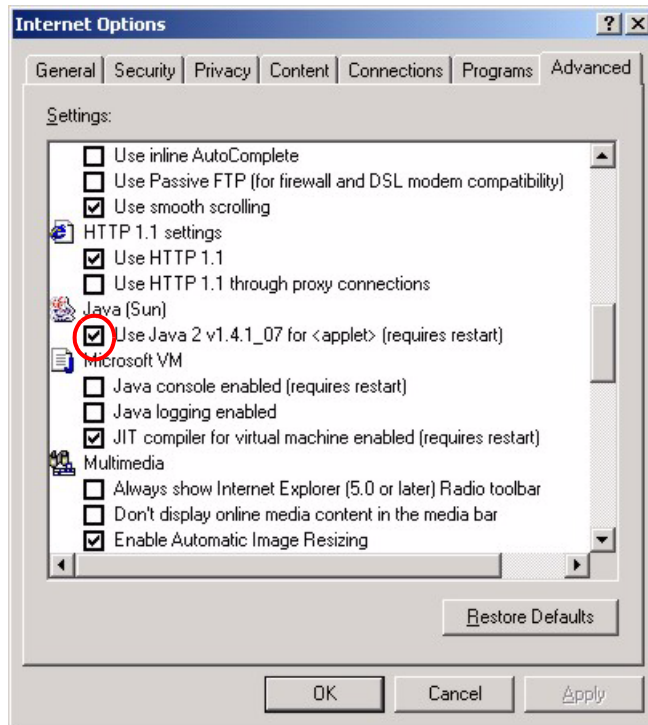
22.7.2 ActiveX Controls in Internet Explorer

If ActiveX is disabled, you will not be able to download ActiveX controls or to use Trend Micro Security Serivces. Make sure that ActiveX controls are allowed in Internet Explorer.

Screen shots for Internet Explorer 6 are shown. Steps may vary depending on your version of Internet Explorer.

   1 In Internet Explorer, click **Tools**, **Internet Options** and then the **Security** tab.

   2 In the **Internet Options** window, click **Custom Level**.

Figure 117 Internet Options Security
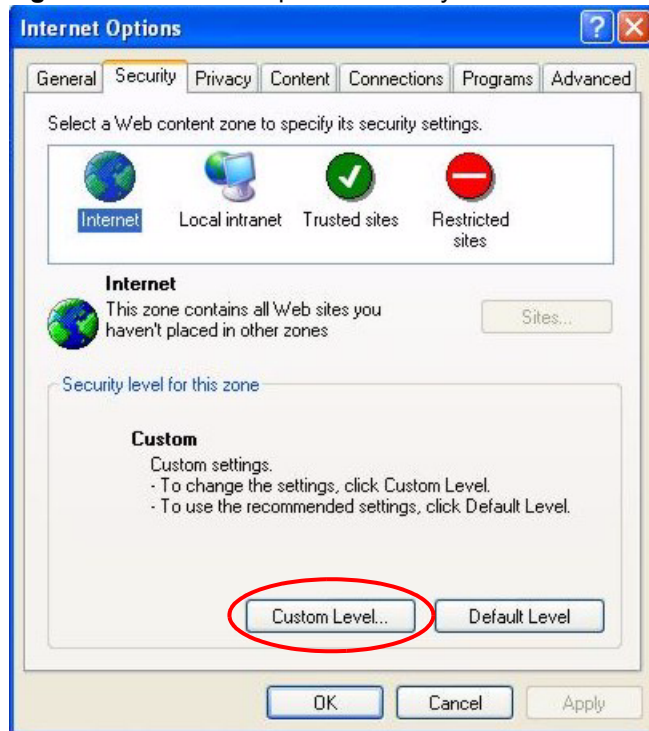
3 Scroll down to **ActiveX controls and plug-ins**.

4 Under **Download signed ActiveX controls** select the **Prompt** radio button.

5 Under **Run ActiveX controls and plug-ins** make sure the **Enable** radio button is selected.

6 Then click the **OK** button.

Figure 118 Security Setting ActiveX Controls
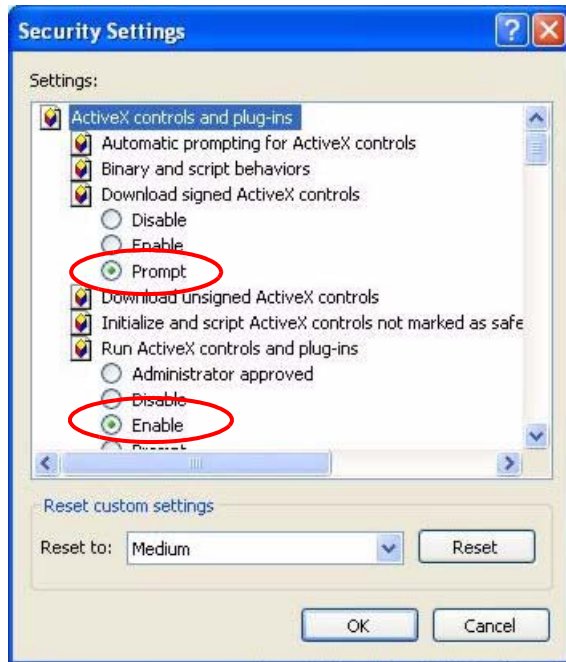
APPENDIX A
Product Specifications

The following table is a summary of other features available.

Table 87 Hardware Features

Default IP Address	192.168.1.1
Default Subnet Mask	255.255.255.0 (24 bits)
Default Password	1234
DHCP Pool	192.168.1.33 to 192.168.1.64
Dimensions (W x D x H)	190 x 128 x 33 mm
Power Specification	12 V AC 1 A
Ethernet ports	Auto-negotiating: 10 Mbps or 100 Mbps in either half-duplex or full-duplex mode. Auto-crossover: Use either crossover or straight-through Ethernet cables.
Operation Temperature	0º C ~ 50º C
Storage Temperature	-20º C ~ 60º C
Operation Humidity	20% ~ 95% RH
Storage Humidity	10% ~ 90% RH
Distance between the centers of the holes on the device's back.	125 mm
Screw size for wall-mounting	M 3*10

Table 88 Firmware Features

FEATURE	DESCRIPTION
Device Management	Use the web configurator to easily configure the rich range of features on the ZyXEL Device.
Firmware Upgrade	Download new firmware (when available) from the ZyXEL web site and use the web configurator, an FTP or a TFTP tool to put it on the ZyXEL Device. **Note:** Only upload firmware for your specific model!
Configuration Backup & Restoration	Make a copy of the ZyXEL Device's configuration and put it back on the ZyXEL Device later if you decide you want to revert back to an earlier configuration.
Network Address Translation (NAT)	Each computer on your network must have its own unique IP address. Use NAT to convert a single public IP address to multiple private IP addresses for the computers on your network.

Table 88 Firmware Features

FEATURE	DESCRIPTION
Port Forwarding	If you have a server (mail or web server for example) on your network, then use this feature to let people access it from the Internet.
DHCP (Dynamic Host Configuration Protocol)	Use this feature to have the ZyXEL Device assign IP addresses, an IP default gateway and DNS servers to computers on your network.
Dynamic DNS Support	With Dynamic DNS (Domain Name System) support, you can use a fixed URL, www.zyxel.com for example, with a dynamic IP address. You must register for this service with a Dynamic DNS service provider.
IP Multicast	IP Multicast is used to send traffic to a specific group of computers. The ZyXEL Device supports versions 1 and 2 of IGMP (Internet Group Management Protocol) used to join multicast groups (see RFC 2236).
IP Alias	IP Alias allows you to subdivide a physical network into logical networks over the same Ethernet interface with the ZyXEL Device itself as the gateway for each subnet.
Time and Date	Get the current time and date from an external server when you turn on your ZyXEL Device. You can also set the time manually. These dates and times are then used in logs.
Logging and Tracing	Use packet tracing and logs for troubleshooting. You can send logs from the ZyXEL Device to an external UNIX syslog server.
PPPoE	PPPoE mimics a dial-up over Ethernet Internet access connection.
PPTP Encapsulation	Point-to-Point Tunneling Protocol (PPTP) enables secure transfer of data through a Virtual Private Network (VPN). The ZyXEL Device supports one PPTP connection at a time.
Universal Plug and Play (UPnP)	The ZyXEL Device can communicate with other UPnP enabled devices in a network.
RoadRunner Support	In addition to standard cable modem services, the ZyXEL Device supports Time Warner's RoadRunner Service.

APPENDIX B
Wall-mounting Instructions

Do the following to hang your ZyXEL Device on a wall.

Note: See the product specifications appendix for the size of screws to use and how far apart to place them.

1 Locate a high position on wall that is free of obstructions. Use a sturdy wall.

2 Drill two holes for the screws. Make sure the distance between the centers of the holes matches what is listed in the product specifications appendix.

Note: Be careful to avoid damaging pipes or cables located inside the wall when drilling holes for the screws.

3 Do not screw the screws all the way into the wall. Leave a small gap of about 0.5 cm between the heads of the screws and the wall.

4 Make sure the screws are snugly fastened to the wall. They need to hold the weight of the ZyXEL Device with the connection cables.

5 Align the holes on the back of the ZyXEL Device with the screws on the wall. Hang the ZyXEL Device on the screws.

Figure 119 Wall-mounting Example
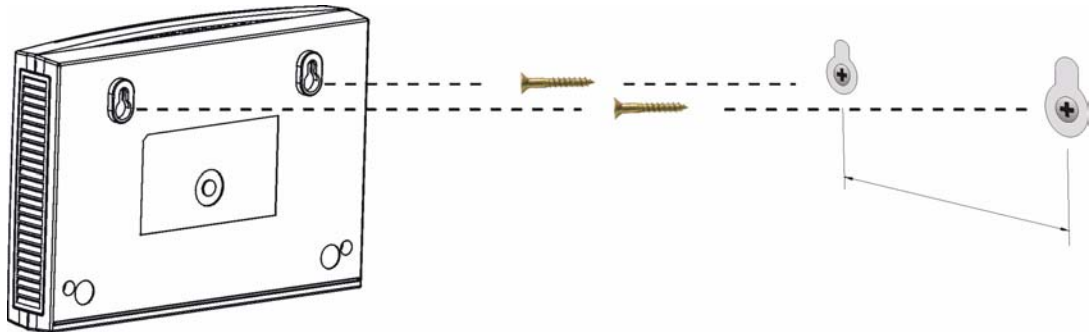
APPENDIX C

Setting up Your Computer's IP Address

All computers must have a 10M or 100M Ethernet adapter card and TCP/IP installed.

Windows 95/98/Me/NT/2000/XP, Macintosh OS 7 and later operating systems and all versions of UNIX/LINUX include the software components you need to install and use TCP/IP on your computer. Windows 3.1 requires the purchase of a third-party TCP/IP application package.

TCP/IP should already be installed on computers using Windows NT/2000/XP, Macintosh OS 7 and later operating systems.

After the appropriate TCP/IP components are installed, configure the TCP/IP settings in order to "communicate" with your network.

If you manually assign IP information instead of using dynamic assignment, make sure that your computers have IP addresses that place them in the same subnet as the ZyXEL Device's LAN port.

Windows 95/98/Me

Click **Start**, **Settings**, **Control Panel** and double-click the **Network** icon to open the **Network** window.

Figure 120   WIndows 95/98/Me: Network: Configuration
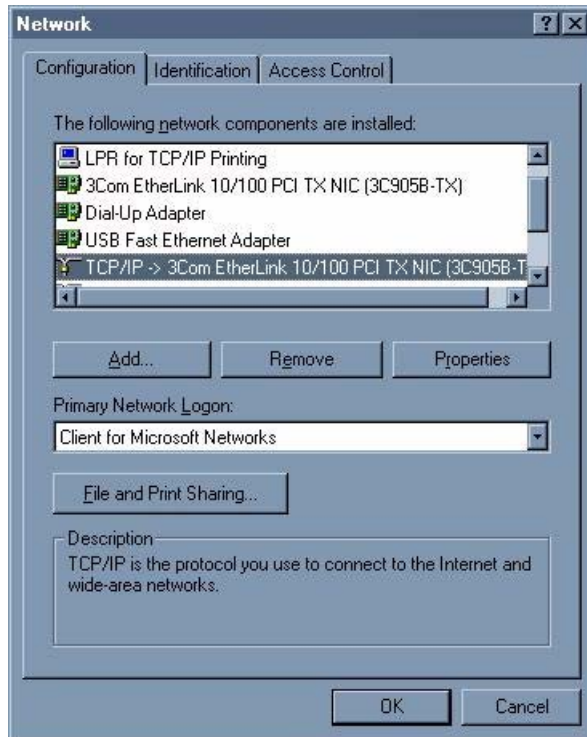
Installing Components

The **Network** window **Configuration** tab displays a list of installed components. You need a network adapter, the TCP/IP protocol and Client for Microsoft Networks.

If you need the adapter:

1 In the **Network** window, click **Add**.

2 Select **Adapter** and then click **Add**.

3 Select the manufacturer and model of your network adapter and then click **OK**.

If you need TCP/IP:

1 In the **Network** window, click **Add**.

2 Select **Protocol** and then click **Add**.

3 Select **Microsoft** from the list of **manufacturers**.

4 Select **TCP/IP** from the list of network protocols and then click **OK**.

If you need Client for Microsoft Networks:

1 Click **Add**.

2 Select **Client** and then click **Add**.

3 Select **Microsoft** from the list of manufacturers.

4 Select **Client for Microsoft Networks** from the list of network clients and then click **OK**.

5 Restart your computer so the changes you made take effect.

Configuring

1 In the **Network** window **Configuration** tab, select your network adapter's TCP/IP entry and click **Properties**

2 Click the **IP Address** tab.

- If your IP address is dynamic, select **Obtain an IP address automatically**.
- If you have a static IP address, select **Specify an IP address** and type your information into the **IP Address** and **Subnet Mask** fields.

Figure 121 Windows 95/98/Me: TCP/IP Properties: IP Address
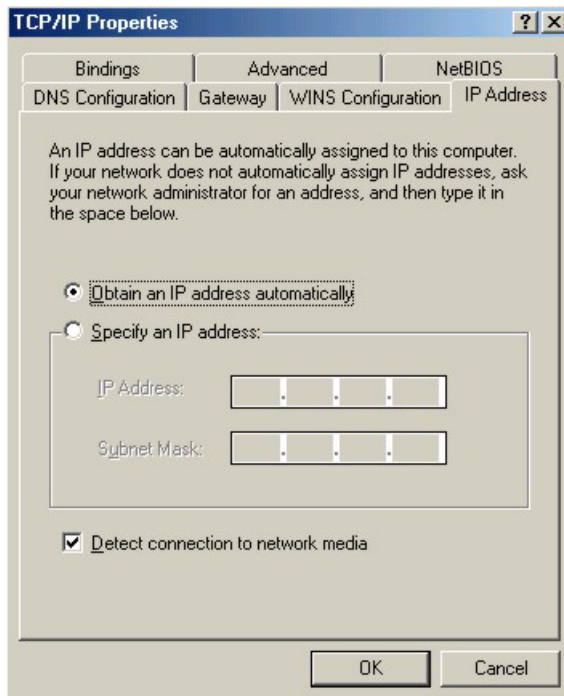
3 Click the **DNS** Configuration tab.

- If you do not know your DNS information, select **Disable DNS**.
- If you know your DNS information, select **Enable DNS** and type the information in the fields below (you may not need to fill them all in).

Figure 122   Windows 95/98/Me: TCP/IP Properties: DNS Configuration
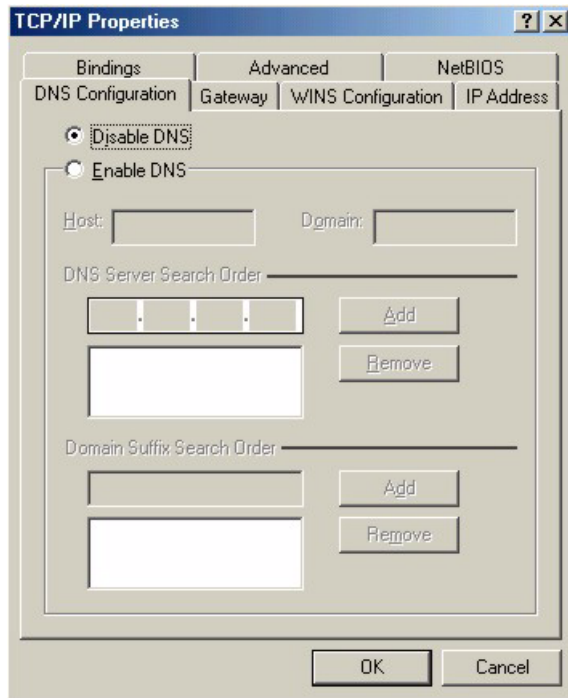
4 Click the **Gateway** tab.

- If you do not know your gateway's IP address, remove previously installed gateways.
- If you have a gateway IP address, type it in the **New gateway field** and click **Add**.

5 Click **OK** to save and close the **TCP/IP Properties** window.

6 Click **OK** to close the **Network** window. Insert the Windows CD if prompted.

7 Turn on your ZyXEL Device and restart your computer when prompted.

Verifying Settings

1 Click **Start** and then **Run**.

2 In the **Run** window, type "winipcfg" and then click **OK** to open the **IP Configuration** window.

3 Select your network adapter. You should see your computer's IP address, subnet mask and default gateway.

Windows 2000/NT/XP

The following example figures use the default Windows XP GUI theme.

