Prestige 650M-6x

ADSL Modem

User's Guide

Version 3.40

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This 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 equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

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

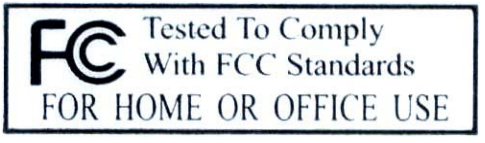
1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and the receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.

Notice 1

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

Certifications

1. Go to 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



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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 value, and will be solely at the discretion of ZyXEL. This warranty shall not apply if the product is modified, misused, tampered with, damaged by an act of God, or subjected to abnormal working conditions.

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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.

Safety Warnings

1. To reduce the risk of fire, use only No. 26 AWG or larger telephone wire.

2. Do not use this product near water, for example, in a wet basement or near a swimming pool.

3. Avoid using this product during an electrical storm. There may be a remote risk of electric shock from lightening.

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[1] FAX[1]	WEB SITE FTP SITE	REGULAR MAIL
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
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.
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
FRANCE	info@zyxel.fr	+33 (0)4 72 52 97 97 +33 (0)4 72 52 19 20	www.zyxel.fr	ZyXEL France 1 rue des Vergers Bat. 1 / C 69760 Limonest France
SPAIN	support@zyxel.es sales@zyxel.es	+34 902 195 420 +34 913 005 345	www.zyxel.es	ZyXEL Communications Alejandro Villegas 33 1º, 28043 Madrid Spain
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 5 2860 Soeborg Denmark
NORWAY	support@zyxel.no sales@zyxel.no	+47 22 80 61 80 +47 22 80 61 81	www.zyxel.no	ZyXEL Communications A/S Nils Hansens vei 13 0667 Oslo Norway

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

METHOD / LOCATION	SUPPORT E-MAIL SALES E-MAIL	TELEPHONE[1] FAX[1]	WEB SITE FTP SITE	REGULAR MAIL
SWEDEN	support@zyxel.se sales@zyxel.se	+46 31 744 7700 +46 31 744 7701	www.zyxel.se	ZyXEL Communications A/S Sjöporten 4, 41764 Göteborg Sweden
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

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Preface

Congratulations on your purchase of the Prestige 650M-6x ADSL Modem.

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.

Your Prestige is easy to install and configure using CLI (Command Line Interface) commands.

Please visit our web site at www.zyxel.com for the latest release notes and product information.

Don't forget to register your Prestige (fast, easy online registration at www.zyxel.com) for free future product updates and information.

About This User's Guide

This manual is designed to guide you through the configuration of your Prestige for its various applications.

Related Documentation

- Supporting Disk

  Refer to the included CD for support documents.

- ZyXEL Web Site

  The ZyXEL download library at www.zyxel.com contains additional support documentation. Please also refer to www.zyxel.com for an online glossary of networking terms.

Syntax Conventions

- "Type" means for you to type one or more characters and press the carriage return. "Select" or "Choose" means for you to use one predefined choices. Command and arrow keys are enclosed in square brackets. [ENTER] means the Enter, or carriage return key.
- For brevity's sake, we will use "e.g.," as shorthand for "for instance", and "i.e.," for "that is" or "in other words" throughout this manual.
- The Prestige 650M-6x ADSL Modem series may be referred to as the Prestige in this user's guide.

Graphics Icons Key

 Prestige	 Computer	 Notebook computer
 Server	 DSLAM	 Firewall
 Telephone	 Switch	 Router
 Wireless Signal		

The following section offers some background information on DSL. Skip to *Chapter 1* if you wish to begin working with your router right away.

Introduction to DSL

DSL (Digital Subscriber Line) technology enhances the data capacity of the existing twisted-pair wire that runs between the local telephone company switching offices and most homes and offices. While the wire itself can handle higher frequencies, the telephone switching equipment is designed to cut off signals above 4,000 Hz to filter noise off the voice line, but now everybody is searching for ways to get more bandwidth to improve access to the Web - hence DSL technologies.

There are actually seven types of DSL service, ranging in speeds from 16 Kbits/sec to 52 Mbits/sec. The services are either symmetrical (traffic flows at the same speed in both directions), or asymmetrical (the downstream capacity is higher than the upstream capacity). Asymmetrical services (ADSL) are suitable for Internet users because more information is usually downloaded than uploaded. For example, a simple button click in a web browser can start an extended download that includes graphics and text.

As data rates increase, the carrying distance decreases. That means that users who are beyond a certain distance from the telephone company's central office may not be able to obtain the higher speeds.

A DSL connection is a point-to-point dedicated circuit, meaning that the link is always up and there is no dialing required.

Introduction to ADSL

It is an asymmetrical technology, meaning that the downstream data rate is much higher than the upstream data rate. As mentioned, this works well for a typical Internet session in which more information is downloaded, for example, from Web servers, than is uploaded. ADSL operates in a frequency range that is above the frequency range of voice services, so the two systems can operate over the same cable.

Part I:

GETTING STARTED

This part is structured as a step-by-step guide to help you access your Prestige. It covers key features and applications.

Chapter 1
Getting To Know Your Prestige

This chapter describes the key features and applications of your Prestige.

1.1 Introducing the Prestige

Your Prestige integrates high-speed 10/100Mbps auto-negotiating LAN interface(s) and a high-speed ADSL port into a single package. The Prestige is ideal for high-speed Internet browsing and making LAN-to-LAN connections to remote networks.

Models ending in "1", for example P650M-61, denote a device that works over the analog telephone system, POTS (Plain Old Telephone Service). Models ending in "3" denote a device that works over ISDN (Integrated Synchronous Digital System). Models ending in "7" denote a device that works over T-ISDN (UR-2).

Only use firmware for your Prestige's specific model. Refer to the label on the bottom of your Prestige.

Your Prestige is easy to install and configure using CLI (Command Line Interface) commands.

1.2 Features of the Prestige

The following sections describe the features of the Prestige.

➢ High Speed Internet Access

Your Prestige ADSL modem can support downstream transmission rates of up to 8Mbps and upstream transmission rates of 832 Kbps.

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

This auto-negotiation feature allows the Prestige 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-Crossover (MDI/MDI-X) 10/100 Mbps Ethernet Interface(s)

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

➢ Multiple PVC (Permanent Virtual Circuits) Support

Your Prestige supports up to 2 PVC's.

➢ ADSL Transmission Rate Standards

- Full-Rate (ANSI T1.413, Issue 2; G.dmt (G.992.1) with line rate support of up to 8 Mbps downstream and 832 Kbps upstream.
- G.lite (G.992.2) with line rate support of up to 1.5Mbps downstream and 512Kbps upstream.
- Supports Multi-Mode standard (ANSI T1.413, Issue 2; G.dmt (G.992.1); G.lite (G992.2)).
- TCP/IP (Transmission Control Protocol/Internet Protocol) network layer protocol.
- ATM Forum UNI 3.1/4.0 PVC.
- Supports up to 2 PVCs (UBR, CBR, VBRrt, VBRnrt).
- Multiple Protocol over AAL5 (RFC 1483).
- RFC 1661.
- Extended-Reach ADSL (ER ADSL)

➢ Networking Compatibility

Your Prestige is compatible with the major ADSL DSLAM (Digital Subscriber Line Access Multiplexer) providers, making configuration as simple as possible for you.

➢ Multiplexing

The Prestige supports VC-based and LLC-based multiplexing.

➢ Encapsulation

The Prestige supports RFC 1483 encapsulation over ATM.

➢ Network Management

- CLI (Command Line Interpreter)
- Remote Management via Telnet
- Syslog
- Telnet Support (Password-protected telnet access to internal configuration manager)
- firmware upgrade utility

- Supports OAM F4/F5 loop-back, AIS and RDI OAM cells

➢ Ease of Installation

Your Prestige is designed for quick, easy and intuitive installation. Its compact size and light weight make it easy to position anywhere in your busy office.

1.3 Applications for the Prestige

Here is an example use for which the Prestige is well suited.

1.3.1 Internet Access

The Prestige is the ideal high-speed Internet access solution. Your Prestige supports the TCP/IP protocol, which the Internet uses exclusively. A typical Internet access application is shown below.

Figure 1-1 Prestige Internet Access Application

Part II:

COMMANDS

This part covers Commands Introduction, System, LAN, Ethernet, Bridge, WAN and IP Commands and Firmware uploading.

Chapter 2
Commands Introduction

This chapter describes how to access the Prestige and provides an overview of its commands.

2.1 Command Line Overview

You can use line commands to configure the Prestige. If you have problems with your Prestige, customer support may request that you issue some of these commands to assist them in troubleshooting.

2.1.1 Command Syntax Conventions

1. Command keywords are in `courier new` font.
2. The / symbol means "or".
3. Type "`help`" or "`?`" to display a list of valid commands or type a command (see *Table 2-1 Command Summary*) to display a list of associated subcommands.

```
Copyright (c) 1994 - 2004 ZyXEL Communications Corp.
ras> ?
Valid commands are:
sys             exit            ether           wan
ip              bridge          lan
ras>
```

Figure 2-1 CLI Help Example –1

```
ras> sys
countrycode     date            edit            feature
hostname        stdio           datetime        time
version         view            wdog            romreset
atsh            password        socket          cpu
ras>
```

Figure 2-2 CLI Help Example -2

2.1.2 Command Notation

The following notations denote user options:

[a/b/c/d...] *or* ***<a/b/c/d…>***:	Select and type the predefined default options.
[DEFAULT] *or* ***<DEFAULT>:***	Enter the value or predefined selection for this sub-command.
a.b.c.d:	The option is a 4-byte dotted decimal value.

2.1.3 Exit

Type **exit** at the command prompt to disconnect from the Prestige.

2.2 Connect to your Prestige Using Telnet

The following procedure details how to telnet into your Prestige.

Step 1. Make sure your computer IP address and the Prestige IP address are on the same subnet. Refer to the *Setting Up Your Computer IP Address* appendix.

Step 2. In Windows, click **Start** (usually in the bottom left corner), **Run** and then type "telnet 192.168.1.1" (the default IP address) and click **OK**.

Step 3. For your first login, enter "1234" in the **Password** field. As you type a password, the screen displays an asterisk " * " for each character you type.

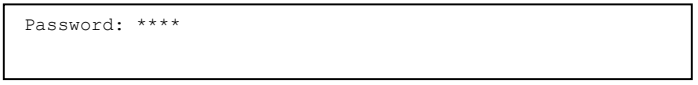


Figure 2-3 Login Screen

Step 4. After entering the correct password you can use the commands to do configuration.

2.3 Resetting the Prestige

If you forget your password or cannot access the Prestige, you will need to use the **RESET** button at the back of the Prestige 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 Using The Reset Button

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

Step 2. Press the **RESET** button for more than five seconds or until the **PWR/SYS** LED begins to blink and then release it. When the **PWR/SYS** LED begins to blink, the defaults have been restored and the Prestige restarts.

2.4 Changing the Password

It is highly recommended that you change the password for accessing the Prestige.

Change the Prestige default password by using the command shown next. Make sure you store the password in a safe place.

Syntax:

```
sys password <new password>
```

```
ras> sys password 5678
save ok
ras>
```

Figure 2-4 Password Changing

2.5 Command Summary

The following table is a summary of the commands available in the Prestige together with a brief description of each command.

Table 2-1 Command Summary

MAIN COMMAND	SUB-COMMAND		DESCRIPTION
exit			This command logs out the prestige.
sys			
	countrycode		This command shows the country code of the firmware.
	date		This command shows the current system date.
	edit <filename>		This command edits a text file.
	feature		This command lists Prestige features.
	hostname <hostname>		This command shows the system hostname.
	stdio		This command shows or sets how many minutes the terminal can be left idle before the session times out.
	datetime	period	This command shows or sets how many days (between 1 and 30) elapses before the Prestige synchronizes with a time server.
	time		This command shows the current system time.
	version		This command shows the firmware version and RAS code.
	view <filename>		This command views a text file.
	wdog	switch [on|off]	This command turn on/off watchdog.
		cnt	This command shows watchdog count value.
	romreset		This command restores the factory defaults of your Prestige.
	atsh		This command shows the factory default data.

Table 2-1 Command Summary

MAIN COMMAND	SUB-COMMAND			DESCRIPTION
	password <new password>			This command sets the new password.
	socket			This command shows system socket information.
	cpu	display		This command shows CPU utilization.
ether				
	config			This command shows LAN settings.
	driver	cnt	disp <name>	This command shows Ethernet driver counters.
		Status <ch-name>		This command shows LAN status.
		config		This command sets MAC phy mode. [0|1=auto|normal] [0|1=10|100] [0|1=HD|FD] <ch-name>
	version			This command shows Ethernet device type.
wan				
	node	index [1~2]		Use this command to set a remote node as the current node to apply node commands.
		clear		This command clears the current nodes statistics
		save		This command saves the current nodes settings.
		ispname <name>		Use this command to identify the ISP used by this node.
		enable		This command enables the currently selected remote node.
		disable		This command disables the currently selected remote node.
		encap <1483 >		Use this command to set the method of encapsulation used by the Prestige.
		disp		This command displays the settings for the current node.
		mux <llc|vc>		Use this command to set the multiplexing method used by the Prestige.
		Vpi <vpi>		Enter the Virtual Path Identifier from 0 to 255.

Table 2-1 Command Summary

MAIN COMMAND	SUB-COMMAND			DESCRIPTION
		vci [num]		Enter the Virtual Channel Identifier from 32 to 65535.
		qos [ubr|cbr|vbr]		This is the ATM QoS type.
		pcr [num]		This is the maximum rate at which the sender can send cells.
		scr [num]		This is the mean cell rate of each bursty traffic source.
		mbs [num]		This is the maximum number of cells that can be sent at the PCR.
		bridge <on|off>		Use this command to select have the Prestige act as a bridge.
		routeip <on|off>		Use this command to select have the Prestige act as a router.
	hwsar	disp		This command displays hwsar packets incoming/outgoing information.
		clear		This command clears hwsar packets information.
	adsl	chandata		This command displays the ADSL line channel information.
		opmode		This command displays the operating mode of the ADSL line.
		linedata	far	Show ADSL far end noise margin
			near	Show ADSL near end noise margin
		perfdata		Show performance information, CRC, FEC, error seconds.
		rateadap	on	Turn on rate adaptive mechanism
			off	Turn off rate adaptive mechanism
		reset		Reset ADSL modem, and must reload the modem code again
		status		ADSL status (ex: up, down or wait for init)
		open		Initialize ADSL connection

Table 2-1 Command Summary

MAIN COMMAND	SUB-COMMAND			DESCRIPTION
		opencmd	gdmt	Open ADSL line with G.dmt standard
			multimode	Open ADSL line in multi modes
		close		Close ADSL line
		targetnoise		Adjust target noise offset
		modem_code		Display modem code version.
IP				
	address	[xxx.xxx.x.x]		This command sets or displays the current IP address of your Prestige.
	arp	status		This command displays arp port statistics of your Prestige.
	ifconfig			This command
	ping<hostid>			Packet Internet Groper is a protocol that sends out ICMP echo requests to test whether or not a remote host is reachable.
	route	status		This command displays the routing information for static (manually entered) routes.
		add <dest addr>[/<bits>] <gateway> [<metric>]		Use this command to add a static route to the routing table.
		drop <host addr> [/<bits>]		Use this command to delete an entry in the routing table.
	status			This command displays IP routing statistics.
	tcp			This command displays tcp statistics.
		ceiling <value>		TCP maximum round trip time.
		floor <value>		TCP minimum rtt.
		kick <tcb>		Kicks Transmission Control Block (TCB).
		irtt<value>		TCP default init rtt.
		limit <value>		Sets TCP output window limit.
		mss <size>		Maximum Segment Size.

Table 2-1 Command Summary

MAIN COMMAND	SUB-COMMAND		DESCRIPTION
		reset <tcb>	Resets TCB.
		rtt	Sets round trip time for tcb.
		status	Display TCP statistic counters.
		syndata [on|off]	TCP syndata piggyback.
		trace [on|off]	Turn on/off trace for debugging.
		window [size]	TCP input window size.
Bridge			
	cnt	disp <channel>	This command displays the connection statistics for a specified channel.
		clear<channel>	This command erases the connection statistics for the specified channel.
	stat	disp	This command displays the packet statistics for a specified channel.
		clear	This command erases the packet statistics for the specified channel.
Lan			
	index <1:main LAN>		Use this command to select an interface for editing or display.
	ipaddr<IP Addr> <Mask>		Use this command to display the IP address and subnet mask for the selected interface.
	display		This command displays the selected interface settings.
	clear		This command erases the IP address and subnet mask settings for the selected interface.
	save		After changing the interface fields save your settings back to the Prestige to keep them after reboot.

Chapter 3
System Setup

This chapter provides the information on system configuration.

3.1 System Commands

Syntax:

```
sys countrycode [0-255]
```

This command sets the country code, the default is already set. If you need to change the country code, contact your vendor for a list of valid codes.

An example is shown next.

```
ras> sys countrycode 225
ras> sys countrycode
country code = 225
ras>
```

Figure 3-1 sys countrycode

Syntax:

```
sys date
```

This command shows the current system date. To set the date set the Prestige to update from the time server, see *Figure 3-7*.

An example is shown next.

```
ras> sys date
Current date is Thu 2004/08/01
ras>
```

Figure 3-2 sys date

Syntax:

```
sys edit<filename>
```

This command edits a text file. Currently you can edit the autoexec.net file stored in the Prestige. This file is run on startup. Edit this file to automate commands that you want to execute every time you start the device.

An example is shown next.

```
ras> sys edit autoexec.net
EDIT cmd: q(uit) x(save & exit) i(nsert after) d(elete)
r(eplace) n(ext)
dir
: sys dir
ras> sys view autoexec.net
sys dir
ip tcp mss 512
ip tcp limit 2
ip tcp irtt 65000
ip tcp window 2
ip tcp ceiling 6000
ras>
```

Figure 3-3 sys edit

Syntax:

```
sys feature
```

This command lists the hardware features of the Prestige.

An example is shown next.

```
ras> sys feature
IPX: no
IP ONLY: yes
AUI: yes
AB ADAPTER: no
IDSL ONLY: no
IDSL: no
INTERNAL HUB: no
ras>
```

Figure 3-4 sys feature

The following table describes the fields in this screen.

Table 3-1 sys feature

FIELD	DESCRIPTION
IPX: no	This Prestige doesn't support the IPX protocol.
IP ONLY: yes	This Prestige uses IP protocol.
AUI: yes	This Prestige has a LAN port.

Table 3-1 sys feature

FIELD	DESCRIPTION
AB ADAPTER: no	This Prestige does not have an internal phone connection.
IDSL ONLY: no	This Prestige does not support IDSL.
IDSL: no	This Prestige does not support IDSL.
INTERNAL HUB: no	This Prestige has one Ethernet port.

Syntax:

```
sys hostname <hostname>
```

This command shows/sets the system hostname. Type a name using 9 characters or less to identify your Prestige on the network. The hostname is also shown in the command prompt.

An example is shown next.

```
ras> sys hostname test
test> sys hostname
test
```

Figure 3-5 sys hostname

Syntax:

```
sys stdio
```

This command shows or sets how many minutes the terminal can be left idle before the session times out.