1 Click **start** (**Start** in Windows 2000/NT), **Settings**, **Control Panel**.

Figure 123 Windows XP: Start Menu
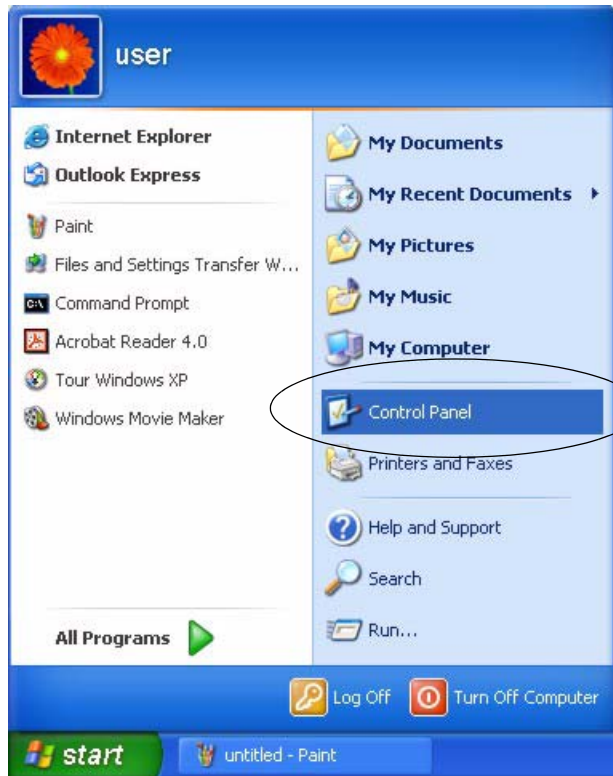
2 In the **Control Panel**, double-click **Network Connections** (**Network and Dial-up Connections** in Windows 2000/NT).

Figure 124 Windows XP: Control Panel

3 Right-click **Local Area Connection** and then click **Properties**.

Figure 125   Windows XP: Control Panel: Network Connections: Properties
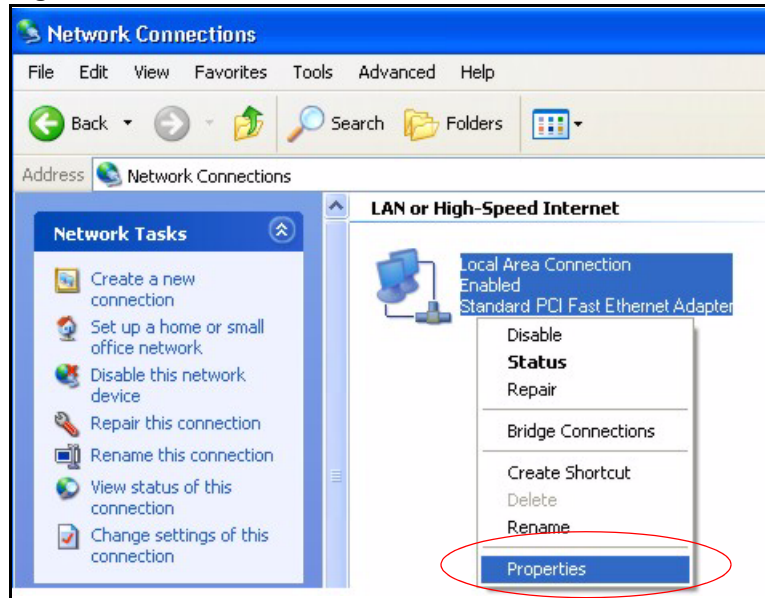
4 Select **Internet Protocol (TCP/IP)** (under the **General** tab in Win XP) and then click **Properties**.

Figure 126   Windows XP: Local Area Connection Properties
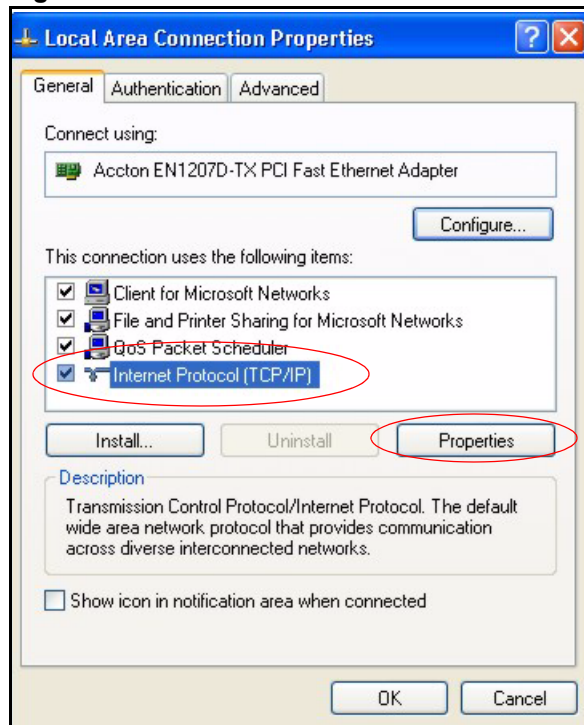
5 The **Internet Protocol TCP/IP Properties** window opens (the **General tab** in Windows XP).

- If you have a dynamic IP address click **Obtain an IP address automatically**.

- If you have a static IP address click **Use the following IP Address** and fill in the **IP address**, **Subnet mask**, and **Default gateway** fields.
- Click **Advanced**.

Figure 127 Windows XP: Internet Protocol (TCP/IP) Properties
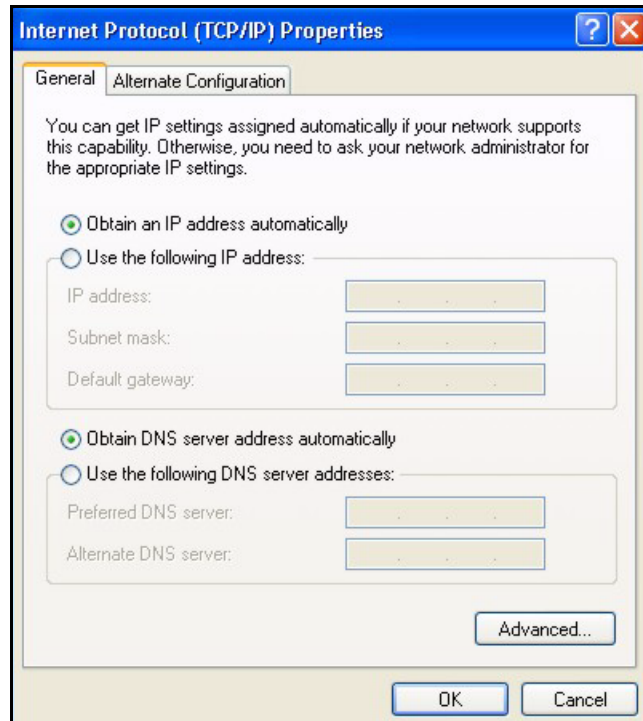
6 If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Settings** tab and click **OK**.

Do one or more of the following if you want to configure additional IP addresses:

- In the **IP Settings** tab, in IP addresses, click **Add**.
- In **TCP/IP Address**, type an IP address in **IP address** and a subnet mask in **Subnet mask**, and then click **Add**.
- Repeat the above two steps for each IP address you want to add.
- Configure additional default gateways in the **IP Settings** tab by clicking **Add** in **Default gateways**.
- In **TCP/IP Gateway Address**, type the IP address of the default gateway in **Gateway**. To manually configure a default metric (the number of transmission hops), clear the **Automatic metric** check box and type a metric in **Metric**.
- Click **Add**.
- Repeat the previous three steps for each default gateway you want to add.
- Click **OK** when finished.

Figure 128 Windows XP: Advanced TCP/IP Properties
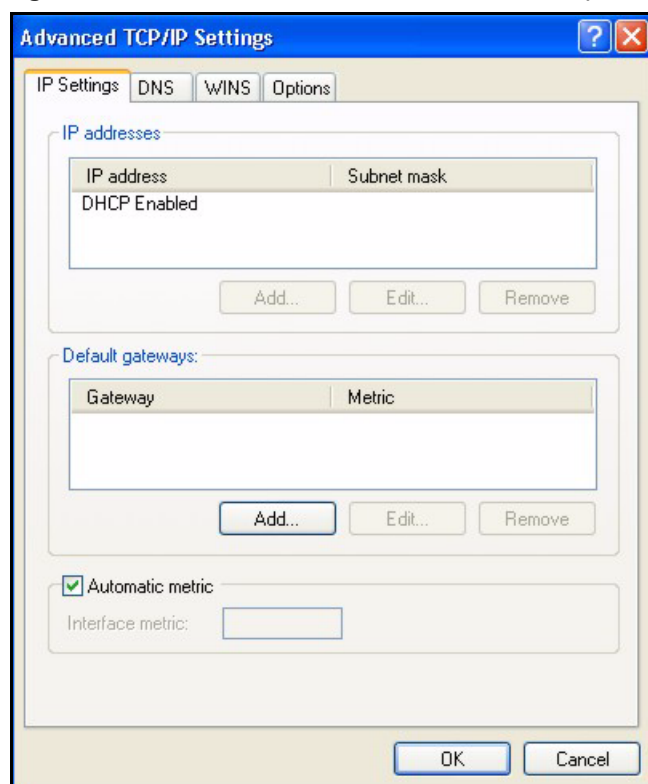
7 In the **Internet Protocol TCP/IP Properties** window (the **General tab** in Windows XP):

- Click **Obtain DNS server address automatically** if you do not know your DNS server IP address(es).

- If you know your DNS server IP address(es), click **Use the following DNS server addresses**, and type them in the **Preferred DNS server** and **Alternate DNS server** fields.

  If you have previously configured DNS servers, click **Advanced** and then the **DNS** tab to order them.

Figure 129 Windows XP: Internet Protocol (TCP/IP) Properties
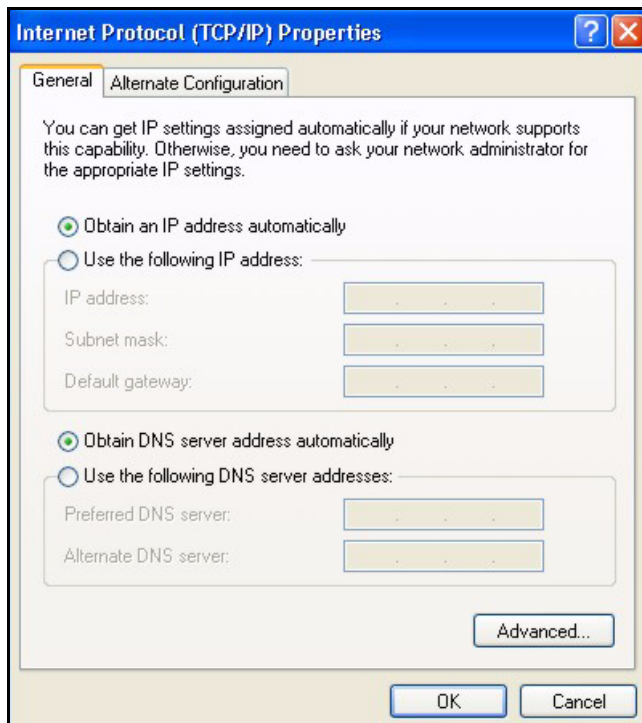
8 Click **OK** to close the **Internet Protocol (TCP/IP) Properties** window.

9 Click **Close** (**OK** in Windows 2000/NT) to close the **Local Area Connection Properties** window.

10 Close the **Network Connections** window (**Network and Dial-up Connections** in Windows 2000/NT).

11 Turn on your ZyXEL Device and restart your computer (if prompted).

Verifying Settings

1 Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.

2 In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

Macintosh OS 8/9

1 Click the **Apple** menu, **Control Panel** and double-click **TCP/IP** to open the **TCP/IP Control Panel**.

Figure 130   Macintosh OS 8/9: Apple Menu
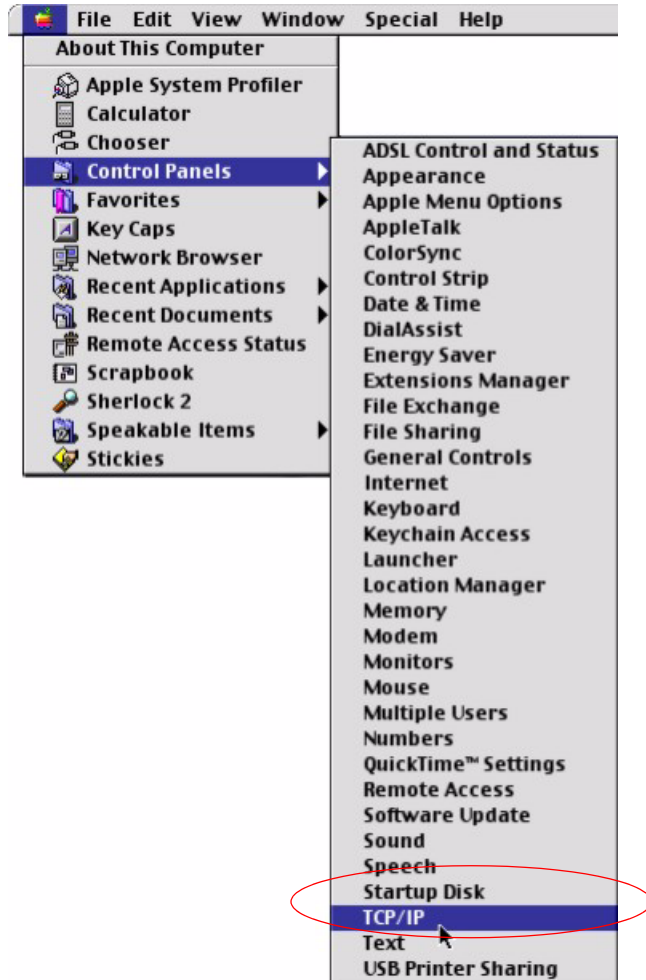
2 Select **Ethernet built-in** from the **Connect via** list.

Figure 131   Macintosh OS 8/9: TCP/IP
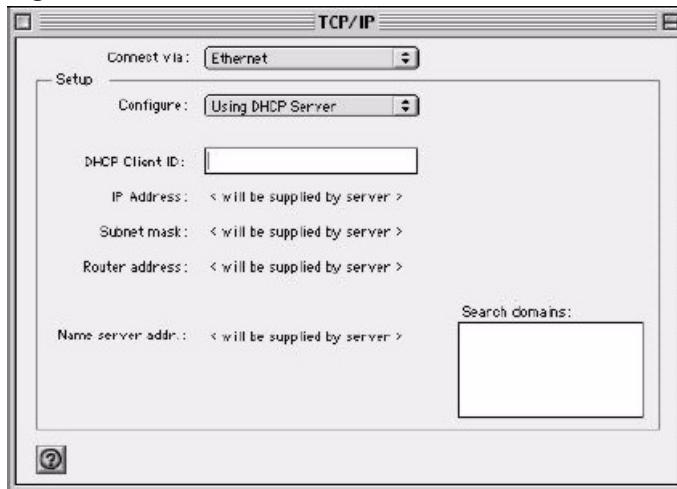
3 For dynamically assigned settings, select **Using DHCP Server** from the **Configure:** list.

4 For statically assigned settings, do the following:

- From the **Configure** box, select **Manually**.
- Type your IP address in the **IP Address** box.
- Type your subnet mask in the **Subnet mask** box.
- Type the IP address of your ZyXEL Device in the **Router address** box.

5 Close the **TCP/IP Control Panel**.

6 Click **Save** if prompted, to save changes to your configuration.

7 Turn on your ZyXEL Device and restart your computer (if prompted).

Verifying Settings

Check your TCP/IP properties in the **TCP/IP Control Panel** window.

Macintosh OS X

1 Click the **Apple** menu, and click **System Preferences** to open the **System Preferences** window.

Figure 132 Macintosh OS X: Apple Menu
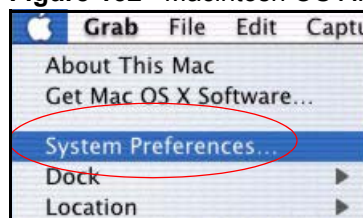
2 Click **Network** in the icon bar.

- Select **Automatic** from the **Location** list.
- Select **Built-in Ethernet** from the **Show** list.
- Click the **TCP/IP** tab.

3 For dynamically assigned settings, select **Using DHCP** from the **Configure** list.

Figure 133 Macintosh OS X: Network
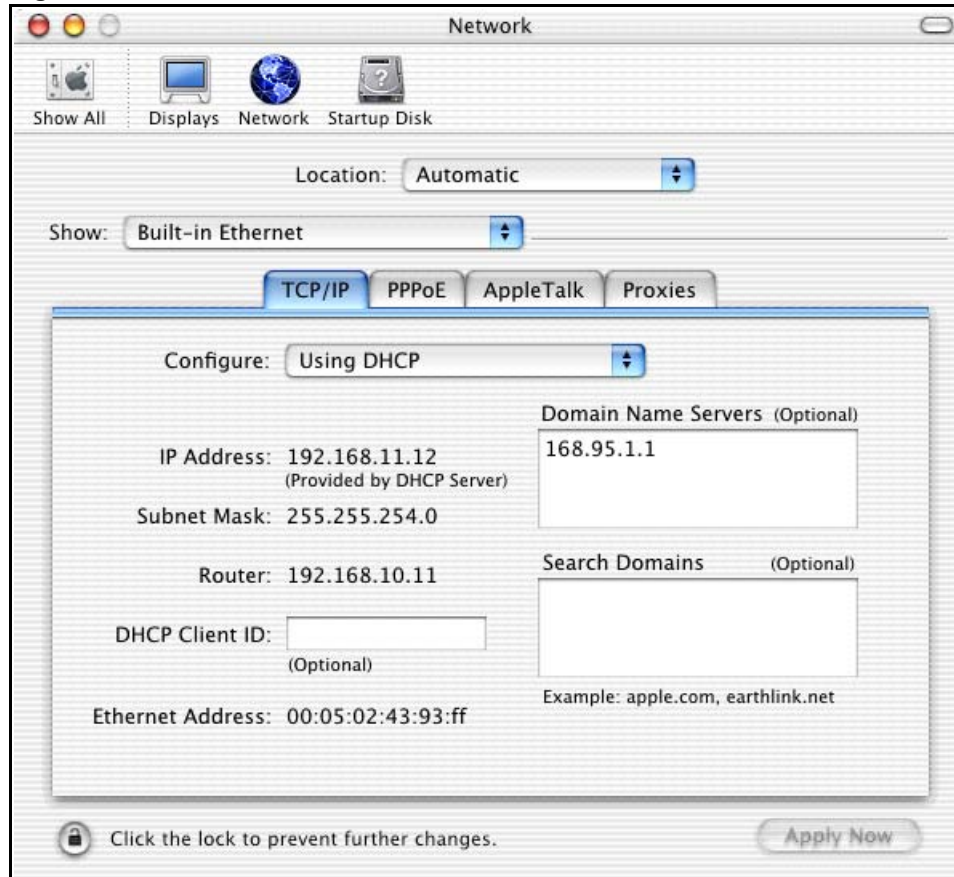
4 For statically assigned settings, do the following:

- From the **Configure** box, select **Manually**.
- Type your IP address in the **IP Address** box.
- Type your subnet mask in the **Subnet mask** box.
- Type the IP address of your ZyXEL Device in the **Router address** box.