An example is shown next.

```
ras> sys stdio 25
Current Stdio Timeout = 25 minutes
```

Figure 3-6 sys stdio

Syntax:

```
sys datetime period
```

This command shows or sets how many days (between 1 and 30) elapses before the Prestige synchronizes with a time server.

```
ras> sys datetime period
The period to synchronize with time server is 1 day(s).
```

Figure 3-7 sys datetime period

Syntax:

```
sys time
```

This command shows the current system time.

An example is shown next.

```
ras> sys time
Current time is 00:13:24
```

Figure 3-8 sys time

Syntax:

```
sys version
```

This command shows the firmware version and RAS code.

An example is shown next.

```
ras> sys version

 ZyNOS version: V3.40(SN.0)b2 | 7/9/2004
 romRasSize: 458764
 system up time:     0:18:23 (1af12 ticks)
 bootbase version: V1.00 | 6/14/2004
ras>
```

Figure 3-9 sys version

Syntax:

```
sys  view <filename>
```

This command views a text file. View the autoexec.net file to see the system defaults, or check your edits.

An example is shown next.

```
ras> sys view autoexec.net
ip tcp mss 512
ip tcp limit 2
ip tcp irtt 65000
ip tcp window 2
ip tcp ceiling 6000
ras>
```

Figure 3-10 sys view

Syntax:

`sys` wdog switch [on|off]

This command turns on/off watchdog.

An example is shown next.

```
ras> sys wdog switch on
```

Figure 3-11 sys wdog switch

Syntax:

`sys` wdog switch cnt

This command shows watchdog count value.

An example is shown next.

```
ras> sys wdog cnt
Max Miss: 180
```

Figure 3-12 sys wdog cnt

Syntax:

`sys` romreset

This command restores the factory defaults of your Prestige.

An example is shown next.

```
ras> sys romreset
Do you want to restore default ROM file(y/n)?n

canceled
```

Figure 3-13 sys romreset

Syntax:

`sys` atsh

This command shows the factory default data.

An example is shown next.

```
ras> sys atsh

RAS version            : V3.40(SN.0)b2 | 7/9/2004
Ram Size               : 2048 Kbytes
Flash Type and Size    : AMD 4Mbits*1
romRasSize             : 458764
bootbase version       : V1.00 | 6/14/2004
Product Model          : Prestige 650M-67
MAC Address            : 00A0C59C7B83
Default Country Code   : FF
Boot Module Debug Flag : 00
RomFile Version        : 17
RomFile Checksum       : 3e31
RAS F/W Checksum       : a2f1
SNMP MIB level & OID   :
060102030405060708091011121314151617181920
Main Feature Bits      : C0
Other Feature Bits     :
92 63 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 41 13 00 00 00
```

Figure 3-14 sys atsh

Syntax:

`sys` password

This command sets the new password. It is highly recommended that you change the password for accessing the Prestige

An example is shown next.

```
ras> sys password 1234
save ok
```

Figure 3-15 sys password

Syntax:

`sys` socket

This command shows system socket information.

An example is shown next.

```
ras> sys socket
S#   Type    PCB      Remote socket         Owner
8192 TCP     94112820 192.168.1.22:1033     940f70cc PP0f
```

Figure 3-16 sys password

Syntax:

`sys` cpu display

This command shows CPU utilization.

An example is shown next.

```
ras> sys cpu display
CPU usage status:
  baseline 872865 ticks
 sec  ticks  util    sec  ticks  util    sec  ticks  util    sec  ticks  util
  0  867922   0.56    1  865527   0.84    2  868346   0.51    3  869880   0.34
  4  869049   0.43    5  868230   0.53    6  872145   0.08    7  872130   0.08
  8  872154   0.08    9  872151   0.08   10  872151   0.08   11  872151   0.08
 12  872088   0.08   13  871744   0.12   14  871914   0.10   15  872154   0.08
 16  872155   0.08   17  872120   0.08   18  872154   0.08   19  872158   0.08
 20  872156   0.08   21  872156   0.08   22  872156   0.08   23  872123   0.08
 24  871868   0.11   25  872160   0.08   26  872158   0.08   27  872148   0.08
 28  872160   0.08   29  872161   0.08   30  872160   0.08   31  872136   0.08
 32  872165   0.08   33  872139   0.08   34  872140   0.08   35  872141   0.08
 36  872140   0.08   37  872124   0.08   38  872140   0.08   39  872140   0.08
 40  872145   0.08   41  872143   0.08   42  872142   0.08   43  872148   0.08
 44  872144   0.08   45  872144   0.08   46  872143   0.08   47  872130   0.08
 48  872149   0.08   49  872148   0.08   50  872147   0.08   51  872150   0.08
 52  872148   0.08   53  872149   0.08   54  872148   0.08   55  872149   0.08
 56  872153   0.08   57  872138   0.08   58  872152   0.08   59  872155   0.08
 60  872152   0.08   61  872153   0.08   62  872151   0.08
```

Figure 3-17 sys cpu display

Chapter 4
LAN Setup

This chapter provides the information on LAN configuration.

4.1 LAN Overview

A Local Area Network (LAN) is a shared communication system to which many computers are attached. A LAN is a computer network limited to the immediate area, usually the same building or floor of a building..

4.1.1 LANs, WANs and the Prestige

The actual physical connection determines whether the Prestige ports are LAN or WAN ports. There are two separate IP networks, one inside the LAN network and the other outside the WAN network as shown next:

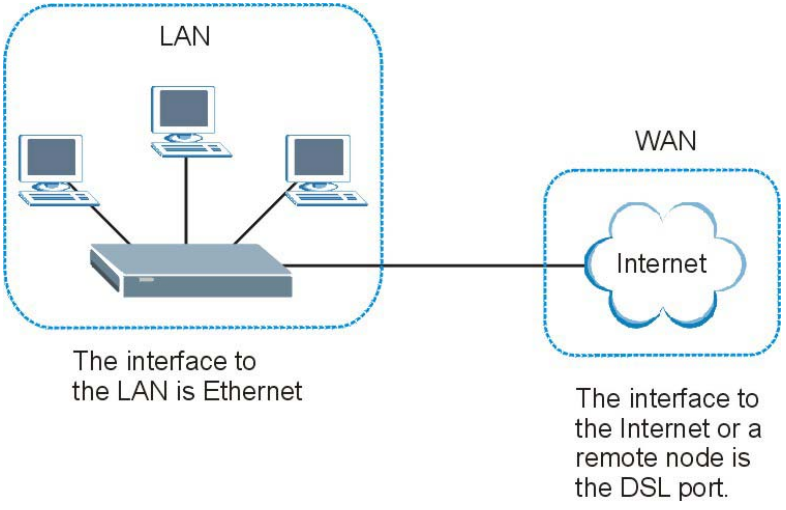


Figure 4-1 LAN and WAN IP Addresses

4.1.2 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 Prestige supports both IGMP version 1 (**IGMP-v1**) and IGMP version 2 (**IGMP-v2**). At start up, the Prestige queries all directly connected networks to gather group membership. After that, the Prestige periodically updates this information.

4.2 LAN Configuration

Syntax:

```
lan index <1:main LAN>
```

Use this command to select an interface for editing or display.

An example is shown next.

```
ras> lan index 2
Nothing Selected
```

Figure 4-2 lan index Example 1

Currently there is only one interface available to select.

```
ras> lan index 1
enif0 is selected
ras>
```

Figure 4-3 lan index Example 2

Syntax:

```
lan ipaddr<IP Addr> <Mask>
```

Use this command to display the IP address and subnet mask for the selected interface.

An example is shown next.

```
ras> lan ipaddr 192.168.1.2 255.255.255.0
ras> lan display
Active: Yes
Interface: enif0
IP Address: 192.168.1.2
Subnet Mask: 255.255.255.0
```

Figure 4-4 lan ipaddr

After changing the interface fields you need to save your settings back to the Prestige to keep them after reboot.

Syntax:

```
lan display
```

This command displays the selected interface settings.

An example is shown next.

```
ras> lan display
Active: Yes
Interface: enif0
IP Address: 192.168.1.2
Subnet Mask: 255.255.255.0
```

Figure 4-5 lan display

Syntax:

```
lan clear
```

This command erases the IP address and subnet mask settings for the selected interface.

An example is shown next.

```
ras> lan clear
ras> lan display
Active: Yes
Interface: enif0
IP Address: 0.0.0.0
Subnet Mask: 0.0.0.0
```

Figure 4-6 lan clear

Syntax:

```
lan save
```

This command erases the IP address and subnet mask settings for the selected interface.

An example is shown next.

```
ras> lan clear
ras> lan display
Active: Yes
Interface: enif0
IP Address: 0.0.0.0
Subnet Mask: 0.0.0.0
```

Figure 4-7 lan save

Chapter 5
Ethernet Setup

This chapter provides the information on Ethernet configuration.

5.1 Ethernet Parameters

5.1.1 Speed

When auto-negotiation is turned on, an Ethernet port negotiates with the peer automatically to determine the connection speed and duplex mode. If the peer Ethernet port does not support auto-negotiation or turns off this feature, the device determines the connection speed by detecting the signal on the cable and using half duplex mode. When the device's auto-negotiation is turned off, an Ethernet port uses the pre-configured speed and duplex mode when making a connection, thus requiring you to make sure that the settings of the peer Ethernet port are the same in order to connect.

5.1.2 Duplex Mode

Duplex mode choices are half duplex or full duplex. When auto-negotiation is turned on, the Ethernet port on the device negotiates with the peer automatically to determine the connection speed and duplex mode. When a port is in half-duplex mode, it can either send data or receive data at a given time. When a port is in full-duplex mode, it can simultaneously send and receive data, effectively doubling its throughput.

5.1.3 Flow Control

A concentration of traffic on a port decreases port bandwidth and overflows buffer memory causing packet discards and frame losses. Flow Control is used to regulate transmission of signals to match the bandwidth of the receiving port.