5 Click **Apply Now** and close the window.

6 Turn on your ZyXEL Device and restart your computer (if prompted).

Verifying Settings

Check your TCP/IP properties in the **Network** window.

Linux

This section shows you how to configure your computer's TCP/IP settings in Red Hat Linux 9.0. Procedure, screens and file location may vary depending on your Linux distribution and release version.

Note: Make sure you are logged in as the root administrator.

Using the K Desktop Environment (KDE)

Follow the steps below to configure your computer IP address using the KDE.

1 Click the Red Hat button (located on the bottom left corner), select **System Setting** and click **Network**.

Figure 134 Red Hat 9.0: KDE: Network Configuration: Devices
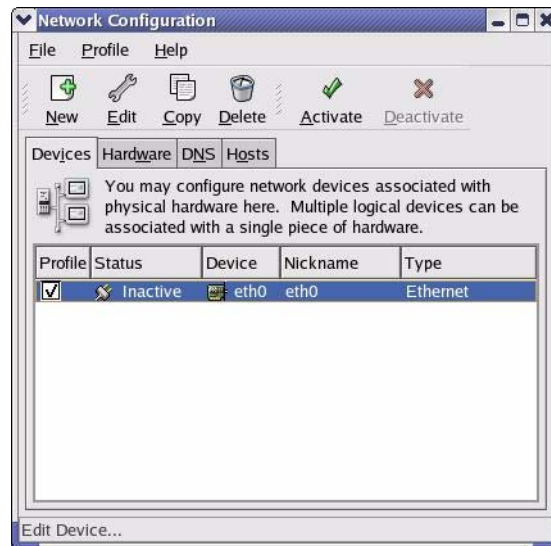
2 Double-click on the profile of the network card you wish to configure. The **Ethernet Device General** screen displays as shown.

Figure 135 Red Hat 9.0: KDE: Ethernet Device: General
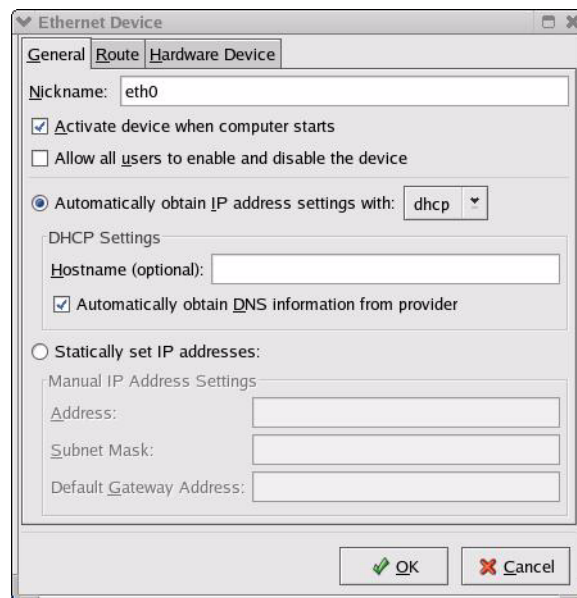
> • If you have a dynamic IP address click **Automatically obtain IP address settings with** and select **dhcp** from the drop down list.
>
> • If you have a static IP address click **Statically set IP Addresses** and fill in the **Address**, **Subnet mask**, and **Default Gateway Address** fields.

3 Click **OK** to save the changes and close the **Ethernet Device General** screen.

4 If you know your DNS server IP address(es), click the **DNS** tab in the **Network Configuration** screen. Enter the DNS server information in the fields provided.

Figure 136 Red Hat 9.0: KDE: Network Configuration: DNS
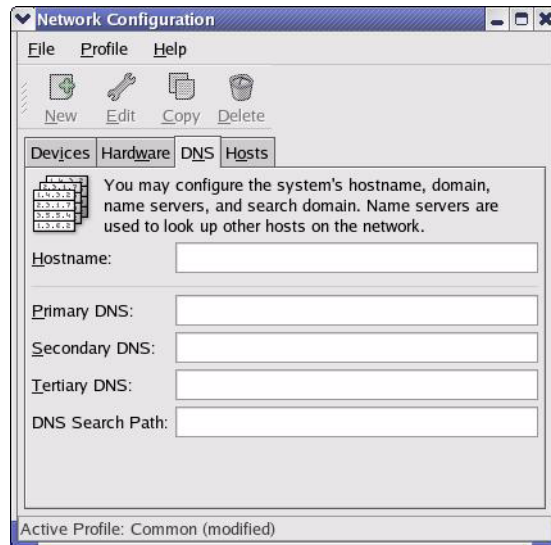
5 Click the **Devices** tab.

6 Click the **Activate** button to apply the changes. The following screen displays. Click **Yes** to save the changes in all screens.

Figure 137 Red Hat 9.0: KDE: Network Configuration: Activate
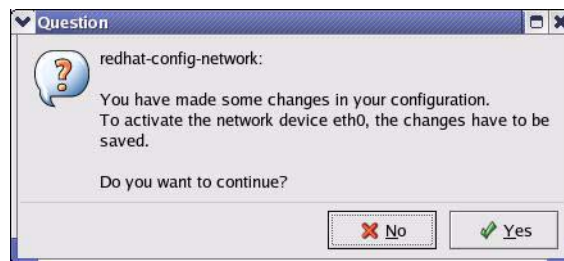
7 After the network card restart process is complete, make sure the **Status** is **Active** in the **Network Configuration** screen.

Using Configuration Files

Follow the steps below to edit the network configuration files and set your computer IP address.

1 Assuming that you have only one network card on the computer, locate the `ifconfig-eth0` configuration file (where `eth0` is the name of the Ethernet card). Open the configuration file with any plain text editor.

- If you have a dynamic IP address, enter **dhcp** in the `BOOTPROTO=` field. The following figure shows an example.

Figure 138 Red Hat 9.0: Dynamic IP Address Setting in ifconfig-eth0

```
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=dhcp
USERCTL=no
PEERDNS=yes
TYPE=Ethernet
```

- If you have a static IP address, enter **static** in the `BOOTPROTO=` field. Type `IPADDR=` followed by the IP address (in dotted decimal notation) and type `NETMASK=` followed by the subnet mask. The following example shows an example where the static IP address is 192.168.1.10 and the subnet mask is 255.255.255.0.

Figure 139 Red Hat 9.0: Static IP Address Setting in ifconfig-eth0

```
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=static
IPADDR=192.168.1.10
NETMASK=255.255.255.0
USERCTL=no
PEERDNS=yes
TYPE=Ethernet
```

2 If you know your DNS server IP address(es), enter the DNS server information in the `resolv.conf` file in the `/etc` directory. The following figure shows an example where two DNS server IP addresses are specified.

Figure 140 Red Hat 9.0: DNS Settings in resolv.conf

```
nameserver 172.23.5.1
nameserver 172.23.5.2
```

3 After you edit and save the configuration files, you must restart the network card. Enter `./network restart` in the `/etc/rc.d/init.d` directory. The following figure shows an example.

Figure 141   Red Hat 9.0: Restart Ethernet Card

```
[root@localhost init.d]# network restart

Shutting down interface eth0:                [OK]
Shutting down loopback interface:            [OK]
Setting network parameters:                  [OK]
Bringing up loopback interface:              [OK]
Bringing up interface eth0:                  [OK]
```

Verifying Settings

Enter `ifconfig` in a terminal screen to check your TCP/IP properties.

Figure 142   Red Hat 9.0: Checking TCP/IP Properties

```
[root@localhost]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:50:BA:72:5B:44
          inet addr:172.23.19.129  Bcast:172.23.19.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:717 errors:0 dropped:0 overruns:0 frame:0
          TX packets:13 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:100
          RX bytes:730412 (713.2 Kb)  TX bytes:1570 (1.5 Kb)
          Interrupt:10 Base address:0x1000
[root@localhost]#
```

APPENDIX D

IP Addresses and Subnetting

This appendix introduces IP addresses, IP address classes and subnet masks. You use subnet masks to subdivide a network into smaller logical networks.

Introduction to IP Addresses

An IP address has two parts: the network number and the host ID. Routers use the network number to send packets to the correct network, while the host ID identifies a single device on the network.

An IP address is made up of four octets, written in dotted decimal notation, for example, 192.168.1.1. (An octet is an 8-digit binary number. Therefore, each octet has a possible range of 00000000 to 11111111 in binary, or 0 to 255 in decimal.)

There are several classes of IP addresses. The first network number (192 in the above example) defines the class of IP address. These are defined as follows:

- Class A: 0 to 127
- Class B: 128 to 191
- Class C: 192 to 223
- Class D: 224 to 239
- Class E: 240 to 255

IP Address Classes and Hosts

The class of an IP address determines the number of hosts you can have on your network.

- In a class A address the first octet is the network number, and the remaining three octets are the host ID.
- In a class B address the first two octets make up the network number, and the two remaining octets make up the host ID.
- In a class C address the first three octets make up the network number, and the last octet is the host ID.

The following table shows the network number and host ID arrangement for classes A, B and C.

Table 89   Classes of IP Addresses

	OCTET 1	OCTET 2	OCTET 3	OCTET 4
Class A	**Network number**	Host ID	Host ID	Host ID
Class B	**Network number**	**Network number**	Host ID	Host ID
Class C	**Network number**	**Network number**	**Network number**	Host ID

An IP address with host IDs of all zeros is the IP address of the network (192.168.1.0 for example). An IP address with host IDs of all ones is the broadcast address for that network (192.168.1.255 for example). Therefore, to determine the total number of hosts allowed in a network, deduct two as shown next:

- A class C address (1 host octet: 8 host bits) can have $2^8 – 2$, or 254 hosts.
- A class B address (2 host octets: 16 host bits) can have $2^{16} – 2$, or 65534 hosts.

A class A address (3 host octets: 24 host bits) can have $2^{24} – 2$ hosts, or approximately 16 million hosts.

IP Address Classes and Network ID

The value of the first octet of an IP address determines the class of an address.

- Class A addresses have a **0** in the leftmost bit.
- Class B addresses have a **1** in the leftmost bit and a **0** in the next leftmost bit.
- Class C addresses start with **1 1 0** in the first three leftmost bits.
- Class D addresses begin with **1 1 1 0**. Class D addresses are used for multicasting, which is used to send information to groups of computers.
- There is also a class E. It is reserved for future use.

The following table shows the allowed ranges for the first octet of each class. This range determines the number of subnets you can have in a network.

Table 90   Allowed IP Address Range By Class

	ALLOWED RANGE OF FIRST OCTET (BINARY)	ALLOWED RANGE OF FIRST OCTET (DECIMAL)
Class A	**0**0000000 to **0**1111111	0 to 127
Class B	**10**000000 to **10**111111	128 to 191
Class C	**110**00000 to **110**11111	192 to 223
Class D	**1110**0000 to **1110**1111	224 to 239
Class E (reserved)	**1111**0000 to **1111**1111	240 to 255

Subnet Masks

A subnet mask is used to determine which bits are part of the network number, and which bits are part of the host ID (using a logical AND operation).

A subnet mask has 32 bits. If a bit in the subnet mask is a "1" then the corresponding bit in the IP address is part of the network number. If a bit in the subnet mask is "0" then the corresponding bit in the IP address is part of the host ID.

Subnet masks are expressed in dotted decimal notation just like IP addresses. The "natural" masks for class A, B and C IP addresses are as follows.

Table 91 "Natural" Masks

	NATURAL MASK
A	255.0.0.0
B	255.255.0.0
C	255.255.255.0

Subnetting

With subnetting, the class arrangement of an IP address is ignored. For example, a class C address no longer has to have 24 bits of network number and 8 bits of host ID. With subnetting, some of the host ID bits are converted into network number bits.

By convention, subnet masks always consist of a continuous sequence of ones beginning from the leftmost bit of the mask, followed by a continuous sequence of zeros, for a total number of 32 bits.

Since the mask is always a continuous number of ones beginning from the left, followed by a continuous number of zeros for the remainder of the 32 bit mask, you can simply specify the number of ones instead of writing the value of each octet. This is usually specified by writing a "/" followed by the number of bits in the mask after the address.

For example, 192.1.1.0 /25 is equivalent to saying 192.1.1.0 with mask 255.255.255.128.

The following table shows all possible subnet masks for a class "C" address using both notations.

Table 92 Alternative Subnet Mask Notation

SUBNET MASK	SUBNET MASK "1" BITS	LAST OCTET BIT VALUE	DECIMAL
255.255.255.0	/24	0000 0000	0
255.255.255.128	/25	1000 0000	128
255.255.255.192	/26	1100 0000	192
255.255.255.224	/27	1110 0000	224

Table 92 Alternative Subnet Mask Notation (continued)

SUBNET MASK	SUBNET MASK "1" BITS	LAST OCTET BIT VALUE	DECIMAL
255.255.255.240	/28	1111 0000	240
255.255.255.248	/29	1111 1000	248
255.255.255.252	/30	1111 1100	252

The first mask shown is the class "C" natural mask. Normally if no mask is specified it is understood that the natural mask is being used.

Example: Two Subnets

As an example, you have a class "C" address 192.168.1.0 with subnet mask of 255.255.255.0.

Table 93 Two Subnets Example

	NETWORK NUMBER	HOST ID
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	00000000
Subnet Mask	255.255.255.	0
Subnet Mask (Binary)	11111111.11111111.11111111.	00000000

The first three octets of the address make up the network number (class "C").

To make two networks, divide the network 192.168.1.0 into two separate subnets by converting one of the host ID bits of the IP address to a network number bit. The "borrowed" host ID bit can be either "0" or "1" thus giving two subnets; 192.168.1.0 with mask 255.255.255.128 and 192.168.1.128 with mask 255.255.255.128.

Note: In the following charts, shaded/bolded last octet bit values indicate host ID bits "borrowed" to make network ID bits. The number of "borrowed" host ID bits determines the number of subnets you can have. The remaining number of host ID bits (after "borrowing") determines the number of hosts you can have on each subnet.

Table 94 Subnet 1

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	**0**0000000
Subnet Mask	255.255.255.	128
Subnet Mask (Binary)	11111111.11111111.11111111.	**1**0000000

Table 94 Subnet 1 (continued)

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
Subnet Address: 192.168.1.0	Lowest Host ID: 192.168.1.1	
Broadcast Address: 192.168.1.127	Highest Host ID: 192.168.1.126	

Table 95 Subnet 2

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	**1**0000000
Subnet Mask	255.255.255.	128
Subnet Mask (Binary)	11111111.11111111.11111111.	**1**0000000
Subnet Address: 192.168.1.128	Lowest Host ID: 192.168.1.129	
Broadcast Address: 192.168.1.255	Highest Host ID: 192.168.1.254	

Host IDs of all zeros represent the subnet itself and host IDs of all ones are the broadcast address for that subnet, so the actual number of hosts available on each subnet in the example above is $2^7 - 2$ or 126 hosts for each subnet.

192.168.1.0 with mask 255.255.255.128 is the subnet itself, and 192.168.1.127 with mask 255.255.255.128 is the directed broadcast address for the first subnet. Therefore, the lowest IP address that can be assigned to an actual host for the first subnet is 192.168.1.1 and the highest is 192.168.1.126. Similarly the host ID range for the second subnet is 192.168.1.129 to 192.168.1.254.

Example: Four Subnets

The above example illustrated using a 25-bit subnet mask to divide a class "C" address space into two subnets. Similarly to divide a class "C" address into four subnets, you need to "borrow" two host ID bits to give four possible combinations (00, 01, 10 and 11). The subnet mask is 26 bits (11111111.11111111.11111111.**11**000000) or 255.255.255.192. Each subnet contains 6 host ID bits, giving 2^6-2 or 62 hosts for each subnet (all zeroes is the subnet itself, all ones is the broadcast address on the subnet).