The Prestige uses IEEE802.3x flow control in full duplex mode and back pressure flow control in half duplex mode.

IEEE802.3x flow control is used in full duplex mode to send a pause signal to the sending port, causing it to temporarily stop sending signals when the receiving port memory buffers fill.

Back pressure flow control is typically used in half duplex mode to send a "collision" signal to the sending port (mimicking a state of packet collision) when the receiving port memory buffers are full causing the sending port to temporarily stop sending signals and resend later.

5.2 Ethernet Commands

Syntax:

```
ether driver status
```

This command displays the current status of the Ethernet ports.

```
ras> ether driver status enet0
 ChanID         =          0, Mac            = 00:a0:c5:9c:7b:83
 eq             =          0, dq             =          0
 ifaceType      =          0, TxSending      =          0
 mac_p          =   940d2a4c, ec_p           =   94147058
 LinkSt         =          7, CacheQueue     =          0
 MbufCacheAlloc =          0, MbufCacheEmpty =          0
 Reset counts   =          0, Phy address    =         1f
 txUnReleasedBufCnt  =    12
```

Figure 5-1 ether status

Syntax:

```
ether config
```

This command shows LAN settings.

An example is shown next.

```
ras> ether config
-------------- NDIS CONFIGURATION BLOCK ----------------
type=1 flags=0001
Board/Chassis:1  Lines/Board:1  Channels/Lines:1 Total Channel:1
task-id=940f6ba8 event-q=94121940(18) data-q=94121984(19) func-
id=2
board-cfg=940fc794 line-cfg=940fc7ac chann-cfg=940fc7c0
board-pp (940fc7d0)
940fc29c
line-pp (940fc7d4)
940fc594
chann-pp (940fc7d8)
94147058
--------------- BOARD DISPLAY ----------------------------
ID  slot#  n-line  n-chann  status  line-cfg  chann-cfg
00      0       1        1    0001  940fc7ac    940fc7c0
--------------- LINE  DISPLAY ----------------------------
ID  line#  board-id  n-chann  chann-cfg
00      1  00              1  940fc7c0
--------------- CHANNEL DISPLAY --------------------------
ID  chan#  line-id  board-id  address name
00      1  00       00        94147058  enet0
```

Figure 5-2 ether config

Syntax:

```
ether driver cnt disp <name>
```

This command shows Ethernet driver counters.

An example is shown next.

```
ras> ether driver cnt disp enet0
[ Ethernet Statistics Display, ChanID = 0 ]
inOctets           = 0x0001ac7a,  inUnicastPkts      = 0x00000580
inMulticastPkts    = 0x000000bd,  inDiscards         = 0x00000000
inErrors           = 0x00000000,  inAll              = 0x0000063d
outOctets          = 0x00020cb1,  outUnicastPkts     = 0x00000847
outMulticastPkts   = 0x00000001,  outDiscards        = 0x00000000
outErrors          = 0x00000000,  outAll             = 0x00000848

[ inSilicon Statistics Display ]
txJabberTimeCnt    = 0x00000000,  txLossOfCarrierCnt = 0x00000000
txNoCarrierCnt     = 0x00000000,  txLateCollisionCnt = 0x00000000
txExCollisionCnt   = 0x00000000,  txHeartbeatFailCnt = 0x00000000
txCollisionCnt     = 0x00000000,  txExDeferralCnt    = 0x00000000
txUnderRunCnt      = 0x00000000,  rxAlignErr         = 0x00000000
rxSymbolErr        = 0x00000000,  rxMiiErr           = 0x00000000
rxCrcErr           = 0x00000000,  rxLengthErr        = 0x00000000
rxDribblingErr     = 0x00000000,  rxRuntErr          = 0x00000000
rxCollisionErr     = 0x00000000,  rxCodeErr          = 0x00000000
```

Figure 5-3 ether driver cnt disp

Syntax:

```
ether driver status <ch-name>
```

This command shows LAN status.

An example is shown next.

```
ras> ether driver status enet0
ChanID         =          0, Mac            = 00:a0:c5:9c:7b:83
eq             =          0, dq             =           0
ifaceType      =          0, TxSending      =           0
mac_p          =   940d2a4c, ec_p           =    94147058
LinkSt         =          7, CacheQueue     =           0
MbufCacheAlloc =          0, MbufCacheEmpty =           0
Reset counts   =          0, Phy address    =          1f
txUnReleasedBufCnt  =    10
```

Figure 5-4 sys password

Syntax:

```
ether driver config [0|1=auto|normal] [0|1=10|100] [0|1=HD|FD] <ch-
name>
```

This command sets MAC phy mode.

An example is shown next.

```
ras> ether driver config 1 1 0 enet0
```

Figure 5-5 ether driver config

Syntax:

```
ether driver status <ch-name>
```

This command shows LAN status.

An example is shown next.

```
ras> ether driver status enet0
ChanID         =          0, Mac            = 00:a0:c5:9c:7b:83
eq             =          0, dq             =          0
ifaceType      =          0, TxSending      =          0
mac_p          =   940d2a4c, ec_p           =   94147058
LinkSt         =          7, CacheQueue     =          0
MbufCacheAlloc =          0, MbufCacheEmpty =          0
Reset counts   =          0, Phy address    =         1f
txUnReleasedBufCnt  =    10
```

Figure 5-6 ether driver status

Syntax:

```
ether driver config [0|1=auto|normal] [0|1=10|100] [0|1=HD|FD] <ch-name>
```

This command sets MAC phy mode.

An example is shown next.

```
ras> ether driver config 0 0 0 enet0
```

Figure 5-7 ether driver config

Table 5-1 Service Characteristic

FIELD	DESCRIPTION
auto|normal	When auto-negotiation is turned on, an Ethernet port negotiates with the peer automatically to determine the connection speed and duplex mode. See *section 5.1.1* for more information.
10|100	Manually set the connection speed to 10Mbps or 100Mbps.
HD|FD	Select either Half Duplex or Full-Duplex, see *section 5.1.2* for more information.
<ch-name>	Specify an Ethernet channel to apply your settings. Currently only one enet0 is supported.

Syntax:

```
ether driver version
```

This command shows the Ethernet device type.

An example is shown next.

```
ras> ether version
ether: V1.00
```

Figure 5-8 ether driver version

Chapter 6
Bridge Statistics

This chapter provides the information on bridge connection and packet statistics

6.1 Bridging in General

Bridging bases the forwarding decision on the MAC (Media Access Control), or hardware address, while routing does it on the network layer (IP) address. Bridging allows the Prestige to transport packets of network layer protocols that it does not route, for example, SNA, from one network to another. The caveat is that, compared to routing, bridging generates more traffic for the same network layer protocol, and it also demands more CPU cycles and memory.

For efficiency reasons, do *not* turn on bridging unless you need to support protocols other than IP on your network. For IP, enable the routing if you need it; do not bridge what the Prestige can route.

6.2 Bridge Ethernet Setup

Basically, all non-local packets are bridged to the WAN. Your Prestige does not support IPX.

Syntax:

```
bridge cnt disp <channel>
```

This command displays the connection statistics for a specified channel.

An example is shown next.

```
ras> bridge cnt disp 1
***Last Bridge Route Code 10
WanLanIdErr              0              WanMacHdrErr             0
WanFiltered              0              WanQueLanErr             0
LanMacHdrErr             0              LanFiltered              0
LanWatchDogQueErr        0              LanNotBrtNotCast         0
LanNoWanDevice           0              LanNoNode                0
LanNoDialOnCast          27             LanDial                  0
LanDialNotAllow          0              BrCastIPNotSent          0
BrCastIPXNotSent         0              BrCastATNotSent          0
BrtDial                  0              BrtDialNotAllow          0
WanNoNode                0              BrtAddLocalNode          0
```

Figure 6-1 bridge cnt disp

Syntax:

```
bridge cnt clear <channel>
```

This command erases the connection statistics for the specified channel.

An example is shown next.

```
ras> bridge cnt clear 1
ras> bridge cnt disp 1
***Last Bridge Route Code 10
WanLanIdErr               0               WanMacHdrErr              0
WanFiltered               0               WanQueLanErr              0
LanMacHdrErr              0               LanFiltered               0
LanWatchDogQueErr         0               LanNotBrtNotCast          0
LanNoWanDevice            0               LanNoNode                 0
LanNoDialOnCast           0               LanDial                   0
LanDialNotAllow           0               BrCastIPNotSent           0
BrCastIPXNotSent          0               BrCastATNotSent           0
BrtDial                   0               BrtDialNotAllow           0
WanNoNode                 0               BrtAddLocalNode           0
```

Figure 6-2 bridge cnt clear

Syntax:

```
bridge stat disp <channel>
```

This command displays the packet statistics for a specified channel.

An example is shown next.

```
ras> bridge stat disp 1
***Last Bridge Pkt code 17
WanInIP          0              WanInIPX                  0
WanInARP                  0              WanInATLK                 0
WanInOTHR                 0              WanInIPbrCast             0
WanInIPXbrCast            0              WanInARPbrCast            0
WanInATLKbrCast           0              WanInOTHRbrCast           0
LanInIP                   0              LanInIPX                  0
LanInARP                  0              LanInATLK                 0
LanInOTHR                 0              LanInIPbrCast             14
LanInIPXbrCast            10             LanInARPbrCast            2
LanInATLKbrCast           0              LanInOTHRbrCast           0
LanInWatchDog             0              WanInOdd                  0
WanInWanOut               0              WanInOwn                  0
WanInLanOut               0              LanInWanOut               0
LanInWanOut2              0
```

Figure 6-3 bridge stat disp

Syntax:

```
bridge stat clear <channel>
```

This command erases the packet statistics for a specified channel.