Table 96 Subnet 1

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	**00**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000

Table 96 Subnet 1 (continued)

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
Subnet Address: 192.168.1.0	Lowest Host ID: 192.168.1.1	
Broadcast Address: 192.168.1.63	Highest Host ID: 192.168.1.62	

Table 97 Subnet 2

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	64
IP Address (Binary)	11000000.10101000.00000001.	**01**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.64	Lowest Host ID: 192.168.1.65	
Broadcast Address: 192.168.1.127	Highest Host ID: 192.168.1.126	

Table 98 Subnet 3

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	**10**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.128	Lowest Host ID: 192.168.1.129	
Broadcast Address: 192.168.1.191	Highest Host ID: 192.168.1.190	

Table 99 Subnet 4

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	192
IP Address (Binary)	11000000.10101000.00000001.	**11**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.192	Lowest Host ID: 192.168.1.193	
Broadcast Address: 192.168.1.255	Highest Host ID: 192.168.1.254	

Example Eight Subnets

Similarly use a 27-bit mask to create eight subnets (000, 001, 010, 011, 100, 101, 110 and 111).

The following table shows class C IP address last octet values for each subnet.

Table 100   Eight Subnets

	SUBNET ADDRESS	FIRST ADDRESS	LAST ADDRESS	BROADCAST ADDRESS
1	0	1	30	31
2	32	33	62	63
3	64	65	94	95
4	96	97	126	127
5	128	129	158	159
6	160	161	190	191
7	192	193	222	223
8	224	225	254	255

The following table is a summary for class "C" subnet planning.

Table 101   Class C Subnet Planning

	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
1	255.255.255.128 (/25)	2	126
2	255.255.255.192 (/26)	4	62
3	255.255.255.224 (/27)	8	30
4	255.255.255.240 (/28)	16	14
5	255.255.255.248 (/29)	32	6
6	255.255.255.252 (/30)	64	2
7	255.255.255.254 (/31)	128	1

Subnetting With Class A and Class B Networks.

For class "A" and class "B" addresses the subnet mask also determines which bits are part of the network number and which are part of the host ID.

A class "B" address has two host ID octets available for subnetting and a class "A" address has three host ID octets (see Table 89 on page 228) available for subnetting.

The following table is a summary for class "B" subnet planning.

Table 102 Class B Subnet Planning

	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
1	255.255.128.0 (/17)	2	32766
2	255.255.192.0 (/18)	4	16382
3	255.255.224.0 (/19)	8	8190
4	255.255.240.0 (/20)	16	4094
5	255.255.248.0 (/21)	32	2046
6	255.255.252.0 (/22)	64	1022
7	255.255.254.0 (/23)	128	510
8	255.255.255.0 (/24)	256	254
9	255.255.255.128 (/25)	512	126
10	255.255.255.192 (/26)	1024	62
11	255.255.255.224 (/27)	2048	30
12	255.255.255.240 (/28)	4096	14
13	255.255.255.248 (/29)	8192	6
14	255.255.255.252 (/30)	16384	2
15	255.255.255.254 (/31)	32768	1

APPENDIX E
Wireless LANs

Wireless LAN Topologies

This section discusses ad-hoc and infrastructure wireless LAN topologies.

Ad-hoc Wireless LAN Configuration

The simplest WLAN configuration is an independent (Ad-hoc) WLAN that connects a set of computers with wireless adapters (A, B, C). Any time two or more wireless adapters are within range of each other, they can set up an independent network, which is commonly referred to as an Ad-hoc network or Independent Basic Service Set (IBSS). The following diagram shows an example of notebook computers using wireless adapters to form an Ad-hoc wireless LAN.

Figure 143   Peer-to-Peer Communication in an Ad-hoc Network
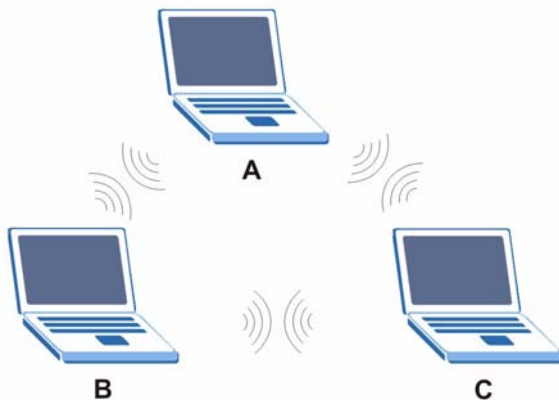
BSS

A Basic Service Set (BSS) exists when all communications between wireless clients or between a wireless client and a wired network client go through one access point (AP).

Intra-BSS traffic is traffic between wireless clients in the BSS. When Intra-BSS is enabled, wireless client **A** and **B** can access the wired network and communicate with each other. When Intra-BSS is disabled, wireless client **A** and **B** can still access the wired network but cannot communicate with each other.

Figure 144   Basic Service Set
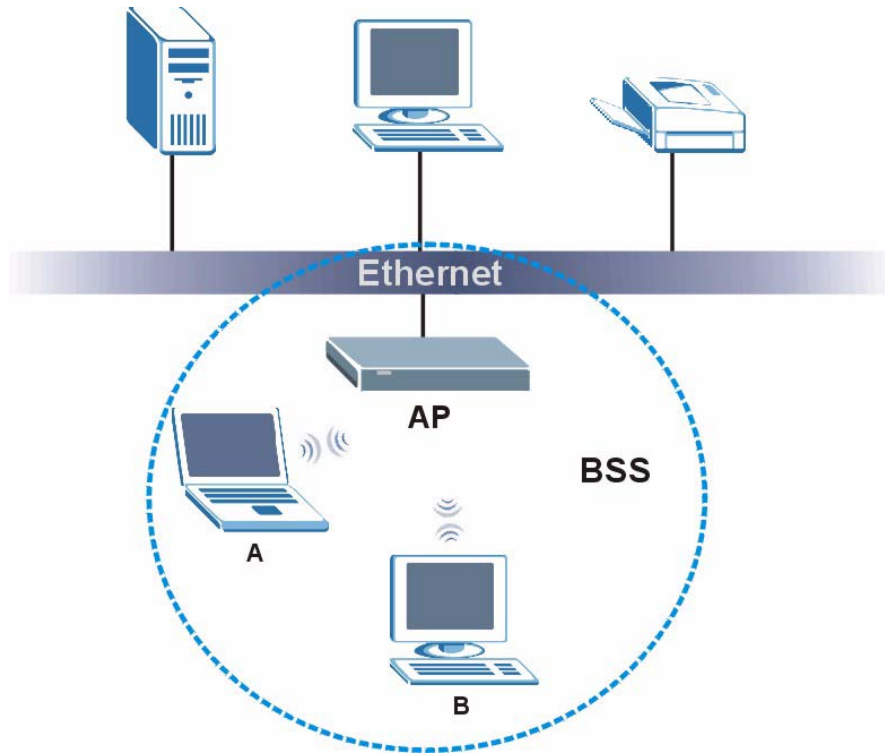
ESS

An Extended Service Set (ESS) consists of a series of overlapping BSSs, each containing an access point, with each access point connected together by a wired network. This wired connection between APs is called a Distribution System (DS).

This type of wireless LAN topology is called an Infrastructure WLAN. The Access Points not only provide communication with the wired network but also mediate wireless network traffic in the immediate neighborhood.

An ESSID (ESS IDentification) uniquely identifies each ESS. All access points and their associated wireless clients within the same ESS must have the same ESSID in order to communicate.

Figure 145 Infrastructure WLAN
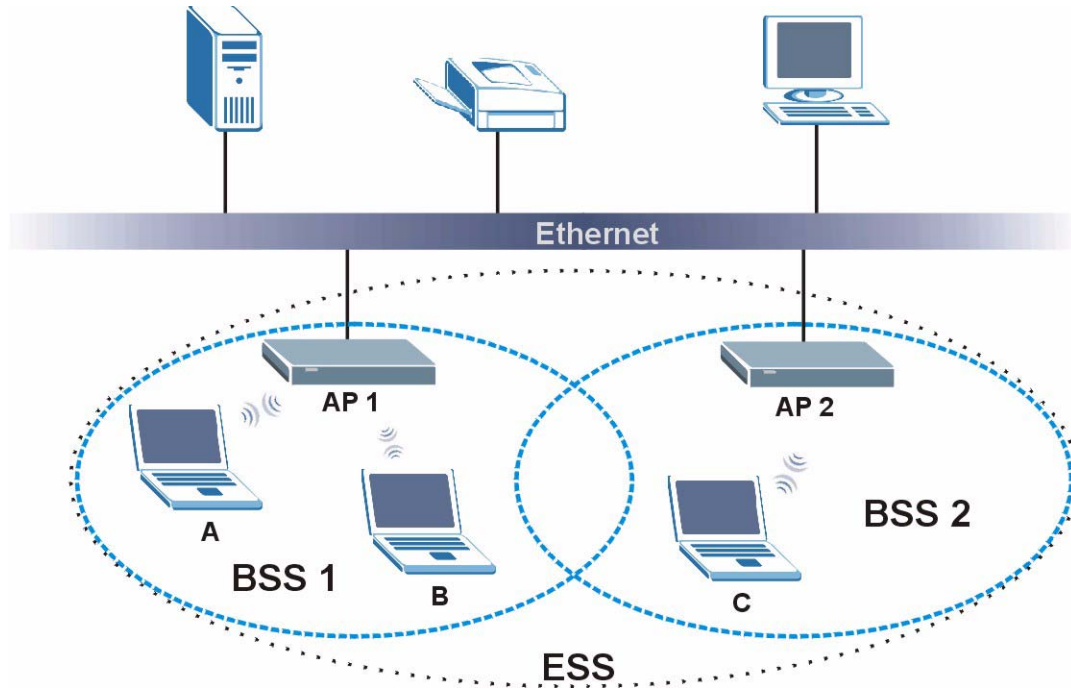
Channel

A channel is the radio frequency(ies) used by IEEE 802.11a/b/g wireless devices. Channels available depend on your geographical area. You may have a choice of channels (for your region) so you should use a different channel than an adjacent AP (access point) to reduce interference. Interference occurs when radio signals from different access points overlap causing interference and degrading performance.

Adjacent channels partially overlap however. To avoid interference due to overlap, your AP should be on a channel at least five channels away from a channel that an adjacent AP is using. For example, if your region has 11 channels and an adjacent AP is using channel 1, then you need to select a channel between 6 or 11.

RTS/CTS

A hidden node occurs when two stations are within range of the same access point, but are not within range of each other. The following figure illustrates a hidden node. Both stations (STA) are within range of the access point (AP) or wireless gateway, but out-of-range of each other, so they cannot "hear" each other, that is they do not know if the channel is currently being used. Therefore, they are considered hidden from each other.

Figure 146 RTS/CTS
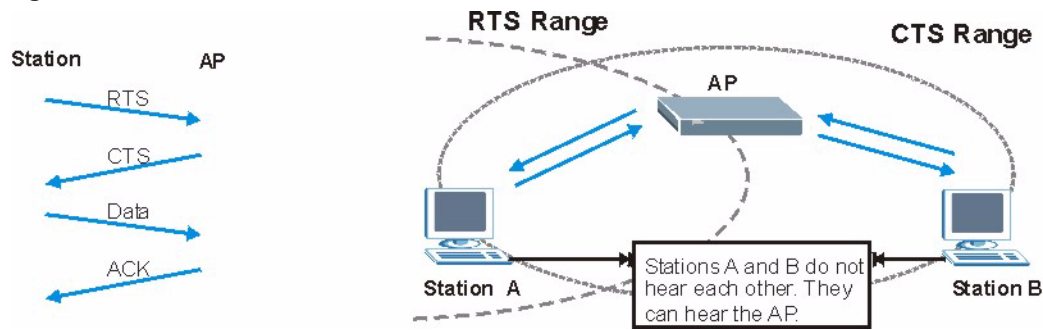
When station **A** sends data to the AP, it might not know that the station **B** is already using the channel. If these two stations send data at the same time, collisions may occur when both sets of data arrive at the AP at the same time, resulting in a loss of messages for both stations.

RTS/CTS is designed to prevent collisions due to hidden nodes. An **RTS/CTS** defines the biggest size data frame you can send before an RTS (Request To Send)/CTS (Clear to Send) handshake is invoked.

When a data frame exceeds the **RTS/CTS** value you set (between 0 to 2432 bytes), the station that wants to transmit this frame must first send an RTS (Request To Send) message to the AP for permission to send it. The AP then responds with a CTS (Clear to Send) message to all other stations within its range to notify them to defer their transmission. It also reserves and confirms with the requesting station the time frame for the requested transmission.

Stations can send frames smaller than the specified **RTS/CTS** directly to the AP without the RTS (Request To Send)/CTS (Clear to Send) handshake.

You should only configure **RTS/CTS** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake.

If the **RTS/CTS** value is greater than the **Fragmentation Threshold** value (see next), then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

Note: Enabling the RTS Threshold causes redundant network overhead that could negatively affect the throughput performance instead of providing a remedy.

Fragmentation Threshold

A **Fragmentation Threshold** is the maximum data fragment size (between 256 and 2432 bytes) that can be sent in the wireless network before the AP will fragment the packet into smaller data frames.

A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference.

If the **Fragmentation Threshold** value is smaller than the **RTS/CTS** value (see previously) you set then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

Preamble Type

Preamble is used to signal that data is coming to the receiver. **Short** and **Long** refer to the length of the syncronization field in a packet.

Short preamble increases performance as less time sending preamble means more time for sending data. All IEEE 802.11b/g compliant wireless adapters support long preamble, but not all support short preamble.

Select **Long** preamble if you are unsure what preamble mode the wireless adapters support, and to provide more reliable communications in busy wireless networks.

Select **Short** preamble if you are sure the wireless adapters support it, and to provide more efficient communications.

Select **Dynamic** to have the AP automatically use short preamble when wireless adapters support it, otherwise the AP uses long preamble.

Note: The AP and the wireless adapters MUST use the same preamble mode in order to communicate.

IEEE 802.11g Wireless LAN

IEEE 802.11g is fully compatible with the IEEE 802.11b standard. This means an IEEE 802.11b adapter can interface directly with an IEEE 802.11g access point (and vice versa) at 11 Mbps or lower depending on range. IEEE 802.11g has several intermediate rate steps between the maximum and minimum data rates. The IEEE 802.11g data rate and modulation are as follows:

Table 103 IEEE 802.11g

DATA RATE (MBPS)	MODULATION
1	DBPSK (Differential Binary Phase Shift Keyed)
2	DQPSK (Differential Quadrature Phase Shift Keying)
5.5 / 11	CCK (Complementary Code Keying)
6/9/12/18/24/36/48/54	OFDM (Orthogonal Frequency Division Multiplexing)

Wireless Security Overview

Wireless security is vital to your network to protect wireless communication between wireless clients, access points and the wired network.

Wireless security methods available on the ZyXEL Device are data encryption, wireless client authentication, restricting access by device MAC address and hiding the ZyXEL Device identity.

The following figure shows the relative effectiveness of these wireless security methods available on your ZyXEL Device.

Table 104   Wireless Security Levels

Security Level	Security Type
Least Secure	Unique SSID (Default)
	Unique SSID with Hide SSID Enabled
	MAC Address Filtering
	WEP Encryption
	IEEE802.1x EAP with RADIUS Server Authentication
	Wi-Fi Protected Access (WPA)
Most Secure	WPA2

Note: You must enable the same wireless security settings on the ZyXEL Device and on all wireless clients that you want to associate with it.

IEEE 802.1x

In June 2001, the IEEE 802.1x standard was designed to extend the features of IEEE 802.11 to support extended authentication as well as providing additional accounting and control features. It is supported by Windows XP and a number of network devices. Some advantages of IEEE 802.1x are:

- User based identification that allows for roaming.
- Support for RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) for centralized user profile and accounting management on a network RADIUS server.
- Support for EAP (Extensible Authentication Protocol, RFC 2486) that allows additional authentication methods to be deployed with no changes to the access point or the wireless clients.

RADIUS

RADIUS is based on a client-server model that supports authentication, authorization and accounting. The access point is the client and the server is the RADIUS server. The RADIUS server handles the following tasks:

- Authentication

  Determines the identity of the users.

- Authorization

  Determines the network services available to authenticated users once they are connected to the network.

- Accounting

  Keeps track of the client's network activity.

RADIUS is a simple package exchange in which your AP acts as a message relay between the wireless client and the network RADIUS server.

Types of RADIUS Messages

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user authentication:

- Access-Request

  Sent by an access point requesting authentication.

- Access-Reject

  Sent by a RADIUS server rejecting access.

- Access-Accept

  Sent by a RADIUS server allowing access.

- Access-Challenge

  Sent by a RADIUS server requesting more information in order to allow access. The access point sends a proper response from the user and then sends another Access-Request message.

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user accounting:

- Accounting-Request

  Sent by the access point requesting accounting.

- Accounting-Response

  Sent by the RADIUS server to indicate that it has started or stopped accounting.

In order to ensure network security, the access point and the RADIUS server use a shared secret key, which is a password, they both know. The key is not sent over the network. In addition to the shared key, password information exchanged is also encrypted to protect the network from unauthorized access.

Types of Authentication

This section discusses some popular authentication types: **EAP-MD5**, **EAP-TLS**, **EAP-TTLS**, **PEAP** and **LEAP**.

The type of authentication you use depends on the RADIUS server or the AP. Consult your network administrator for more information.

EAP-MD5 (Message-Digest Algorithm 5)

MD5 authentication is the simplest one-way authentication method. The authentication server sends a challenge to the wireless client. The wireless client 'proves' that it knows the password by encrypting the password with the challenge and sends back the information. Password is not sent in plain text.

However, MD5 authentication has some weaknesses. Since the authentication server needs to get the plaintext passwords, the passwords must be stored. Thus someone other than the authentication server may access the password file. In addition, it is possible to impersonate an authentication server as MD5 authentication method does not perform mutual authentication. Finally, MD5 authentication method does not support data encryption with dynamic session key. You must configure WEP encryption keys for data encryption.