An example is shown next.

```
ras> bridge stat clear 1
ras> bridge stat disp 1
***Last Bridge Pkt code 17
WanInIP          0              WanInIPX                  0
WanInARP                 0              WanInATLK                 0
WanInOTHR                0              WanInIPbrCast             0
WanInIPXbrCast           0              WanInARPbrCast            0
WanInATLKbrCast          0              WanInOTHRbrCast           0
LanInIP                  0              LanInIPX                  0
LanInARP                 0              LanInATLK                 0
LanInOTHR                0              LanInIPbrCast             0
LanInIPXbrCast           0             LanInARPbrCast             0
LanInATLKbrCast          0              LanInOTHRbrCast           0
LanInWatchDog            0              WanInOdd                  0
WanInWanOut              0              WanInOwn                  0
WanInLanOut              0              LanInWanOut               0
LanInWanOut2             0
```

Figure 6-4 bridge stat clear

Chapter 7
WAN Setup

This chapter provides the information on WAN configuration.

7.1 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 7-1 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.

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.

7.2 RFC 1483

RFC 1483 describes two methods for Multiprotocol Encapsulation over ATM Adaptation Layer 5 (AAL5). The first method allows multiplexing of multiple protocols over a single ATM virtual circuit (LLC-based multiplexing) and the second method assumes that each protocol is carried over a separate ATM virtual circuit (VC-based multiplexing). Please refer to the RFC for more detailed information.

7.3 Multiplexing

There are two conventions to identify what protocols the virtual circuit (VC) is carrying. Be sure to use the multiplexing method required by your ISP.

7.3.1 VC-based Multiplexing

In this case, by prior mutual agreement, each protocol is assigned to a specific virtual circuit; for example, VC1 carries IP, etc. VC-based multiplexing may be dominant in environments where dynamic creation of large numbers of ATM VCs is fast and economical.

7.3.2 LLC-based Multiplexing

In this case one VC carries multiple protocols with protocol identifying information being contained in each packet header. Despite the extra bandwidth and processing overhead, this method may be advantageous if it is not practical to have a separate VC for each carried protocol, for example, if charging heavily depends on the number of simultaneous VCs.

7.4 VPI and VCI

Be sure to use the correct Virtual Path Identifier (VPI) and Virtual Channel Identifier (VCI) numbers assigned to you. The valid range for the VPI is 0 to 255 and for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Please see the appendix for more information.

7.5 Introduction to ATM

ATM (Asynchronous Transfer Mode) is a connection-oriented switching technology that uses fixed-size cells to transmit data across a dedicated path (permanent virtual circuit (PVC)).

An ATM service contract is an agreement between the carrier and the subscriber to regulate the average rate and fluctuations of data transmission over an ATM network. This agreement helps eliminate congestion, which is important for transmission of real time data such as audio and video connections.

7.5.1 Quality of Service (QoS) Parameters

Peak Cell Rate (PCR) is the maximum rate at which the sender can send cells. This parameter may be lower (but not higher) than the maximum line speed. 1 ATM cell is 53 bytes (424 bits), so a maximum speed of 832 Kbps gives a maximum PCR of 1962 cells/sec. This rate is not guaranteed because it is dependent on the line speed.

Sustained Cell Rate (SCR) is the mean cell rate of each bursty (data flows followed by idle periods) traffic source. It specifies the maximum average rate at which cells can be sent over the virtual connection. SCR may not be greater than the PCR.

Maximum Burst Size (MBS) is the maximum number of cells that can be sent at the PCR. After MBS is reached, cell rates fall below SCR until cell rate averages to the SCR again. At this time, more cells (up to the MBS) can be sent at the PCR again.

The following figure illustrates the relationship between PCR, SCR and MBS.

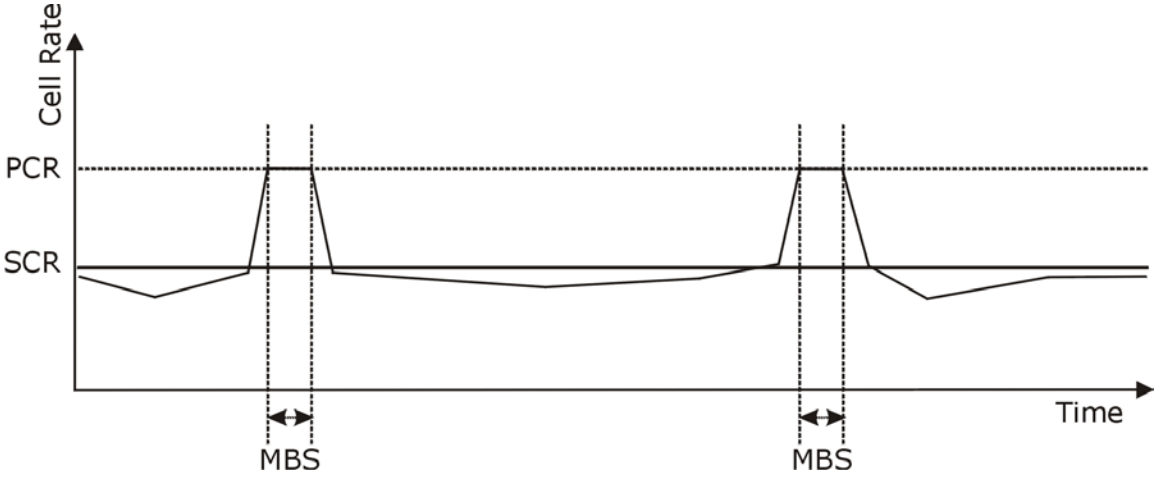


Figure 5-4 Example of Traffic Shaping

Cell Transfer Delay (CTD) is the average time for a cell to be transferred from its source to its destination over a virtual connection.

Cell Delay Variation (CDV) is difference between the maximum and minimum CTDs experienced during the connection.

Cell Delay Variation Tolerance (CDVT) is the acceptable range of the CDV.

7.5.2 Service Categories

Service categories ensure that high priority transmissions get the bandwidth they need.

CBR (Constant Bit Rate) provides a fixed amount of bandwidth that is always available even if no data is being sent. A PCR is specified and if traffic exceeds this rate, cells may be dropped. An example application is a T1 circuit.

rt-VBR (real-time Variable Bit Rate) also provides a fixed amount of bandwidth (a PCR is specified) but is only available when data is being sent. An example application is real-time videoconferencing.

nrt-VBR (non-real-time Variable Bit Rate) is commonly used for "bursty" traffic typical on LANs. PCR and MBS define the burst levels, SCR defines the minimum level. An example application is multimedia e-mail.

Unspecified Bit Rate (UBR) does not guarantee bandwidth or throughput. Cells are dropped if there is not enough bandwidth. Only the PCR is set. An example application is background file transfer.

Table 7-2 Service Characteristic

CHARACTERISTIC	CBR	RT-VBR	NRT-VBR	UBR
Guaranteed Bandwidth	✓	✓	✓	×
Good for Real-Time Traffic	✓	✓	×	×
Suitable for Bursty Traffic	×	×	✓	✓

7.6 Interleave Delay

Interleave delay is the wait (in milliseconds) that determines the size of a single block of data to be interleaved (assembled) and then transmitted. Interleave delay is used when transmission error correction (Reed- Solomon) is necessary due to a less than ideal telephone line. The bigger the delay, the bigger the data block size, allowing better error correction to be performed. This may sometimes be referred to as a "slow channel".

An interleave delay of "0" means no interleaving takes place and transmission is faster (a "fast channel"). This would be suitable if you have a good line where little error correction is necessary.

Reed-Solomon codes are block-based error correcting codes with a wide range of applications. The Reed-Solomon encoder takes a block of digital data and adds extra "redundant" bits. The Reed-Solomon decoder processes each block and attempts to correct errors and recover the original data.

7.7 G.Hs

The G.hs (G standards handshake) is a list of standards DSLAMs (DSL Access Multiplexer) use to select a common mode of operation and exchange data. G.hs standards include ITU-T Recommendations G.992.1, G.992.2, G.993.1 and working draft T1E1.4/2000 009R3 VDSL contribution. G.hs occurs before the DSL initialization sequence.

When G.hs is enabled in the VDSL modem, the DSLAM dictates (and overrides) all modem VDSL parameters.

7.8 SNR (Signal-to-Noise-Ratio)

The Prestige uses SNR(Signal-to-Noise-Ratio) to determine line quality. SNR is the ratio of the amplitude of the actual signal to the amplitude of noise signals at a given point in time. A slow SNR indicates poor line quality. When SNR (upstream or downstream) falls below a pre-determined threshold, the Prestige then uses rate adaptation.

7.9 Remote node Configuration

Syntax:

```
wan node index [1-2]
```

Use this command to set a remote node as the current node to apply node commands.

An example is shown next.

```
ras> wan node index 1
```

Figure 7-1 wan node index

Syntax:

```
wan node clear
```

This command clears the current nodes statistics.

An example is shown next.

```
ras> wan node clear
```

Figure 7-2 wan node clear

Syntax:

```
wan node save
```

This command saves the current nodes statistics.

An example is shown next.

```
ras> wan node save
```

Figure 7-3 wan node save

Syntax:

```
wan node ispname <name>
```

Use this command to identify the ISP used by this node. You can check the current name by using the `wan node display` command.

An example is shown next.

```
ras> wan node index 2
ras> wan node ispname
```

Figure 7-4 wan node ispname

Syntax:

`wan node enable`

Use this command to activate this node. You can check the node status by using the `wan node display` command.

An example is shown next.

```
ras> wan node index 2
ras> wan node enable
WAN node 2 is enabled
```

Figure 7-5 wan node enable

Syntax:

`wan node disable`

Use this command to deactivate this node. You can check the node status by using the `wan node display` command.