EAP-TLS (Transport Layer Security)

With EAP-TLS, digital certifications are needed by both the server and the wireless clients for mutual authentication. The server presents a certificate to the client. After validating the identity of the server, the client sends a different certificate to the server. The exchange of certificates is done in the open before a secured tunnel is created. This makes user identity vulnerable to passive attacks. A digital certificate is an electronic ID card that authenticates the sender's identity. However, to implement EAP-TLS, you need a Certificate Authority (CA) to handle certificates, which imposes a management overhead.

EAP-TTLS (Tunneled Transport Layer Service)

EAP-TTLS is an extension of the EAP-TLS authentication that uses certificates for only the server-side authentications to establish a secure connection. Client authentication is then done by sending username and password through the secure connection, thus client identity is protected. For client authentication, EAP-TTLS supports EAP methods and legacy authentication methods such as PAP, CHAP, MS-CHAP and MS-CHAP v2.

PEAP (Protected EAP)

Like EAP-TTLS, server-side certificate authentication is used to establish a secure connection, then use simple username and password methods through the secured connection to authenticate the clients, thus hiding client identity. However, PEAP only supports EAP methods, such as EAP-MD5, EAP-MSCHAPv2 and EAP-GTC (EAP-Generic Token Card), for client authentication. EAP-GTC is implemented only by Cisco.

LEAP

LEAP (Lightweight Extensible Authentication Protocol) is a Cisco implementation of IEEE 802.1x.

Dynamic WEP Key Exchange

The AP maps a unique key that is generated with the RADIUS server. This key expires when the wireless connection times out, disconnects or reauthentication times out. A new WEP key is generated each time reauthentication is performed.

If this feature is enabled, it is not necessary to configure a default encryption key in the Wireless screen. You may still configure and store keys here, but they will not be used while Dynamic WEP is enabled.

Note: EAP-MD5 cannot be used with Dynamic WEP Key Exchange

For added security, certificate-based authentications (EAP-TLS, EAP-TTLS and PEAP) use dynamic keys for data encryption. They are often deployed in corporate environments, but for public deployment, a simple user name and password pair is more practical. The following table is a comparison of the features of authentication types.

Table 105   Comparison of EAP Authentication Types

		EAP-TLS	EAP-TTLS	PEAP	LEAP
Mutual Authentication	No	Yes	Yes	Yes	Yes
Certificate – Client	No	Yes	Optional	Optional	No
Certificate – Server	No	Yes	Yes	Yes	No
Dynamic Key Exchange	No	Yes	Yes	Yes	Yes
Credential Integrity	None	Strong	Strong	Strong	Moderate
Deployment Difficulty	Easy	Hard	Moderate	Moderate	Moderate
Client Identity Protection	No	No	Yes	Yes	No

WPA and WPA2

Wi-Fi Protected Access (WPA) is a subset of the IEEE 802.11i standard. WPA2 (IEEE 802.11i) is a wireless security standard that defines stronger encryption, authentication and key management than WPA.

Key differences between WPA or WPA2 and WEP are improved data encryption and user authentication.

If both an AP and the wireless clients support WPA2 and you have an external RADIUS server, use WPA2 for stronger data encryption. If you don't have an external RADIUS server, you should use WPA2-PSK (WPA2-Pre-Shared Key) that only requires a single (identical) password entered into each access point, wireless gateway and wireless client. As long as the passwords match, a wireless client will be granted access to a WLAN.

If the AP or the wireless clients do not support WPA2, just use WPA or WPA-PSK depending on whether you have an external RADIUS server or not.

Select WEP only when the AP and/or wireless clients do not support WPA or WPA2. WEP is less secure than WPA or WPA2.

Encryption

Both WPA and WPA2 improve data encryption by using Temporal Key Integrity Protocol (TKIP), Message Integrity Check (MIC) and IEEE 802.1x. WPA and WPA2 use Advanced Encryption Standard (AES) in the Counter mode with Cipher block chaining Message authentication code Protocol (CCMP) to offer stronger encryption than TKIP.

TKIP uses 128-bit keys that are dynamically generated and distributed by the authentication server. AES (Advanced Encryption Standard) is a block cipher that uses a 256-bit mathematical algorithm called Rijndael. They both include a per-packet key mixing function, a Message Integrity Check (MIC) named Michael, an extended initialization vector (IV) with sequencing rules, and a re-keying mechanism.

WPA and WPA2 regularly change and rotate the encryption keys so that the same encryption key is never used twice.

The RADIUS server distributes a Pairwise Master Key (PMK) key to the AP that then sets up a key hierarchy and management system, using the PMK to dynamically generate unique data encryption keys to encrypt every data packet that is wirelessly communicated between the AP and the wireless clients. This all happens in the background automatically.

The Message Integrity Check (MIC) is designed to prevent an attacker from capturing data packets, altering them and resending them. The MIC provides a strong mathematical function in which the receiver and the transmitter each compute and then compare the MIC. If they do not match, it is assumed that the data has been tampered with and the packet is dropped.

By generating unique data encryption keys for every data packet and by creating an integrity checking mechanism (MIC), with TKIP and AES it is more difficult to decrypt data on a Wi-Fi network than WEP and difficult for an intruder to break into the network.

The encryption mechanisms used for WPA(2) and WPA(2)-PSK are the same. The only difference between the two is that WPA(2)-PSK uses a simple common password, instead of user-specific credentials. The common-password approach makes WPA(2)-PSK susceptible to brute-force password-guessing attacks but it's still an improvement over WEP as it employs a consistent, single, alphanumeric password to derive a PMK which is used to generate unique temporal encryption keys. This prevent all wireless devices sharing the same encryption keys. (a weakness of WEP)

User Authentication

WPA and WPA2 apply IEEE 802.1x and Extensible Authentication Protocol (EAP) to authenticate wireless clients using an external RADIUS database. WPA2 reduces the number of key exchange messages from six to four (CCMP 4-way handshake) and shortens the time required to connect to a network. Other WPA2 authentication features that are different from WPA include key caching and pre-authentication. These two features are optional and may not be supported in all wireless devices.

Key caching allows a wireless client to store the PMK it derived through a successful authentication with an AP. The wireless client uses the PMK when it tries to connect to the same AP and does not need to go with the authentication process again.

Pre-authentication enables fast roaming by allowing the wireless client (already connecting to an AP) to perform IEEE 802.1x authentication with another AP before connecting to it.

Wireless Client WPA Supplicants

A wireless client supplicant is the software that runs on an operating system instructing the wireless client how to use WPA. At the time of writing, the most widely available supplicant is the WPA patch for Windows XP, Funk Software's Odyssey client.

The Windows XP patch is a free download that adds WPA capability to Windows XP's built-in "Zero Configuration" wireless client. However, you must run Windows XP to use it.

WPA(2) with RADIUS Application Example

You need the IP address of the RADIUS server, its port number (default is 1812), and the RADIUS shared secret. A WPA(2) application example with an external RADIUS server looks as follows. "A" is the RADIUS server. "DS" is the distribution system.

1 The AP passes the wireless client's authentication request to the RADIUS server.

2 The RADIUS server then checks the user's identification against its database and grants or denies network access accordingly.

3 The RADIUS server distributes a Pairwise Master Key (PMK) key to the AP that then sets up a key hierarchy and management system, using the pair-wise key to dynamically generate unique data encryption keys to encrypt every data packet that is wirelessly communicated between the AP and the wireless clients.

Figure 147 WPA(2) with RADIUS Application Example
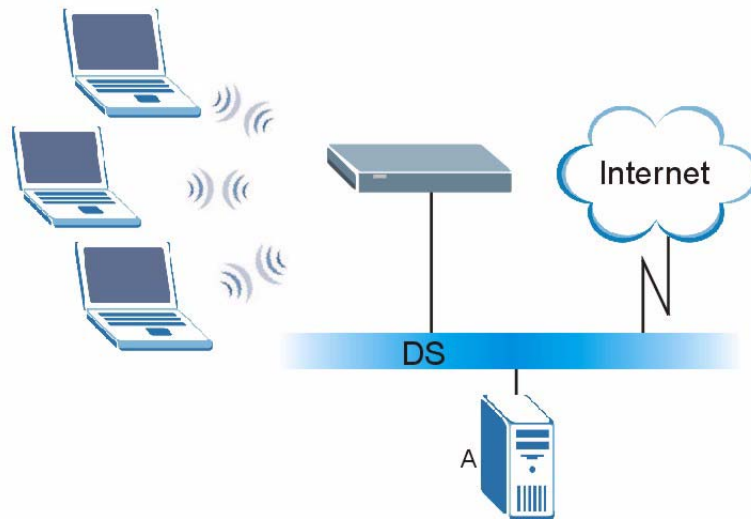
WPA(2)-PSK Application Example

A WPA(2)-PSK application looks as follows.

1 First enter identical passwords into the AP and all wireless clients. The Pre-Shared Key (PSK) must consist of between 8 and 63 ASCII characters or 64 hexadecimal characters (including spaces and symbols).

2 The AP checks each wireless client's password and (only) allows it to join the network if the password matches.

3 The AP and wireless clients use the pre-shared key to generate a common PMK (Pairwise Master Key).

4 The AP and wireless clients use the TKIP or AES encryption process to encrypt data exchanged between them.

Figure 148 WPA(2)-PSK Authentication
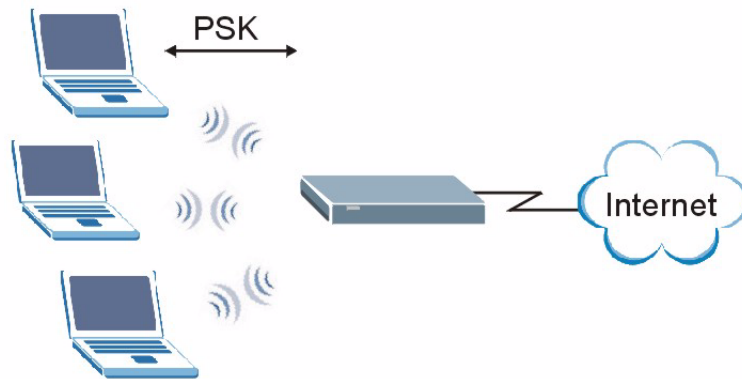
Security Parameters Summary

Refer to this table to see what other security parameters you should configure for each Authentication Method/ key management protocol type. MAC address filters are not dependent on how you configure these security features.

Table 106 Wireless Security Relational Matrix

	ENCRYPTION METHOD	ENTER MANUAL KEY	IEEE 802.1X
Open	None	No	Disable
			Enable without Dynamic WEP Key
Open	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
Shared	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
WPA	TKIP/AES	No	Enable
WPA-PSK	TKIP/AES	Yes	Disable
WPA2	TKIP/AES	No	Enable
WPA2-PSK	TKIP/AES	Yes	Disable

APPENDIX F
Command Interpreter

The following describes how to use the command interpreter. See the included disk or zyxel.com for more detailed information on these commands.

Note: Use of undocumented commands or misconfiguration can damage the unit and possibly render it unusable.

Accessing the Command Interpreter

If your device has SMT, enter 24 in the main menu to bring up the system maintenance menu. Enter 8 to go to **Menu 24.8 - Command Interpreter Mode**.

If your device does not have SMT, simply Telnet to the ZyXEL Device's IP address. You will log directly into the command interpreter.

Command Syntax

- The command keywords are in `courier new` font.
- Enter the command keywords exactly as shown, do not abbreviate.
- The required fields in a command are enclosed in angle brackets `<>`.
- The optional fields in a command are enclosed in square brackets `[]`.
- The `|` symbol means or.

  For example,

  sys filter netbios config <type> <on|off>

  means that you must specify the type of netbios filter and whether to turn it on or off.

Command Usage

A list of valid commands can be found by typing `help` or `?` at the command prompt. Always type the full command. Type `exit` when finished.

APPENDIX G

Log Descriptions

This appendix provides descriptions of example log messages.

Table 107 System Maintenance Logs

LOG MESSAGE	DESCRIPTION
Time calibration is successful	The router has adjusted its time based on information from the time server.
Time calibration failed	The router failed to get information from the time server.
WAN interface gets IP:%s	A WAN interface got a new IP address from the DHCP, PPPoE, PPTP or dial-up server.
DHCP client IP expired	A DHCP client's IP address has expired.
DHCP server assigns%s	The DHCP server assigned an IP address to a client.
Successful WEB login	Someone has logged on to the router's web configurator interface.
WEB login failed	Someone has failed to log on to the router's web configurator interface.
Successful TELNET login	Someone has logged on to the router via telnet.
TELNET login failed	Someone has failed to log on to the router via telnet.
Successful FTP login	Someone has logged on to the router via ftp.
FTP login failed	Someone has failed to log on to the router via ftp.
NAT Session Table is Full!	The maximum number of NAT session table entries has been exceeded and the table is full.
Starting Connectivity Monitor	Starting Connectivity Monitor.
Time initialized by Daytime Server	The router got the time and date from the Daytime server.
Time initialized by Time server	The router got the time and date from the time server.
Time initialized by NTP server	The router got the time and date from the NTP server.
Connect to Daytime server fail	The router was not able to connect to the Daytime server.
Connect to Time server fail	The router was not able to connect to the Time server.
Connect to NTP server fail	The router was not able to connect to the NTP server.
Too large ICMP packet has been dropped	The router dropped an ICMP packet that was too large.
Configuration Change: PC = 0x%x, Task ID = 0x%x	The router is saving configuration changes.
Successful SSH login	Someone has logged on to the router's SSH server.
SSH login failed	Someone has failed to log on to the router's SSH server.

Table 107 System Maintenance Logs (continued)

LOG MESSAGE	DESCRIPTION
Successful HTTPS login	Someone has logged on to the router's web configurator interface using HTTPS protocol.
HTTPS login failed	Someone has failed to log on to the router's web configurator interface using HTTPS protocol.

Table 108 System Error Logs

	DESCRIPTION
%s exceeds the max. number of session per host!	This attempt to create a NAT session exceeds the maximum number of NAT session table entries allowed to be created per host.
setNetBIOSFilter: calloc error	The router failed to allocate memory for the NetBIOS filter settings.
readNetBIOSFilter: calloc error	The router failed to allocate memory for the NetBIOS filter settings.
WAN connection is down.	A WAN connection is down. You cannot access the network through this interface.

Table 109 Access Control Logs

	DESCRIPTION
Firewall default policy: [TCP | UDP | IGMP | ESP | GRE | OSPF] <Packet Direction>	Attempted TCP/UDP/IGMP/ESP/GRE/OSPF access matched the default policy and was blocked or forwarded according to the default policy's setting.
Firewall rule [NOT] match:[TCP | UDP | IGMP | ESP | GRE | OSPF] <Packet Direction>, <rule:%d>	Attempted TCP/UDP/IGMP/ESP/GRE/OSPF access matched (or did not match) a configured firewall rule (denoted by its number) and was blocked or forwarded according to the rule.
Triangle route packet forwarded: [TCP | UDP | IGMP | ESP | GRE | OSPF]	The firewall allowed a triangle route session to pass through.
Packet without a NAT table entry blocked: [TCP | UDP | IGMP | ESP | GRE | OSPF]	The router blocked a packet that didn't have a corresponding NAT table entry.
Router sent blocked web site message: TCP	The router sent a message to notify a user that the router blocked access to a web site that the user requested.

Table 110 TCP Reset Logs

	DESCRIPTION
`Under SYN flood attack, sent TCP RST`	The router sent a TCP reset packet when a host was under a SYN flood attack (the TCP incomplete count is per destination host.)
`Exceed TCP MAX incomplete, sent TCP RST`	The router sent a TCP reset packet when the number of TCP incomplete connections exceeded the user configured threshold. (the TCP incomplete count is per destination host.) Note: Refer to **TCP Maximum Incomplete** in the **Firewall Attack Alerts** screen.
`Peer TCP state out of order, sent TCP RST`	The router sent a TCP reset packet when a TCP connection state was out of order.Note: The firewall refers to RFC793 Figure 6 to check the TCP state.
`Firewall session time out, sent TCP RST`	The router sent a TCP reset packet when a dynamic firewall session timed out. The default timeout values are as follows: ICMP idle timeout: 3 minutes UDP idle timeout: 3 minutes TCP connection (three way handshaking) timeout: 270 seconds TCP FIN-wait timeout: 2 MSL (Maximum Segment Lifetime set in the TCP header). TCP idle (established) timeout (s): 150 minutes TCP reset timeout: 10 seconds
`Exceed MAX incomplete, sent TCP RST`	The router sent a TCP reset packet when the number of incomplete connections (TCP and UDP) exceeded the user-configured threshold. (Incomplete count is for all TCP and UDP connections through the firewall.)Note: When the number of incomplete connections (TCP + UDP) > "Maximum Incomplete High", the router sends TCP RST packets for TCP connections and destroys TOS (firewall dynamic sessions) until incomplete connections < "Maximum Incomplete Low".
`Access block, sent TCP RST`	The router sends a TCP RST packet and generates this log if you turn on the firewall TCP reset mechanism (via CI command: "sys firewall tcprst").

Table 111 Packet Filter Logs

	DESCRIPTION
`[TCP	UDP	ICMP	IGMP	Generic] packet filter matched (set:%d, rule:%d)`	Attempted access matched a configured filter rule (denoted by its set and rule number) and was blocked or forwarded according to the rule.

Table 112 ICMP Logs

	DESCRIPTION
`Firewall default policy: ICMP <Packet Direction>, <type:%d>, <code:%d>`	ICMP access matched the default policy and was blocked or forwarded according to the user's setting. For type and code details, see Table 121 on page 259.
`Firewall rule [NOT] match: ICMP <Packet Direction>, <rule:%d>, <type:%d>, <code:%d>`	ICMP access matched (or didn't match) a firewall rule (denoted by its number) and was blocked or forwarded according to the rule. For type and code details, see Table 121 on page 259.
`Triangle route packet forwarded: ICMP`	The firewall allowed a triangle route session to pass through.
`Packet without a NAT table entry blocked: ICMP`	The router blocked a packet that didn't have a corresponding NAT table entry.
`Unsupported/out-of-order ICMP: ICMP`	The firewall does not support this kind of ICMP packets or the ICMP packets are out of order.
`Router reply ICMP packet: ICMP`	The router sent an ICMP reply packet to the sender.