An example is shown next.

```
ras> wan node index 2
ras> wan node disable
WAN node 2 is disabled
```

Figure 7-6 wan node disable

Syntax:

`wan node` encap <1483>

Use this command to set the method of encapsulation used by the Prestige.[1]

An example is shown next.

```
ras> wan node encap 1483
```

Figure 7-7 wan node encap

[1] At the time of writing 1483 is the only supported encapsulation method.

Syntax:

```
wan node display <ch-name>
```

This command displays the settings for the current node.

An example is shown next.

```
ras> wan node display
WAN node index = 1
Active = yes
Route IP = off
Brdige = on
Name = MyISP
Encapsulcation <RFC1483 > = 1
Mux <1:LLC|2:VC> = 1
VPI/VCI = 8 / 35
QOS Type <2:CBR|3:UBR|4:VBR> = 3
QOS PCR/SCR/MBS =     0,    0,    0
```

Figure 7-8 wan node display

Syntax:

```
wan node mux <llc|vc>
```

Use this command to set the multiplexing method used by the Prestige.

An example is shown next.

```
ras> wan node mux vc
```

Figure 7-9 wan node mux

Syntax:

```
wan node vpi <vpi>
```

Enter the Virtual Path Identifier from 0 to 255.

An example is shown next.

```
ras> wan node vpi 100
```

Figure 7-10 wan node vpi

Syntax:

```
wan node vci <vci>
```

Enter the Virtual Channel Identifier from 32 to 65535.

An example is shown next.

```
ras> wan node vci 32
```

Figure 7-11 wan node vci

Syntax:

```
wan node qos <ubr|cbr|vbr>
```

This is the ATM QoS type.

An example is shown next.

```
ras> wan node qos ubr
```

Figure 7-12 wan node qos

Syntax:

```
wan node pcr
```

This is the maximum rate at which the sender can send cells.

An example is shown next.

```
ras> wan node pcr
```

Figure 7-13 wan node pcr

Syntax:

```
wan node scr
```

This is the mean cell rate of each bursty traffic source.

An example is shown next.

```
ras> wan node scr 20
```

Figure 7-14 wan node scr

Syntax:

```
wan node mbs <mbs>
```

This is the maximum number of cells that can be sent at the PCR.

An example is shown next.

```
ras> wan node mbs 10
```

Figure 7-15 wan node mbs

7.10 ADSL Configuration

Syntax:

```
wan adsl chandata
```

This command displays the channel data and line rate..

An example is shown next.

```
ras> wan adsl chandata
near-end interleaved channel bit rate: 7616 kbps
near-end fast channel bit rate: 0 kbps
far-end interleaved channel bit rate: 800 kbps
far-end fast channel bit rate: 0 kbps
```

Figure 7-16 wan adsl chandata

Syntax:

```
wan adsl close
```

This command disconnects the adsl line.

An example is shown next.

```
ras> wan adsl close
```

Figure 7-17 wan adsl close

Syntax:

```
wan adsl linedata near
```

This command displays the adsl near end noise margin.

An example is shown next.

```
ras> wan adsl linedata near
relative capacity occupation: 0%
noise margin downstream: 21 db
output power upstream: 11 db
attenuation downstream: 1 db
```

Figure 7-18 wan adsl linedata near

Syntax:

```
wan adsl linedata far
```

This command displays the adsl far end noise margin.

An example is shown next.

```
ras> wan adsl linedata far
relative capacity occupation: 0%
noise margin upstream: 15 db
output power downstream: 12 db
attenuation upstream: 2 db
```

Figure 7-19 wan adsl linedata far

Syntax:

```
wan adsl open
```

This command intialises the adsl connection..

An example is shown next.

```
ras> wan adsl open
```

Figure 7-20 wan adsl open

Syntax:

```
wan adsl opencmd[gdmt|multimode]
```

This command opens the adsl line using a specified standard.

An example is shown next.

```
ras> wan adsl opencmd gdmt
```

Figure 7-21 wan adsl opencmd

Syntax:

```
wan adsl opmode
```

This command displays the operational mode.

An example is shown next.

```
ras> wan adsl opmode
DSL standard: NORMAL
```

Figure 7-22 wan adsl opmode

Syntax:

```
wan adsl rateadap[on|off]
```

This command turns on/off the automatic rate adaption mechanism.

An example is shown next.

```
ras> wan adsl rateadap on
```

Figure 7-23 wan adsl rateadap

Syntax:

```
wan adsl perfdata
```

This command displays line statistics.

An example is shown next.

```
ras> adsl perfdata
near-end FEC error fast:   0
near-end FEC error interleaved:  12
near-end CRC error fast:   0
near-end CRC error interleaved:   2
near-end HEC error fast:   0
near-end HEC error interleaved:   0
far-end FEC error fast:   0
far-end FEC error interleaved: 102
far-end CRC error fast:   0
far-end CRC error interleaved:   7
far-end HEC error fast:   0
far-end HEC error interleaved: 272
```

Figure 7-24 wan adsl perfdata

Syntax:

```
wan adsl reset
```

This command disconnects and re-initializes the adsl line

An example is shown next.

```
ras> wan adsl reset
```

Figure 7-25 wan adsl reset

Syntax:

```
wan adsl status
```

This command displays the line status; either up, down, or intialising

An example is shown next.

```
ras> wan adsl status
Line Status: Up
```

Figure 7-26 wan adsl status

Chapter 8
IP Configuration

This chapter provides the information on IP commands

8.1 IP Address

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. If this is the case, it is recommended that you select a network number from 192.168.0.0 to 192.168.255.0 and you must enable the Network Address Translation (NAT) feature of the Prestige. 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 Prestige, but make sure that no other device on your network is using that IP address.

Syntax:

```
wan node mbs <mbs>
```

This command displays or sets the LAN IP address.

An example is shown next.

```
ras> ip address 192.168.1.3
ras> ip address
192.168.1.3 (set)
ras>
```

Figure 8-1 ip address

8.2 Introduction to ARP Table

Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol address (IP address) to a physical machine address, also known as a Media Access Control or MAC address, on the local area network.

An IP (version 4) address is 32 bits long. In an Ethernet LAN, MAC addresses are 48 bits long. The ARP Table maintains an association between each MAC address and its corresponding IP address.

8.2.1 How ARP Works

When an incoming packet destined for a host device on a local area network arrives at the switch, the switch's ARP program looks in the ARP Table and, if it finds the address, sends it to the device.

If no entry is found for the IP address, ARP broadcasts the request to all the devices on the LAN. The switch fills in its own MAC and IP address in the sender address fields, and puts the known IP address of the target in the target IP address field. In addition, the switch puts all ones in the target MAC field (FF.FF.FF.FF.FF.FF is the Ethernet broadcast address). The replying device (which is either the IP address of the device being sought or the router that knows the way) replaces the broadcast address with the target's MAC address, swaps the sender and target pairs, and unicasts the answer directly back to the requesting machine. ARP updates the ARP Table for future reference and then sends the packet to the MAC address that replied.

Syntax:

```
ip arp status
```

This command displays the arp port statistics of your Prestige.

```
ras> ip arp status
received 3 badtype 0 bogus addr 0 reqst in 3 replies 0 reqst out 0
cache hit 865 (99%), cache miss 6 (0%)
IP-addr         Type           Time  Addr              stat iface
192.168.1.200   10 Mb Ethernet 300   00:10:b5:ae:56:9b 41   enif0
192.168.1.255   10 Mb Ethernet 0     ff:ff:ff:ff:ff:ff 43   NULL
num of arp entries= 2
ras>
```

Figure 8-2 ip arp status

8.3 About Ping

Ping is a command you can use to check whether the Prestige can recognize other computers on your local network. A ping command sends a message to the computer you specify. If the computer receives the message, it sends messages in reply. Using ping, you can test whether the path to the device is working. To use it, you must know the IP address or the host name of the computer you are trying to communicate with.

8.4 Ping Commands

Syntax:

```
ip ping [-LRdfnqrv] [-c count] [-i wait] [-l preload]
     [-p pattern] [-s packetsize] [-t ttl]
     [-I interface address] host
```

This command send ICMP echo request message to a remote host. The command options are case sensitive.

Table 8-1 Ping Commands

OPTION	DESCRIPTION
-L	This suppresses loopback of multicast packets. This option only applies if the ping destination is a multicast address.
-R	This is record route. It includes the RECORD_ROUTE option in the ECHO_REQUEST packet and displays the route buffer on returned packets. Note that the IP header is only large enough for nine such routes. Many hosts ignore or discard this option.
-d	This set the SO_DEBUG option on the socket being used.
-f	This is flood ping. For every ECHO_REQUEST sent a period "." is printed, while for every ECHO_REPLY received a backspace is printed. This provides a rapid display of how many packets are being drooped. If interval is not given, it sets interval to zero and outputs packets as fast as they come back or one hundred times per second, whichever is more. Only the super-user may use his option with zero interval.
-n	This is numeric output only. No attempt will be made to look up symbolic names for host addresses.
-g	This is quiet output. Nothing is displayed except the summary lines at startup time and when finished.
-r	Bypass the normal routing tables and send directly to a host on an attacked interface. If the host is not on a directly attached network, an error is returned. This option can be used to ping a local host through an interface that has no route through it provided the option -I is also used.
-v	This is verbose output.
-c count	Stop after sending count ECHO_REGUEST packets. With deadline option, ping waits for cpimt ECJP_REPLY packets, until the timeout expires.