Table 113 CDR Logs

	DESCRIPTION
`board%d line%d channel%d, call%d,%s C01 Outgoing Call dev=%x ch=%x%s`	The router received the setup requirements for a call. "call" is the reference (count) number of the call. "dev" is the device type (3 is for dial-up, 6 is for PPPoE, 10 is for PPTP). "channel" or "ch" is the call channel ID.For example,"board 0 line 0 channel 0, call 3, C01 Outgoing Call dev=6 ch=0 "Means the router has dialed to the PPPoE server 3 times.
`board%d line%d channel%d, call%d,%s C02 OutCall Connected%d%s`	The PPPoE, PPTP or dial-up call is connected.
`board%d line%d channel%d, call%d,%s C02 Call Terminated`	The PPPoE, PPTP or dial-up call was disconnected.

Table 114 PPP Logs

LOG MESSAGE	DESCRIPTION
`ppp:LCP Starting`	The PPP connection's Link Control Protocol stage has started.
`ppp:LCP Opening`	The PPP connection's Link Control Protocol stage is opening.
`ppp:CHAP Opening`	The PPP connection's Challenge Handshake Authentication Protocol stage is opening.
`ppp:IPCP Starting`	The PPP connection's Internet Protocol Control Protocol stage is starting.
`ppp:IPCP Opening`	The PPP connection's Internet Protocol Control Protocol stage is opening.

Table 114 PPP Logs (continued)

LOG MESSAGE	DESCRIPTION
`ppp:LCP Closing`	The PPP connection's Link Control Protocol stage is closing.
`ppp:IPCP Closing`	The PPP connection's Internet Protocol Control Protocol stage is closing.

Table 115 UPnP Logs

	DESCRIPTION
`UPnP pass through Firewall`	UPnP packets can pass through the firewall.

Table 116 Content Filtering Logs

LOG MESSAGE	DESCRIPTION
`%s: Keyword blocking`	The content of a requested web page matched a user defined keyword.
`%s: Not in trusted web list`	The web site is not in a trusted domain, and the router blocks all traffic except trusted domain sites.
`%s: Forbidden Web site`	The web site is in the forbidden web site list.
`%s: Contains ActiveX`	The web site contains ActiveX.
`%s: Contains Java applet`	The web site contains a Java applet.
`%s: Contains cookie`	The web site contains a cookie.
`%s: Proxy mode detected`	The router detected proxy mode in the packet.
`%s`	The content filter server responded that the web site is in the blocked category list, but it did not return the category type.
`%s:%s`	The content filter server responded that the web site is in the blocked category list, and returned the category type.
`%s(cache hit)`	The system detected that the web site is in the blocked list from the local cache, but does not know the category type.
`%s:%s(cache hit)`	The system detected that the web site is in blocked list from the local cache, and knows the category type.
`%s: Trusted Web site`	The web site is in a trusted domain.
`%s`	When the content filter is not on according to the time schedule or you didn't select the "Block Matched Web Site" check box, the system forwards the web content.
`Waiting content filter server timeout`	The external content filtering server did not respond within the timeout period.
`DNS resolving failed`	The ZyXEL Device cannot get the IP address of the external content filtering via DNS query.
`Creating socket failed`	The ZyXEL Device cannot issue a query because TCP/IP socket creation failed, port:port number.

Table 116 Content Filtering Logs (continued)

LOG MESSAGE	DESCRIPTION
`Connecting to content filter server fail`	The connection to the external content filtering server failed.
`License key is invalid`	The external content filtering license key is invalid.

Table 117 Attack Logs

	DESCRIPTION
`attack [TCP	UDP	IGMP	ESP	GRE	OSPF]`	The firewall detected a TCP/UDP/IGMP/ESP/GRE/OSPF attack.
`attack ICMP (type:%d, code:%d)`	The firewall detected an ICMP attack. For type and code details, see Table 121 on page 259.
`land [TCP	UDP	IGMP	ESP	GRE	OSPF]`	The firewall detected a TCP/UDP/IGMP/ESP/GRE/OSPF land attack.
`land ICMP (type:%d, code:%d)`	The firewall detected an ICMP land attack. For type and code details, see Table 121 on page 259.
`ip spoofing - WAN [TCP	UDP	IGMP	ESP	GRE	OSPF]`	The firewall detected an IP spoofing attack on the WAN port.
`ip spoofing - WAN ICMP (type:%d, code:%d)`	The firewall detected an ICMP IP spoofing attack on the WAN port. For type and code details, see Table 121 on page 259.
`icmp echo: ICMP (type:%d, code:%d)`	The firewall detected an ICMP echo attack. For type and code details, see Table 121 on page 259.
`syn flood TCP`	The firewall detected a TCP syn flood attack.
`ports scan TCP`	The firewall detected a TCP port scan attack.
`teardrop TCP`	The firewall detected a TCP teardrop attack.
`teardrop UDP`	The firewall detected an UDP teardrop attack.
`teardrop ICMP (type:%d, code:%d)`	The firewall detected an ICMP teardrop attack. For type and code details, see Table 121 on page 259.
`illegal command TCP`	The firewall detected a TCP illegal command attack.
`NetBIOS TCP`	The firewall detected a TCP NetBIOS attack.
`ip spoofing - no routing entry [TCP	UDP	IGMP	ESP	GRE	OSPF]`	The firewall classified a packet with no source routing entry as an IP spoofing attack.
`ip spoofing - no routing entry ICMP (type:%d, code:%d)`	The firewall classified an ICMP packet with no source routing entry as an IP spoofing attack.
`vulnerability ICMP (type:%d, code:%d)`	The firewall detected an ICMP vulnerability attack. For type and code details, see Table 121 on page 259.
`traceroute ICMP (type:%d, code:%d)`	The firewall detected an ICMP traceroute attack. For type and code details, see Table 121 on page 259.

Table 118 PKI Logs

	DESCRIPTION
`Enrollment successful`	The SCEP online certificate enrollment was successful. The Destination field records the certification authority server IP address and port.
`Enrollment failed`	The SCEP online certificate enrollment failed. The Destination field records the certification authority server's IP address and port.
`Failed to resolve <SCEP CA server url>`	The SCEP online certificate enrollment failed because the certification authority server's address cannot be resolved.
`Enrollment successful`	The CMP online certificate enrollment was successful. The Destination field records the certification authority server's IP address and port.
`Enrollment failed`	The CMP online certificate enrollment failed. The Destination field records the certification authority server's IP address and port.
`Failed to resolve <CMP CA server url>`	The CMP online certificate enrollment failed because the certification authority server's IP address cannot be resolved.
`Rcvd ca cert: <subject name>`	The router received a certification authority certificate, with subject name as recorded, from the LDAP server whose IP address and port are recorded in the Source field.
`Rcvd user cert: <subject name>`	The router received a user certificate, with subject name as recorded, from the LDAP server whose IP address and port are recorded in the Source field.
`Rcvd CRL <size>: <issuer name>`	The router received a CRL (Certificate Revocation List), with size and issuer name as recorded, from the LDAP server whose IP address and port are recorded in the Source field.
`Rcvd ARL <size>: <issuer name>`	The router received an ARL (Authority Revocation List), with size and issuer name as recorded, from the LDAP server whose address and port are recorded in the Source field.
`Failed to decode the received ca cert`	The router received a corrupted certification authority certificate from the LDAP server whose address and port are recorded in the Source field.
`Failed to decode the received user cert`	The router received a corrupted user certificate from the LDAP server whose address and port are recorded in the Source field.
`Failed to decode the received CRL`	The router received a corrupted CRL (Certificate Revocation List) from the LDAP server whose address and port are recorded in the Source field.
`Failed to decode the received ARL`	The router received a corrupted ARL (Authority Revocation List) from the LDAP server whose address and port are recorded in the Source field.
`Rcvd data <size> too large! Max size allowed: <max size>`	The router received directory data that was too large (the size is listed) from the LDAP server whose address and port are recorded in the Source field. The maximum size of directory data that the router allows is also recorded.
`Cert trusted: <subject name>`	The router has verified the path of the certificate with the listed subject name.
`Due to <reason codes>, cert not trusted: <subject name>`	Due to the reasons listed, the certificate with the listed subject name has not passed the path verification. The recorded reason codes are only approximate reasons for not trusting the certificate. Please see Table 121 on page 259 for the corresponding descriptions of the codes.

Table 119 802.1X Logs

	DESCRIPTION
`Local User Database accepts user.`	A user was authenticated by the local user database.
`Local User Database reports user credential error.`	A user was not authenticated by the local user database because of an incorrect user password.
`Local User Database does not find user`s credential.`	A user was not authenticated by the local user database because the user is not listed in the local user database.
`RADIUS accepts user.`	A user was authenticated by the RADIUS Server.
`RADIUS rejects user. Pls check RADIUS Server.`	A user was not authenticated by the RADIUS Server. Please check the RADIUS Server.
`Local User Database does not support authentication method.`	The local user database only supports the EAP-MD5 method. A user tried to use another authentication method and was not authenticated.
`User logout because of session timeout expired.`	The router logged out a user whose session expired.
`User logout because of user deassociation.`	The router logged out a user who ended the session.
`User logout because of no authentication response from user.`	The router logged out a user from which there was no authentication response.
`User logout because of idle timeout expired.`	The router logged out a user whose idle timeout period expired.
`User logout because of user request.`	A user logged out.
`Local User Database does not support authentication mothed.`	A user tried to use an authentication method that the local user database does not support (it only supports EAP-MD5).
`No response from RADIUS. Pls check RADIUS Server.`	There is no response message from the RADIUS server, please check the RADIUS server.
`Use Local User Database to authenticate user.`	The local user database is operating as the authentication server.
`Use RADIUS to authenticate user.`	The RADIUS server is operating as the authentication server.
`No Server to authenticate user.`	There is no authentication server to authenticate a user.
`Local User Database does not find user`s credential.`	A user was not authenticated by the local user database because the user is not listed in the local user database.

Table 120 ACL Setting Notes

PACKET DIRECTION	DIRECTION	DESCRIPTION
(L to W)	LAN to WAN	ACL set for packets traveling from the LAN to the WAN.
(W to L)	WAN to LAN	ACL set for packets traveling from the WAN to the LAN.

Table 120 ACL Setting Notes (continued)

PACKET DIRECTION	DIRECTION	DESCRIPTION
(L to L/P)	LAN to LAN/ ZyXEL Device	ACL set for packets traveling from the LAN to the LAN or the ZyXEL Device.
(W to W/P)	WAN to WAN/ ZyXEL Device	ACL set for packets traveling from the WAN to the WAN or the ZyXEL Device.

Table 121 ICMP Notes

TYPE	CODE	DESCRIPTION
0		Echo Reply
	0	Echo reply message
3		Destination Unreachable
	0	Net unreachable
	1	Host unreachable
	2	Protocol unreachable
	3	Port unreachable
	4	A packet that needed fragmentation was dropped because it was set to Don't Fragment (DF)
	5	Source route failed
4		Source Quench
	0	A gateway may discard internet datagrams if it does not have the buffer space needed to queue the datagrams for output to the next network on the route to the destination network.
5		Redirect
	0	Redirect datagrams for the Network
	1	Redirect datagrams for the Host
	2	Redirect datagrams for the Type of Service and Network
	3	Redirect datagrams for the Type of Service and Host
8		Echo
	0	Echo message
11		Time Exceeded
	0	Time to live exceeded in transit
	1	Fragment reassembly time exceeded
12		Parameter Problem
	0	Pointer indicates the error
13		Timestamp
	0	Timestamp request message
14		Timestamp Reply
	0	Timestamp reply message
15		Information Request

Table 121   ICMP Notes (continued)

TYPE	CODE	DESCRIPTION
	0	Information request message
16		Information Reply
	0	Information reply message

Table 122   Syslog Logs

	DESCRIPTION
`<Facility*8 + Severity>Mon dd hr:mm:ss hostname src="<srcIP:srcPort>" dst="<dstIP:dstPort>" msg="<msg>" note="<note>" devID="<mac address last three numbers>" cat="<category>`	"This message is sent by the system ("RAS" displays as the system name if you haven't configured one) when the router generates a syslog. The facility is defined in the web MAIN MENU->LOGS->Log Settings page. The severity is the log's syslog class. The definition of messages and notes are defined in the various log charts throughout this appendix. The "devID" is the last three characters of the MAC address of the router's LAN port. The "cat" is the same as the category in the router's logs.

The following table shows RFC-2408 ISAKMP payload types that the log displays. Please refer to the RFC for detailed information on each type.

Table 123   RFC-2408 ISAKMP Payload Types

	PAYLOAD TYPE
`SA`	Security Association
`PROP`	Proposal
`TRANS`	Transform
`KE`	Key Exchange
`ID`	Identification
`CER`	Certificate
`CER_REQ`	Certificate Request
`HASH`	Hash
`SIG`	Signature
`NONCE`	Nonce
`NOTFY`	Notification
`DEL`	Delete
`VID`	Vendor ID

Log Commands

Go to the command interpreter interface.

Configuring What You Want the ZyXEL Device to Log

1 Use the `sys logs load` command to load the log setting buffer that allows you to configure which logs the ZyXEL Device is to record.

2 Use `sys logs category` to view a list of the log categories.

Figure 149 Displaying Log Categories Example

```
          Copyright (c) 1994 - 2006 ZyXEL Communications Corp.
          ras> sys logs category
          8021x           access          attack          display
          error           icmp            javablocked     mten
          packetfilter    ppp             cdr             remote
          tcpreset        traffic         upnp            urlblocked
          urlforward      wireless
          ras>
```

3 Use `sys logs category` followed by a log category to display the parameters that are available for the category.

Figure 150 Displaying Log Parameters Example

```
          ras> sys logs category access
          Usage: [0:none/1:log/2:alert/3:both] [0:don't show debug type/
          1:show debug type]
```

4 Use `sys logs category` followed by a log category and a parameter to decide what to record.

Use 0 to not record logs for that category, 1 to record only logs for that category, 2 to record only alerts for that category, and 3 to record both logs and alerts for that category. Not every parameter is available with every category.

5 Use the `sys logs save` command to store the settings in the ZyXEL Device (you must do this in order to record logs).

Displaying Logs

- Use the `sys logs display` command to show all of the logs in the ZyXEL Device's log.
- Use the `sys logs category display` command to show the log settings for all of the log categories.
- Use the `sys logs display [log category]` command to show the logs in an individual ZyXEL Device log category.
- Use the `sys logs clear` command to erase all of the ZyXEL Device's logs.

Log Command Example

This example shows how to set the ZyXEL Device to record the access logs and alerts and then view the results.

```
ras> sys logs load
ras> sys logs category access 3
ras> sys logs save
ras> sys logs display access

#.time                    source                    destination            notes

    message

 0|01/02/2000 04:06:35 |192.168.1.33:2190    |207.69.188.186:135     |ACCESS
FORWARD
    Firewall default policy: TCP (L to W)
 1|01/02/2000 04:06:28 |192.168.1.33:2190    |207.69.188.186:135     |ACCESS
FORWARD
    Firewall default policy: TCP (L to W)
 3|01/02/2000 04:06:25 |192.168.1.33:2190    |207.69.188.186:135     |ACCESS
FORWARD
    Firewall default policy: UDP (L to W)
 4|01/02/2000 04:06:16 |192.168.1.33:2187    |207.69.188.186:80      |ACCESS
FORWARD
    Firewall default policy: TCP (L to W)
```

APPENDIX H
NetBIOS Filter Commands

The following describes the NetBIOS packet filter commands.

Introduction

NetBIOS (Network Basic Input/Output System) are TCP or UDP broadcast packets that enable a computer to connect to and communicate with a LAN.

For some dial-up services such as PPPoE or PPTP, NetBIOS packets cause unwanted calls.

You can configure NetBIOS filters to do the following:

- Allow or disallow the sending of NetBIOS packets from the LAN to the WAN and from the WAN to the LAN.
- Allow or disallow the sending of NetBIOS packets through VPN connections.
- Allow or disallow NetBIOS packets to initiate calls.

Display NetBIOS Filter Settings

```
sys filter netbios disp
```

This command gives a read-only list of the current NetBIOS filter modes for the ZyXEL Device.

NetBIOS Display Filter Settings Command Example

```
=========== NetBIOS Filter Status ===========
        Between LAN and WAN: Block
        IPSec Packets: Forward
        Trigger Dial: Disabled
```

The filter types and their default settings are as follows.

Table 124   NetBIOS Filter Default Settings

	DESCRIPTION	EXAMPLE
Between LAN and WAN	This field displays whether NetBIOS packets are blocked or forwarded between the LAN and the WAN.	Block
IPSec Packets	This field displays whether NetBIOS packets sent through a VPN connection are blocked or forwarded.	Forward
Trigger dial	This field displays whether NetBIOS packets are allowed to initiate calls. Disabled means that NetBIOS packets are blocked from initiating calls.	Disabled

NetBIOS Filter Configuration

```
Syntax:sys filter netbios config <type> <on|off>
```

where

`<type> =`	Identify which NetBIOS filter (numbered 0-3) to configure.
	0 = Between LAN and WAN
	3 = IPSec packet pass through
	4 = Trigger Dial
`<on|off> =`	For type 0 and 1, use on to enable the filter and block NetBIOS packets. Use off to disable the filter and forward NetBIOS packets.
	For type 3, use on to block NetBIOS packets from being sent through a VPN connection. Use off to allow NetBIOS packets to be sent through a VPN connection.
	For type 4, use on to allow NetBIOS packets to initiate dial backup calls. Use off to block NetBIOS packets from initiating dial backup calls.

Example commands

`sys filter netbios config 0 on`	This command blocks LAN to WAN and WAN to LAN NetBIOS packets.
`sys filter netbios config 3 on`	This command blocks IPSec NetBIOS packets.
`sys filter netbios config 4 off`	This command stops NetBIOS commands from initiating calls.

APPENDIX I
Services

The following table lists some commonly-used services and their associated protocols and port numbers.

- **Name**: This is a short, descriptive name for the service. You can use this one or create a different one, if you like.
- **Protocol**: This is the type of IP protocol used by the service. If this is **TCP/UDP**, then the service uses the same port number with TCP and UDP. If this is **User-Defined**, the **Port(s**) is the IP protocol number, not the port number.
- **Port(s)**: This value depends on the **Protocol**.
    - If the **Protocol** is **TCP**, **UDP**, or **TCP/UDP**, this is the IP port number.
    - If the **Protocol** is **USER**, this is the IP protocol number.
- **Description**: This is a brief explanation of the applications that use this service or the situations in which this service is used.

Table 125 Examples of Services

NAME	PROTOCOL	PORT(S)	DESCRIPTION
AH (IPSEC_TUNNEL)	User-Defined	51	The IPSEC AH (Authentication Header) tunneling protocol uses this service.
AIM	TCP	5190	AOL's Internet Messenger service.
AUTH	TCP	113	Authentication protocol used by some servers.
BGP	TCP	179	Border Gateway Protocol.
BOOTP_CLIENT	UDP	68	DHCP Client.
BOOTP_SERVER	UDP	67	DHCP Server.
CU-SEEME	TCP/UDP TCP/UDP	7648 24032	A popular videoconferencing solution from White Pines Software.
DNS	TCP/UDP	53	Domain Name Server, a service that matches web names (e.g. www.zyxel.com) to IP numbers.
ESP (IPSEC_TUNNEL)	User-Defined	50	The IPSEC ESP (Encapsulation Security Protocol) tunneling protocol uses this service.
FINGER	TCP	79	Finger is a UNIX or Internet related command that can be used to find out if a user is logged on.
FTP	TCP TCP	20 21	File Transfer Program, a program to enable fast transfer of files, including large files that may not be possible by e-mail.
H.323	TCP	1720	NetMeeting uses this protocol.

Table 125 Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
HTTP	TCP	80	Hyper Text Transfer Protocol - a client/server protocol for the world wide web.
HTTPS	TCP	443	HTTPS is a secured http session often used in e-commerce.
ICMP	User-Defined	1	Internet Control Message Protocol is often used for diagnostic purposes.
ICQ	UDP	4000	This is a popular Internet chat program.
IGMP (MULTICAST)	User-Defined	2	Internet Group Multicast Protocol is used when sending packets to a specific group of hosts.
IKE	UDP	500	The Internet Key Exchange algorithm is used for key distribution and management.
IMAP4	TCP	143	The Internet Message Access Protocol is used for e-mail.
IMAP4S	TCP	993	This is a more secure version of IMAP4 that runs over SSL.
IRC	TCP/UDP	6667	This is another popular Internet chat program.
MSN Messenger	TCP	1863	Microsoft Networks' messenger service uses this protocol.
NetBIOS	TCP/UDP TCP/UDP TCP/UDP TCP/UDP	137 138 139 445	The Network Basic Input/Output System is used for communication between computers in a LAN.
NEW-ICQ	TCP	5190	An Internet chat program.
NEWS	TCP	144	A protocol for news groups.
NFS	UDP	2049	Network File System - NFS is a client/server distributed file service that provides transparent file sharing for network environments.
NNTP	TCP	119	Network News Transport Protocol is the delivery mechanism for the USENET newsgroup service.
PING	User-Defined	1	Packet INternet Groper is a protocol that sends out ICMP echo requests to test whether or not a remote host is reachable.
POP3	TCP	110	Post Office Protocol version 3 lets a client computer get e-mail from a POP3 server through a temporary connection (TCP/IP or other).
POP3S	TCP	995	This is a more secure version of POP3 that runs over SSL.
PPTP	TCP	1723	Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the control channel.
PPTP_TUNNEL (GRE)	User-Defined	47	PPTP (Point-to-Point Tunneling Protocol) enables secure transfer of data over public networks. This is the data channel.

Table 125 Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
RCMD	TCP	512	Remote Command Service.
REAL_AUDIO	TCP	7070	A streaming audio service that enables real time sound over the web.
REXEC	TCP	514	Remote Execution Daemon.
RLOGIN	TCP	513	Remote Login.
ROADRUNNER	TCP/UDP	1026	This is an ISP that provides services mainly for cable modems.
RTELNET	TCP	107	Remote Telnet.
RTSP	TCP/UDP	554	The Real Time Streaming (media control) Protocol (RTSP) is a remote control for multimedia on the Internet.
SFTP	TCP	115	The Simple File Transfer Protocol is an old way of transferring files between computers.
SMTP	TCP	25	Simple Mail Transfer Protocol is the message-exchange standard for the Internet. SMTP enables you to move messages from one e-mail server to another.
SMTPS	TCP	465	This is a more secure version of SMTP that runs over SSL.
SNMP	TCP/UDP	161	Simple Network Management Program.
SNMP-TRAPS	TCP/UDP	162	Traps for use with the SNMP (RFC:1215).
SQL-NET	TCP	1521	Structured Query Language is an interface to access data on many different types of database systems, including mainframes, midrange systems, UNIX systems and network servers.
SSDP	UDP	1900	The Simple Service Discovery Protocol supports Universal Plug-and-Play (UPnP).
SSH	TCP/UDP	22	Secure Shell Remote Login Program.
STRM WORKS	UDP	1558	Stream Works Protocol.
SYSLOG	UDP	514	Syslog allows you to send system logs to a UNIX server.
TACACS	UDP	49	Login Host Protocol used for (Terminal Access Controller Access Control System).
TELNET	TCP	23	Telnet is the login and terminal emulation protocol common on the Internet and in UNIX environments. It operates over TCP/IP networks. Its primary function is to allow users to log into remote host systems.

Table 125   Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
TFTP	UDP	69	Trivial File Transfer Protocol is an Internet file transfer protocol similar to FTP, but uses the UDP (User Datagram Protocol) rather than TCP (Transmission Control Protocol).
VDOLIVE	TCP UDP	7000 user-defined	A videoconferencing solution. The UDP port number is specified in the application.

APPENDIX J
Internal SPTGEN

This appendix introduces Internal SPTGEN. All menus shown in this appendix are example menus meant to show SPTGEN usage. Actual menus for your product may differ.

Internal SPTGEN Overview

Internal SPTGEN (System Parameter Table Generator) is a configuration text file useful for efficient configuration of multiple ZyXEL Devices. Internal SPTGEN lets you configure, save and upload multiple menus at the same time using just one configuration text file – eliminating the need to navigate and configure individual screens for each ZyXEL Device. You can use FTP to get the Internal SPTGEN file. Then edit the file in a text editor and use FTP to upload it again to the same device or another one. See the following sections for details.

The Configuration Text File Format

All Internal SPTGEN text files conform to the following format:

```
<field identification number = field name = parameter values
allowed = input>,
```

where `<input>` is your input conforming to `<parameter values allowed>`.

The figure shown next is an example of an Internal SPTGEN text file.

Figure 151 Configuration Text File Format: Column Descriptions

```
/ Menu 1 General Setup
 10000000 = Configured              <0(No)| 1(Yes)>      = 1
 10000001 = System Name             <Str>                = Your Device
 10000002 = Location                <Str>                =
 10000003 = Contact Person's Name   <Str>                =
 10000004 = Route IP                <0(No)| 1(Yes)>      = 1
 10000005 = Route IPX               <0(No)| 1(Yes)>      = 0
 10000006 = Bridge                  <0(No)| 1(Yes)>      = 0
```

Note: DO NOT alter or delete any field except parameters in the Input column.

This appendix introduces Internal SPTGEN. All menus shown in this appendix are example menus meant to show SPTGEN usage. Actual menus for your product may differ.

Internal SPTGEN File Modification - Important Points to Remember

Each parameter you enter must be preceded by one "="sign and one space.

Some parameters are dependent on others. For example, if you disable the **Configured** field in menu 1 (see), then you disable every field in this menu.

If you enter a parameter that is invalid in the **Input** column, the ZyXEL Device will not save the configuration and the command line will display the **Field Identification Number**. , shown next, is an example of what the ZyXEL Device displays if you enter a value other than "0" or "1" in the **Input** column of **Field Identification Number** 1000000 (refer to).

Figure 152 Invalid Parameter Entered: Command Line Example

```
field value is not legal error:-1
ROM-t is not saved, error Line ID:10000000
reboot to get the original configuration
Bootbase Version: V2.02 | 2/22/2001 13:33:11
RAM: Size = 8192 Kbytes
FLASH: Intel 8M *2
```

The ZyXEL Device will display the following if you enter parameter(s) that *are* valid.

Figure 153 Valid Parameter Entered: Command Line Example

```
Please wait for the system to write SPT text file(ROM-t)...
Bootbase Version: V2.02 | 2/22/2001 13:33:11
RAM: Size = 8192 Kbytes
FLASH: Intel 8M *2
```

Internal SPTGEN FTP Download Example

1 Launch your FTP application.

2 Enter "bin". The command "bin" sets the transfer mode to binary.

3 Get "rom-t" file. The command "get" transfers files from the ZyXEL Device to your computer. The name "rom-t" is the configuration filename on the ZyXEL Device.

4 Edit the "rom-t" file using a text editor (do not use a word processor). You must leave this FTP screen to edit.

Figure 154   Internal SPTGEN FTP Download Example

```
c:\ftp 192.168.1.1
220 PPP FTP version 1.0 ready at Sat Jan 1 03:22:12 2000
User (192.168.1.1:(none)):
331 Enter PASS command
Password:
230 Logged in
ftp>bin
200 Type I OK
ftp> get rom-t
ftp>bye
c:\edit rom-t
(edit the rom-t text file by a text editor and save it)
```

Note: You can rename your "rom-t" file when you save it to your computer but it must be named "rom-t" when you upload it to your ZyXEL Device.

Internal SPTGEN FTP Upload Example

1 Launch your FTP application.

2 Enter "bin". The command "bin" sets the transfer mode to binary.

3 Upload your "rom-t" file from your computer to the ZyXEL Device using the "put" command. computer to the ZyXEL Device.

4 Exit this FTP application.

Figure 155   Internal SPTGEN FTP Upload Example

```
c:\ftp 192.168.1.1
220 PPP FTP version 1.0 ready at Sat Jan 1 03:22:12 2000
User (192.168.1.1:(none)):
331 Enter PASS command
Password:
230 Logged in
ftp>bin
200 Type I OK
ftp> put rom-t
ftp>bye
```

Example Internal SPTGEN Menus

This section provides example Internal SPTGEN menus.

Table 126 Abbreviations Used in the Example Internal SPTGEN Screens Table

ABBREVIATION	MEANING
FIN	Field Identification Number
FN	Field Name
PVA	Parameter Values Allowed
INPUT	An example of what you may enter
*	Applies to the ZyXEL Device.

Table 127 Menu 1 General Setup

/ Menu 1 General Setup			
FIN	FN	PVA	INPUT
10000000 =	Configured	<0(No) | 1(Yes)>	= 0
10000001 =	System Name	<Str>	= Your Device
10000002 =	Location	<Str>	=
10000003 =	Contact Person's Name	<Str>	=
10000004 =	Route IP	<0(No) | 1(Yes)>	= 1
10000006 =	Bridge	<0(No) | 1(Yes)>	= 0

Table 128 Menu 3

/ Menu 3.1 General Ethernet Setup			
FIN	FN	PVA	INPUT
30100001 =	Input Protocol filters Set 1		= 2
30100002 =	Input Protocol filters Set 2		= 256
30100003 =	Input Protocol filters Set 3		= 256
30100004 =	Input Protocol filters Set 4		= 256
30100005 =	Input device filters Set 1		= 256
30100006 =	Input device filters Set 2		= 256
30100007 =	Input device filters Set 3		= 256
30100008 =	Input device filters Set 4		= 256
30100009 =	Output protocol filters Set 1		= 256
30100010 =	Output protocol filters Set 2		= 256
30100011 =	Output protocol filters Set 3		= 256

Table 128   Menu 3

30100012 =	Output protocol filters Set 4		= 256
30100013 =	Output device filters Set 1		= 256
30100014 =	Output device filters Set 2		= 256
30100015 =	Output device filters Set 3		= 256
30100016 =	Output device filters Set 4		= 256
/ Menu 3.2 TCP/IP and DHCP Ethernet Setup			
FIN	FN	PVA	INPUT
30200001 =	DHCP	<0(None) | 1(Server) | 2(Relay)>	= 0
30200002 =	Client IP Pool Starting Address		= 192.168.1.33
30200003 =	Size of Client IP Pool		= 32
30200004 =	Primary DNS Server		= 0.0.0.0
30200005 =	Secondary DNS Server		= 0.0.0.0
30200006 =	Remote DHCP Server		= 0.0.0.0
30200008 =	IP Address		= 172.21.2.200
30200009 =	IP Subnet Mask		= 16
30200010 =	RIP Direction	<0(None) | 1(Both) | 2(In Only) | 3(Out Only)>	= 0
30200011 =	Version	<0(Rip-1) | 1(Rip-2B) |2(Rip-2M)>	= 0
30200012 =	Multicast	<0(IGMP-v2) | 1(IGMP-v1) | 2(None)>	= 2
30200013 =	IP Policies Set 1 (1~12)		= 256
30200014 =	IP Policies Set 2 (1~12)		= 256
30200015 =	IP Policies Set 3 (1~12)		= 256
30200016 =	IP Policies Set 4 (1~12)		= 256
/ Menu 3.2.1 IP Alias Setup			
FIN	FN	PVA	INPUT
30201001 =	IP Alias 1	<0(No) | 1(Yes)>	= 0
30201002 =	IP Address		= 0.0.0.0
30201003 =	IP Subnet Mask		= 0
30201004 =	RIP Direction	<0(None) | 1(Both) | 2(In Only) | 3(Out Only)>	= 0

Table 128 Menu 3

30201005 =	Version	<0(Rip-1) | 1(Rip-2B) |2(Rip-2M)>	= 0
30201006 =	IP Alias #1 Incoming protocol filters Set 1		= 256
30201007 =	IP Alias #1 Incoming protocol filters Set 2		= 256
30201008 =	IP Alias #1 Incoming protocol filters Set 3		= 256
30201009 =	IP Alias #1 Incoming protocol filters Set 4		= 256
30201010 =	IP Alias #1 Outgoing protocol filters Set 1		= 256
30201011 =	IP Alias #1 Outgoing protocol filters Set 2		= 256
30201012 =	IP Alias #1 Outgoing protocol filters Set 3		= 256
30201013 =	IP Alias #1 Outgoing protocol filters Set 4		= 256
30201014 =	IP Alias 2 <0(No) | 1(Yes)>		= 0
30201015 =	IP Address		= 0.0.0.0
30201016 =	IP Subnet Mask		= 0
30201017 =	RIP Direction	<0(None) | 1(Both) | 2(In Only) | 3(Out Only)>	= 0
30201018 =	Version	<0(Rip-1) | 1(Rip-2B) |2(Rip-2M)>	= 0
30201019 =	IP Alias #2 Incoming protocol filters Set 1		= 256
30201020 =	IP Alias #2 Incoming protocol filters Set 2		= 256
30201021 =	IP Alias #2 Incoming protocol filters Set 3		= 256
30201022 =	IP Alias #2 Incoming protocol filters Set 4		= 256
30201023 =	IP Alias #2 Outgoing protocol filters Set 1		= 256
30201024 =	IP Alias #2 Outgoing protocol filters Set 2		= 256
30201025 =	IP Alias #2 Outgoing protocol filters Set 3		= 256
30201026 =	IP Alias #2 Outgoing protocol filters Set 4		= 256
*/ Menu 3.5 Wireless LAN Setup			

Table 128   Menu 3

FIN	FN	PVA	INPUT
30500001 =	ESSID		Wireless
30500002 =	Hide ESSID	<0(No) | 1(Yes)>	= 0
30500003 =	Channel ID	<1|2|3|4|5|6|7|8|9|10|11|12|13>	= 1
30500004 =	RTS Threshold	<0 ~ 2432>	= 2432
30500005 =	FRAG. Threshold	<256 ~ 2432>	= 2432
30500006 =	WEP	<0(DISABLE) | 1(64-bit WEP) | 2(128-bit WEP)>	= 0
30500007 =	Default Key	<1|2|3|4>	= 0
30500008 =	WEP Key1		=
30500009 =	WEP Key2		=
30500010 =	WEP Key3		=
30500011 =	WEP Key4		=
30500012 =	Wlan Active	<0(Disable) | 1(Enable)>	= 0
30500013 =	Wlan 4X Mode	<0(Disable) | 1(Enable)>	= 0
*/ MENU 3.5.1 WLAN MAC ADDRESS FILTER			
FIN	FN	PVA	INPUT
30501001 =	Mac Filter Active	<0(No) | 1(Yes)>	= 0
30501002 =	Filter Action	<0(Allow) | 1(Deny)>	= 0
30501003 =	Address 1		= 00:00:00:00:00:00
30501004 =	Address 2		= 00:00:00:00:00:00
30501005 =	Address 3		= 00:00:00:00:00:00
Continued	…		…
30501034 =	Address 32		= 00:00:00:00:00:00