Table 8-1 Ping Commands

OPTION	DESCRIPTION
`-i interval`	This is wait interval seconds between sending each packet. The default is to wait for one second between each packet normally, or not to wait in flood mode. Only super-user may set interval to values less 0.2 seconds.
`-I interface address`	This set source address to specified interface address. Argument may be numeric IP address or name of device. When pinging IPv6 link-local address this option is required.
`-l preload`	If preload is specified, ping sends that many packets not waiting for reply. Only the super-user may select preload more than 3.
`-p patten`	You may specify up to 16 "pad" bytes to fill out the packet you send. This is useful for diagnosing data-dependent problems in a network. For example, -p ff will cause the send packet to be filled with all ones.
`-s packetsize`	This specifies the number of data bytes to be sent. The default is 56, which translates into 64 ICMP data bytes when combined with the 8 bytes of ICMP header data.
`-t ttl`	This sets the IP Time to Live (TTL).

Some examples are shown next.

```
ras> ip ping -c 10 -i 2 192.168.1.1
PING 192.168.1.1 (192.168.1.1): 56 data bytes
64 bytes from 192.168.1.1: icmp_seq=0 ttl=255 time=0.0 ms
64 bytes from 192.168.1.1: icmp_seq=1 ttl=255 time=0.0 ms
64 bytes from 192.168.1.1: icmp_seq=2 ttl=255 time=0.0 ms
64 bytes from 192.168.1.1: icmp_seq=3 ttl=255 time=0.0 ms
64 bytes from 192.168.1.1: icmp_seq=4 ttl=255 time=0.0 ms
64 bytes from 192.168.1.1: icmp_seq=5 ttl=255 time=0.0 ms
64 bytes from 192.168.1.1: icmp_seq=6 ttl=255 time=0.0 ms
64 bytes from 192.168.1.1: icmp_seq=7 ttl=255 time=0.0 ms
64 bytes from 192.168.1.1: icmp_seq=8 ttl=255 time=0.0 ms
64 bytes from 192.168.1.1: icmp_seq=9 ttl=255 time=0.0 ms

--- 192.168.1.1 ping statistics ---
10 packets transmitted, 10 packets received, 0% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms
ras>
```

Figure 8-3 Ping Commands Example-1

```
ras> ip ping -R -c 3 192.168.1.1
PING 192.168.1.1 (192.168.1.1): 56 data bytes
64 bytes from 192.168.1.1: icmp_seq=0 ttl=255 time=0.0 ms
RR:     192.168.1.1
        192.168.1.1
        192.168.1.1
        192.168.1.1
64 bytes from 192.168.1.1: icmp_seq=1 ttl=255 time=0.0 ms      (same route)
64 bytes from 192.168.1.1: icmp_seq=2 ttl=255 time=0.0 ms      (same route)

--- 192.168.1.1 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms
ras>
```

Figure 8-4 Ping Commands Example-2

8.5 Static Route Overview

Each remote node specifies only the network to which the gateway is directly connected, and the Prestige has no knowledge of the networks beyond. For instance, the Prestige knows about network N2 in the following figure through remote node Router 1. However, the Prestige 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 1 (via gateway Router 2). The static routes are for you to tell the Prestige about the networks beyond the remote nodes.

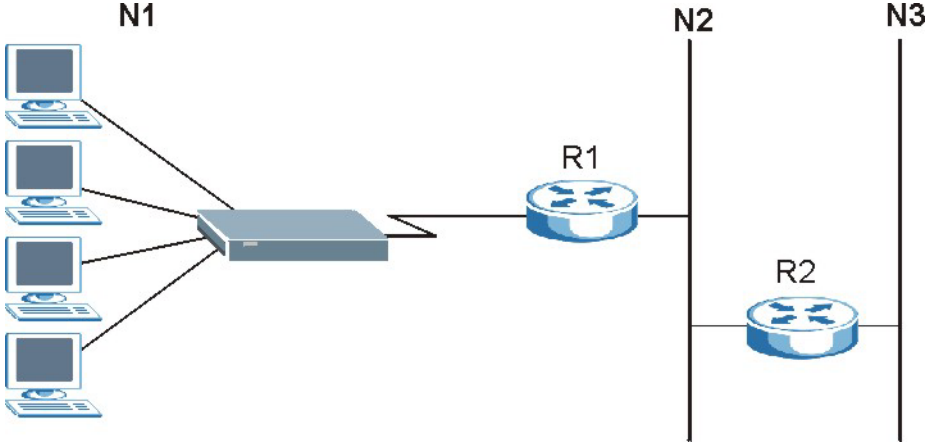


Figure 8-5 Example of Static Routing Topology

Syntax:

```
ip route status
```

This command displays the routing information for static (manually entered) routes.

An example is shown next.

```
ras> ip route status
Dest            FF Len Device     Gateway         Metric stat Timer  Use
192.168.1.0     00 24  enet0      192.168.1.1       1    041b 0      1548
```

Figure 8-6 ip route status

Syntax:

```
ip route addiface <dest addr>[/<bits>] <gateway> [<metric>]
```

Use this command to add a static route to a specific interface.

At the time of writing, the Prestige supports one interface. Add routing information using the add **command.**

Syntax:

```
ip route addprivate <dest addr>[/<bits>] <gateway> [<metric>]
```

Use this command to add a private route to the routing table.

Syntax:

```
ip route drop <host addr> [/<bits>]
```

Use this command to delete an entry in the routing table.

An example is shown next.

```
ras> ip route drop 192.168.1.100
ras> ip route status
Dest            FF Len Device     Gateway         Metric stat Timer  Use
192.168.1.0     00 24  enet0      192.168.1.1       1    041b 0      678
ras>
```

Figure 8-7 ip route drop

Use the status command to confirm your settings, see *Figure 8-6*.

Syntax:

```
ip route flush <host addr> [/<bits>]
```

Use this command to clear routing information.

An example is shown next.

```
ras> ip route flush
```

Figure 8-8 ip route flush

Syntax:

```
ip route lookup <host addr> [/<bits>]
```

Use this command to clear routing information.

An example is shown next.

```
ras> ip route lookup 192.168.1.15
192.168.1.0     00 24  enif0      192.168.1.1       6    001b 0      1146
```

Figure 8-9 ip route lookup

8.6 TCP/IP

TCP/IP is a connection-oriented protocol that handles internet traffic between applications.

Information is sent in datagrams (split into segment) and resent, if required. The datagrams are reassembled at the destination. TCP provides 'reliable' delivery.

Syntax:

```
ip tcp status
```

This command displays TCP statistic counters.

An example is shown next.

```
ras> ip tcp status
( 1)tcpRtoAlgorithm               4       ( 2)tcpRtoMin                     0
( 3)tcpRtoMax           4294967295        ( 4)tcpMaxConn           4294967295
( 5)tcpActiveOpens                0       ( 6)tcpPassiveOpens               3
( 7)tcpAttemptFails               0       ( 8)tcpEstabResets                0
( 9)tcpCurrEstab                  1       (10)tcpInSegs                   685
(11)tcpOutSegs                 1076       (12)tcpRetransSegs               19
(14)tcpInErrs                     0       (15)tcpOutRsts                    0
    &TCB Rcv-Q Snd-Q  Local socket                Remote socket            State
94112b5c     0   602  192.168.1.1:23              192.168.1.100:1309       Estab
ras>
```

Figure 8-10 ip tcp status

Chapter 9
Firmware Upload

This chapter tells you how to upload new firmware.

9.1 Firmware Upload Overview

Find firmware at www.zyxel.com and refer to the following sections for upgrading firmware. After a successful upload, the system will reboot.

Only use firmware for your Prestige's specific model. Refer to the label on the bottom of your Prestige.

9.2 Checking System Firmware Version

Syntax:

```
sys version
```

This command displays the current system firmware version. An example is shown next.

```
ras> sys version

 ZyNOS version: V3.40(SN.0)b2 | 7/9/2004
 romRasSize: 458764
 system up time:      0:00:26 (a74 ticks)
 bootbase version: V1.00 | 6/14/2004
 ZyNOS CODE: P660M-67C ATU-R Jul 09 2004 19:54:59
ras>
```

Figure 9-1 Version Command Example

9.3 Uploading Firmware via Utility

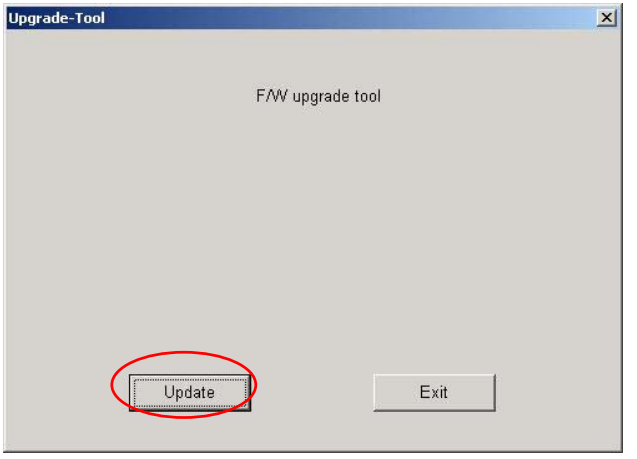
Do not turn off the device while firmware upload is in progress!!

To upgrade the firmware by using the software utility with a "*.exe" extension in the zip firmware file, follow the steps listed below:

Step 1. Find and download the firmware from www.zyxel.com and store the firmware on your computer. Remember that you must decompress compressed (.zip) files before you can upload it.

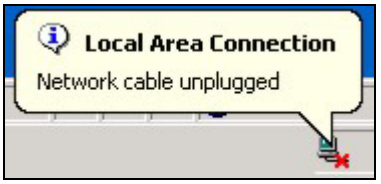
Step 2. Double-click the utility icon, as shown below, in your zip firmware file.

Step 3. You will see the **Upgrade-Tool** screen. Click **Update** to proceed to upload new firmware to the Prestige or click **Exit** to quit.



Step 4. Disconnect and re-connect the power adaptor to restart the Prestige when prompted and click **OK**.

Step 5. The Prestige restarts causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.



Step 6. Firmware upload is in progress; do not turn off the Prestige or disconnect the Ethernet cable.

Step 7. The Prestige automatically restarts again.