Table 129   Menu 4 Internet Access Setup

/ Menu 4 Internet Access Setup			
FIN	FN	PVA	INPUT
40000000 =	Configured	<0(No) | 1(Yes)>	= 1
40000001 =	ISP	<0(No) | 1(Yes)>	= 1
40000002 =	Active	<0(No) | 1(Yes)>	= 1
40000003 =	ISP's Name		= ChangeMe
40000004 =	Encapsulation	<2(PPPOE) | 3(RFC 1483)| 4(PPPoA)| 5(ENET ENCAP)>	= 2
40000005 =	Multiplexing	<1(LLC-based) | 2(VC-based)	= 1
40000006 =	VPI #		= 0
40000007 =	VCI #		= 35
40000008 =	Service Name	<Str>	= any
40000009 =	My Login	<Str>	= test@pqa
40000010 =	My Password	<Str>	= 1234
40000011 =	Single User Account	<0(No) | 1(Yes)>	= 1
40000012 =	IP Address Assignment	<0(Static)|1(Dynamic)>	= 1
40000013 =	IP Address		= 0.0.0.0
40000014 =	Remote IP address		= 0.0.0.0
40000015 =	Remote IP subnet mask		= 0
40000016 =	ISP incoming protocol filter set 1		= 6
40000017 =	ISP incoming protocol filter set 2		= 256
40000018 =	ISP incoming protocol filter set 3		= 256
40000019 =	ISP incoming protocol filter set 4		= 256
40000020 =	ISP outgoing protocol filter set 1		= 256
40000021 =	ISP outgoing protocol filter set 2		= 256
40000022 =	ISP outgoing protocol filter set 3		= 256
40000023 =	ISP outgoing protocol filter set 4		= 256
40000024 =	ISP PPPoE idle timeout		= 0
40000025 =	Route IP	<0(No) | 1(Yes)>	= 1
40000026 =	Bridge	<0(No) | 1(Yes)>	= 0

Table 129   Menu 4 Internet Access Setup (continued)

40000027 =	ATM QoS Type	<0(CBR) | (1 (UBR)>	= 1
40000028 =	Peak Cell Rate (PCR)		= 0
40000029 =	Sustain Cell Rate (SCR)		= 0
40000030 =	Maximum Burst Size(MBS)		= 0
40000031=	RIP Direction	<0(None) | 1(Both) | 2(In Only) | 3(Out Only)>	= 0
40000032=	RIP Version	<0(Rip-1) | 1(Rip-2B) |2(Rip-2M)>	= 0
40000033=	Nailed-up Connection	<0(No) |1(Yes)>	= 0

Table 130   Menu 12

/ Menu 12.1.1 IP Static Route Setup			
FIN	FN	PVA	INPUT
120101001 =	IP Static Route set #1, Name	<Str>	=
120101002 =	IP Static Route set #1, Active	<0(No) |1(Yes)>	= 0
120101003 =	IP Static Route set #1, Destination IP address		= 0.0.0.0
120101004 =	IP Static Route set #1, Destination IP subnetmask		= 0
120101005 =	IP Static Route set #1, Gateway		= 0.0.0.0
120101006 =	IP Static Route set #1, Metric		= 0
120101007 =	IP Static Route set #1, Private	<0(No) |1(Yes)>	= 0
/ Menu 12.1.2 IP Static Route Setup			
FIN	FN	PVA	INPUT
120108001 =	IP Static Route set #8, Name	<Str>	=
120108002 =	IP Static Route set #8, Active	<0(No) |1(Yes)>	= 0
120108003 =	IP Static Route set #8, Destination IP address		= 0.0.0.0
120108004 =	IP Static Route set #8, Destination IP subnetmask		= 0
120108005 =	IP Static Route set #8, Gateway		= 0.0.0.0
120108006 =	IP Static Route set #8, Metric		= 0
120108007 =	IP Static Route set #8, Private	<0(No) |1(Yes)>	= 0

Table 131 Menu 15 SUA Server Setup

/ Menu 15 SUA Server Setup			
FIN	FN	PVA	INPUT
150000001 =	SUA Server IP address for default port		= 0.0.0.0
150000002 =	SUA Server #2 Active	<0(No) | 1(Yes)>	= 0
150000003 =	SUA Server #2 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000004 =	SUA Server #2 Port Start		= 0
150000005 =	SUA Server #2 Port End		= 0
150000006 =	SUA Server #2 Local IP address		= 0.0.0.0
150000007 =	SUA Server #3 Active	<0(No) | 1(Yes)>	= 0
150000008 =	SUA Server #3 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000009 =	SUA Server #3 Port Start		= 0
150000010 =	SUA Server #3 Port End		= 0
150000011 =	SUA Server #3 Local IP address		= 0.0.0.0
150000012 =	SUA Server #4 Active	<0(No) | 1(Yes)>	= 0
150000013 =	SUA Server #4 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000014 =	SUA Server #4 Port Start		= 0
150000015 =	SUA Server #4 Port End		= 0
150000016 =	SUA Server #4 Local IP address		= 0.0.0.0
150000017 =	SUA Server #5 Active	<0(No) | 1(Yes)>	= 0
150000018 =	SUA Server #5 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000019 =	SUA Server #5 Port Start		= 0
150000020 =	SUA Server #5 Port End		= 0
150000021 =	SUA Server #5 Local IP address		= 0.0.0.0
150000022 =	SUA Server #6 Active	<0(No) | 1(Yes)> = 0	= 0
150000023 =	SUA Server #6 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000024 =	SUA Server #6 Port Start		= 0
150000025 =	SUA Server #6 Port End		= 0
150000026 =	SUA Server #6 Local IP address		= 0.0.0.0
150000027 =	SUA Server #7 Active	<0(No) | 1(Yes)>	= 0
150000028 =	SUA Server #7 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0.0.0.0
150000029 =	SUA Server #7 Port Start		= 0
150000030 =	SUA Server #7 Port End		= 0

Table 131   Menu 15 SUA Server Setup (continued)

150000031 =	SUA Server #7 Local IP address		= 0.0.0.0
150000032 =	SUA Server #8 Active	<0(No) | 1(Yes)>	= 0
150000033 =	SUA Server #8 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000034 =	SUA Server #8 Port Start		= 0
150000035 =	SUA Server #8 Port End		= 0
150000036 =	SUA Server #8 Local IP address		= 0.0.0.0
150000037 =	SUA Server #9 Active	<0(No) | 1(Yes)>	= 0
150000038 =	SUA Server #9 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000039 =	SUA Server #9 Port Start		= 0
150000040 =	SUA Server #9 Port End		= 0
150000041 =	SUA Server #9 Local IP address		= 0.0.0.0
150000042	= SUA Server #10 Active	<0(No) | 1(Yes)>	= 0
150000043 =	SUA Server #10 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000044 =	SUA Server #10 Port Start		= 0
150000045 =	SUA Server #10 Port End		= 0
150000046 =	SUA Server #10 Local IP address		= 0.0.0.0
150000047 =	SUA Server #11 Active	<0(No) | 1(Yes)>	= 0
150000048 =	SUA Server #11 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000049 =	SUA Server #11 Port Start		= 0
150000050 =	SUA Server #11 Port End		= 0
150000051 =	SUA Server #11 Local IP address		= 0.0.0.0
150000052 =	SUA Server #12 Active	<0(No) | 1(Yes)>	= 0
150000053 =	SUA Server #12 Protocol	<0(All)|6(TCP)|17(UDP)>	= 0
150000054 =	SUA Server #12 Port Start		= 0
150000055 =	SUA Server #12 Port End		= 0
150000056 =	SUA Server #12 Local IP address		= 0.0.0.0

Table 132   Menu 21.1 Filter Set #1

/ Menu 21 Filter set #1			
FIN	FN	PVA	INPUT
210100001 =	Filter Set 1, Name	<Str>	=
/ Menu 21.1.1.1 set #1, rule #1			
FIN	FN	PVA	INPUT
210101001 =	IP Filter Set 1,Rule 1 Type	<2(TCP/IP)>	= 2

Table 132 Menu 21.1 Filter Set #1 (continued)

210101002 =	IP Filter Set 1,Rule 1 Active	<0(No)|1(Yes)>	= 1
210101003 =	IP Filter Set 1,Rule 1 Protocol		= 6
210101004 =	IP Filter Set 1,Rule 1 Dest IP address		= 0.0.0.0
210101005 =	IP Filter Set 1,Rule 1 Dest Subnet Mask		= 0
210101006 =	IP Filter Set 1,Rule 1 Dest Port		= 137
210101007 =	IP Filter Set 1,Rule 1 Dest Port Comp	<0(none)|1(equal)|2(not equal)|3(less)|4(greater)>	= 1
210101008 =	IP Filter Set 1,Rule 1 Src IP address		= 0.0.0.0
210101009 =	IP Filter Set 1,Rule 1 Src Subnet Mask		= 0
210101010 =	IP Filter Set 1,Rule 1 Src Port		= 0
210101011 =	IP Filter Set 1,Rule 1 Src Port Comp	<0(none)|1(equal)|2(not equal)|3(less)|4(greater)>	= 0
210101013 =	IP Filter Set 1,Rule 1 Act Match	<1(check next)|2(forward)|3(drop)>	= 3
210101014 =	IP Filter Set 1,Rule 1 Act Not Match	<1(check next)|2(forward)|3(drop)>	= 1
/ Menu 21.1.1.2 set #1, rule #2			
FIN	FN	PVA	INPUT
210102001 =	IP Filter Set 1,Rule 2 Type	<2(TCP/IP)>	= 2
210102002 =	IP Filter Set 1,Rule 2 Active	<0(No)|1(Yes)>	= 1
210102003 =	IP Filter Set 1,Rule 2 Protocol		= 6
210102004 =	IP Filter Set 1,Rule 2 Dest IP address		= 0.0.0.0
210102005 =	IP Filter Set 1,Rule 2 Dest Subnet Mask		= 0
210102006 =	IP Filter Set 1,Rule 2 Dest Port		= 138
210102007 =	IP Filter Set 1,Rule 2 Dest Port Comp	<0(none)|1(equal)|2(not equal)|3(less)|4(greater)>	= 1
210102008 =	IP Filter Set 1,Rule 2 Src IP address		= 0.0.0.0
210102009 =	IP Filter Set 1,Rule 2 Src Subnet Mask		= 0
210102010 =	IP Filter Set 1,Rule 2 Src Port		= 0
210102011 =	IP Filter Set 1,Rule 2 Src Port Comp	<0(none)|1(equal)|2(not equal)|3(less)|4(greater)>	= 0

Table 132 Menu 21.1 Filter Set #1 (continued)

| 210102013 = | IP Filter Set 1,Rule 2 Act Match | <1(check next)\|2(forward)\|3(drop)> | = 3 |
| 210102014 = | IP Filter Set 1,Rule 2 Act Not Match | <1(check next)\|2(forward)\|3(drop)> | = 1 |

Table 133 Menu 21.1 Filer Set #2,

/ Menu 21.1 filter set #2,			
FIN	FN	PVA	INPUT
210200001 =	Filter Set 2, Nam	<Str>	= NetBIOS_WAN
/ Menu 21.1.2.1 Filter set #2, rule #1			
FIN	FN	PVA	INPUT
210201001 =	IP Filter Set 2, Rule 1 Type	<0(none)|2(TCP/IP)>	= 2
210201002 =	IP Filter Set 2, Rule 1 Active	<0(No)|1(Yes)>	= 1
210201003 =	IP Filter Set 2, Rule 1 Protocol		= 6
210201004 =	IP Filter Set 2, Rule 1 Dest IP address		= 0.0.0.0
210201005 =	IP Filter Set 2, Rule 1 Dest Subnet Mask		= 0
210201006 =	IP Filter Set 2, Rule 1 Dest Port		= 137
210201007 =	IP Filter Set 2, Rule 1 Dest Port Comp	<0(none)|1(equal)|2(not equal)|3(less)|4(greater)>	= 1
210201008 =	IP Filter Set 2, Rule 1 Src IP address		= 0.0.0.0
210201009 =	IP Filter Set 2, Rule 1 Src Subnet Mask		= 0
210201010 =	IP Filter Set 2, Rule 1 Src Port		= 0
210201011 =	IP Filter Set 2, Rule 1 Src Port Comp	<0(none)|1(equal)|2(not equal)|3(less)|4(greater)>	= 0
210201013 =	IP Filter Set 2, Rule 1 Act Match	<1(check next)|2(forward)|3(drop)>	= 3
210201014 =	IP Filter Set 2, Rule 1 Act Not Match	<1(check next)|2(forward)|3(drop)>	= 1
/ Menu 21.1.2.2 Filter set #2, rule #2			
FIN	FN	PVA	INPUT

Table 133   Menu 21.1 Filer Set #2,   (continued)

210202001 =	IP Filter Set 2, Rule 2 Type	<0(none)|2(TCP/IP)>	= 2
210202002 =	IP Filter Set 2, Rule 2 Active	<0(No)|1(Yes)>	= 1
210202003 =	IP Filter Set 2, Rule 2 Protocol		= 6
210202004 =	IP Filter Set 2, Rule 2 Dest IP address		= 0.0.0.0
210202005 =	IP Filter Set 2, Rule 2 Dest Subnet Mask		= 0
210202006 =	IP Filter Set 2, Rule 2 Dest Port		= 138
210202007 =	IP Filter Set 2, Rule 2 Dest Port Comp	<0(none)|1(equal)|2 (not equal)|3(less)|4(gr eater)>	= 1
210202008 =	IP Filter Set 2, Rule 2 Src IP address		= 0.0.0.0
210202009 =	IP Filter Set 2, Rule 2 Src Subnet Mask		= 0
210202010 =	IP Filter Set 2,Rule 2 Src Port		= 0
210202011 =	IP Filter Set 2, Rule 2 Src Port Comp	<0(none)|1(equal)|2 (not equal)|3(less)|4(gr eater)>	= 0
210202013 =	IP Filter Set 2, Rule 2 Act Match	<1(check next)|2(forward)|3(drop)>	= 3
210202014 =	IP Filter Set 2, Rule 2 Act Not Match	<1(check next)|2(forward)|3(drop)>	= 1

Table 134   Menu 23 System Menus

*/ Menu 23.1 System Password Setup			
FIN	FN	PVA	INPUT
230000000 =	System Password		= 1234
*/ Menu 23.2 System security: radius server			
FIN	FN	PVA	INPUT
230200001 =	Authentication Server Configured	<0(No)	1(Yes)>	= 1
230200002 =	Authentication Server Active	<0(No)	1(Yes)>	= 1
230200003 =	Authentication Server IP Address		= 192.168.1.32
230200004 =	Authentication Server Port		= 1822

Table 134 Menu 23 System Menus (continued)

230200005 =	Authentication Server Shared Secret		= 111111111111111 111111111111 1111
230200006 =	Accounting Server Configured	<0(No) | 1(Yes)>	= 1
230200007 =	Accounting Server Active	<0(No) | 1(Yes)>	= 1
230200008 =	Accounting Server IP Address		= 192.168.1.44
230200009 =	Accounting Server Port		= 1823
230200010 =	Accounting Server Shared Secret		= 1234
*/ Menu 23.4 System security: IEEE802.1x			
FIN	FN	PVA	INPUT
230400001 =	Wireless Port Control	<0(Authentication Required) |1(No Access Allowed) |2(No Authentication Required)>	= 2
230400002 =	ReAuthentication Timer (in second)		= 555
230400003 =	Idle Timeout (in second)		= 999
230400004 =	Authentication Databases	<0(Local User Database Only) |1(RADIUS Only) |2(Local,RADIUS) |3(RADIUS,Local)>	= 1
230400005 =	Key Management Protocol	<0(8021x) |1(WPA) |2(WPAPSK)>	= 0
230400006 =	Dynamic WEP Key Exchange	<0(Disable) |1(64-bit WEP) |2(128-bit WEP)>	= 0
230400007 =	PSK =		=
230400008 =	WPA Mixed Mode	<0(Disable) |1(Enable)>	= 0
230400009 =	Data Privacy for Broadcast/ Multicast packets	<0(TKIP) |1(WEP)>	= 0
230400010 =	WPA Broadcast/Multicast Key Update Timer		= 0

Table 135 Menu 24.11 Remote Management Control

/ Menu 24.11 Remote Management Control			
FIN	FN	PVA	INPUT
241100001 =	TELNET Server Port		= 23

Table 135   Menu 24.11 Remote Management Control (continued)

241100002 =	TELNET Server Access	<0(all)|1(none)|2(Lan)|3(Wan)>	= 0
241100003 =	TELNET Server Secured IP address		= 0.0.0.0
241100004 =	FTP Server Port		= 21
241100005 =	FTP Server Access	<0(all)|1(none)|2(Lan)|3(Wan)>	= 0
241100006 =	FTP Server Secured IP address		= 0.0.0.0
241100007 =	WEB Server Port		= 80
241100008 =	WEB Server Access	<0(all)|1(none)|2(Lan) |3(Wan)>	= 0
241100009 =	WEB Server Secured IP address		= 0.0.0.0

Command Examples

The following are example Internal SPTGEN screens associated with the ZyXEL Device's command interpreter commands.

Table 136   Command Examples

		FN	**PVA**	**INPUT**
/ci command (for annex a): wan adsl opencmd				
		FN	PVA	INPUT
		ADSL OPMD	<0(glite)|1(t1.413)|2(gdmt)|3(multimode)>	= 3
/ci command (for annex B): wan adsl opencmd				
		FN	PVA	INPUT
		ADSL OPMD	<0(etsi)|1(normal)|2(gdmt)|3(multimode)>	= 3

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