Step 8. The upload was successful. When you see the next screen, click **OK**. Wait few minutes before logging in again and check your new firmware version by using the `sys version` command (refer to the *Checking System Firmware Version* section).

Part III:

APPENDICES AND INDEX

This part contains troubleshooting, additional background information and an index of key terms.

Appendix A Troubleshooting

This chapter covers potential problems and the corresponding remedies.

Make sure you have securely attached the proper cables to the proper ports. Refer to *Rear Panel* section for this information. If your Prestige still does not work properly, refer to the table shown next.

PROBLEM	CORRECTIVE ACTION
No LEDs are on when I turn the Prestige on.	Your Prestige or power adaptor may have malfunctioned. Check that the power cable is connected properly and that you are using the supplied power adaptor for your region. Make sure the power source is turned on and that the Prestige is receiving sufficient power. Try a different power outlet. If all this fails, contact your vendor.
The LAN LED(s) is off.	Verify that the attached device(s) is turned on and properly connected. Make sure the Ethernet cards are working on the attached devices. Verify that the proper network cable type is used and its length does not exceed 100 meters. Use unshielded twisted pair (UTP) or shielded twisted-pair (STP) Ethernet cables for the Ethernet ports. For 10 Base-T connections, use 100W 2-pair UTP/STP Category 3, 4 or 5 cable(s). For 100 Base-TX connections, use 100W 2-pair UTP/STP Category 5 cable(s).
The VDSL LED is not on or is blinking.	Make sure the distance from the Prestige to the DSLAM does not exceed 1.25km (3750feet). Rates deteriorate the further away the DSLAM is from the modem. Check with your telephone company that the telephone line quality is good enough for VDSL transmission. If G.hs is disabled in the Prestige, then make sure the Prestige and the remote DSLAM have the same VDSL parameters. Use the CI commands (refer to the chapter on VDSL commands) to check your VDSL parameters such as band plan, band modifier, channel type (is interleave delay set?), encapsulation mode, VPI/VCI numbers, QoS parameters and service categories. When G.hs is enabled in the Prestige, the DSLAM dictates (and overrides) all modem VDSL parameters.

Appendix B
Virtual Circuit Topology

ATM is a connection-oriented technology, meaning that it sets up virtual circuits over which end systems communicate. The terminology for virtual circuits is as follows:

- Virtual Channel — Logical connections between ATM switches
- Virtual Path — A bundle of virtual channels
- Virtual Circuit — A series of virtual paths between circuit end points

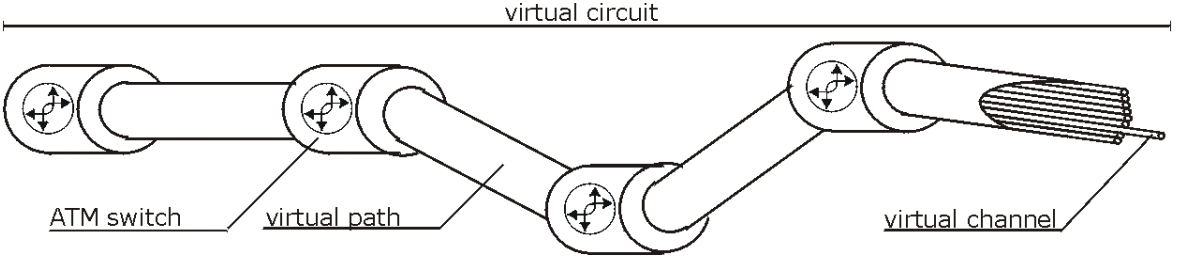


Diagram B-1 Virtual Circuit Topology

Think of a virtual path as a cable that contains a bundle of wires. The cable connects two points and wires within the cable provide individual circuits between the two points. In an ATM cell header, a VPI (Virtual Path Identifier) identifies a link formed by a virtual path; a VCI (Virtual Channel Identifier) identifies a channel within a virtual path.

The VPI and VCI identify a virtual path, that is, termination points between ATM switches. A series of virtual paths make up a virtual circuit.

Your service provider should supply you with VPI/VCI numbers.

Appendix C
IP Subnetting

IP Addressing

Routers "route" based on the network number. The router that delivers the data packet to the correct destination host uses the host ID.

IP Classes

An IP address is made up of four octets (eight bits), written in dotted decimal notation, for example, 192.168.1.1. IP addresses are categorized into different classes. The class of an address depends on the value of its first octet.

- Class "A" addresses have a 0 in the left most bit. In a class "A" address the first octet is the network number and the remaining three octets make up the host ID.
- Class "B" addresses have a 1 in the left most bit and a 0 in the next left most bit. In a class "B" address the first two octets make up the network number and the two remaining octets make up the host ID.
- Class "C" addresses begin (starting from the left) with 1 1 0. In a class "C" address the first three octets make up the network number and the last octet is the host ID.
- Class "D" addresses begin with 1 1 1 0. Class "D" addresses are used for multicasting. (There is also a class "E" address. It is reserved for future use.)

Chart C-1 Classes of IP Addresses

IP ADDRESS:		OCTET 1	OCTET 2	OCTET 3	OCTET 4
Class A	0	Network number	Host ID	Host ID	Host ID
Class B	10	Network number	Network number	Host ID	Host ID
Class C	110	Network number	Network number	Network number	Host ID

Host IDs of all zeros or all ones are not allowed.

Therefore:

- A class "C" network (8 host bits) can have 2^8 –2 or 254 hosts.
- A class "B" address (16 host bits) can have 2^{16} –2 or 65534 hosts.

A class "A" address (24 host bits) can have 2^{24} –2 hosts (approximately 16 million hosts).

Since the first octet of a class "A" IP address must contain a "0", the first octet of a class "A" address can have a value of 0 to 127.

Similarly the first octet of a class "B" must begin with "10", therefore the first octet of a class "B" address has a valid range of 128 to 191. The first octet of a class "C" address begins with "110", and therefore has a range of 192 to 223.

Chart C-2 Allowed IP Address Range By Class

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

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; each bit of the mask corresponds to a bit of the IP address. 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 as IP addresses are. The "natural" masks for class A, B and C IP addresses are as follows.

Chart C-3 "Natural" Masks

CLASS	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 left most 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.

Chart C-4 Alternative Subnet Mask Notation

SUBNET MASK IP ADDRESS	SUBNET MASK "1" BITS	LAST OCTET BIT VALUE
255.255.255.0	/24	0000 0000
255.255.255.128	/25	1000 0000
255.255.255.192	/26	1100 0000
255.255.255.224	/27	1110 0000
255.255.255.240	/28	1111 0000
255.255.255.248	/29	1111 1000
255.255.255.252	/30	1111 1100

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.

	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"). You want to have two separate 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.

In the following charts, shaded/bolded last octet bit values indicate host ID bits "borrowed" to form 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.

Chart C-5 Subnet 1

	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
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	

Chart C-6 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	

The remaining 7 bits determine the number of hosts each subnet can have. 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 of 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 0's is the subnet itself, all 1's is the broadcast address on the subnet).

Chart C-7 Subnet 1

	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
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	

Chart C-8 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	

Chart C-9 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	

Chart C-10 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 8 subnets (001, 010, 011, 100, 101, 110).

The following table shows class C IP address last octet values for each subnet.

Chart C-11 Eight Subnets

SUBNET	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	223	254	255

The following table is a summary for class "C" subnet planning.

Chart C-12 Class C Subnet Planning

NO. "BORROWED" HOST BITS	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 *Chart C-1*) available for subnetting.

The following table is a summary for class "B" subnet planning.

Chart C-13 Class B Subnet Planning

NO. "BORROWED" HOST BITS	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	512	126

Chart C-13 Class B Subnet Planning

NO. "BORROWED" HOST BITS	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
	(/25)		
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 D
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.

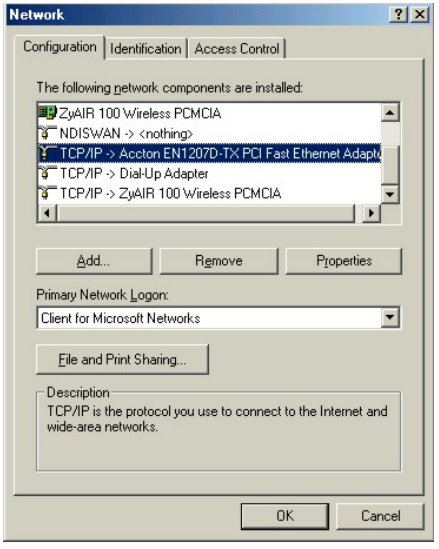
TCP/IP should already be installed on computers using Windows NT/2000/XP, Macintosh OS 7 and later operating systems.

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 Prestige's LAN port.

Windows 95/98/Me

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



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:

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

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

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

If you need TCP/IP:

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

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

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

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

If you need Client for Microsoft Networks:

a. Click **Add**.

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

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

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

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

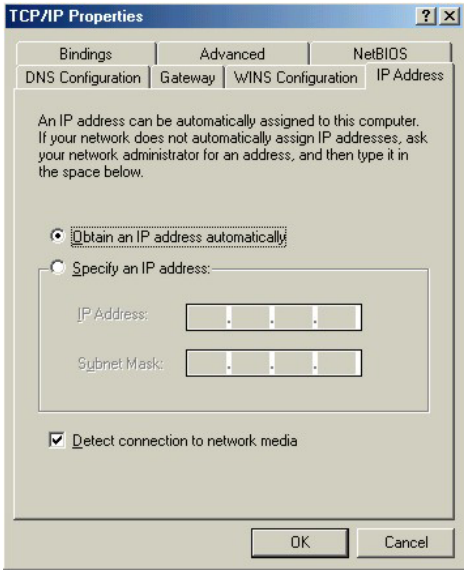
Configuring

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**.

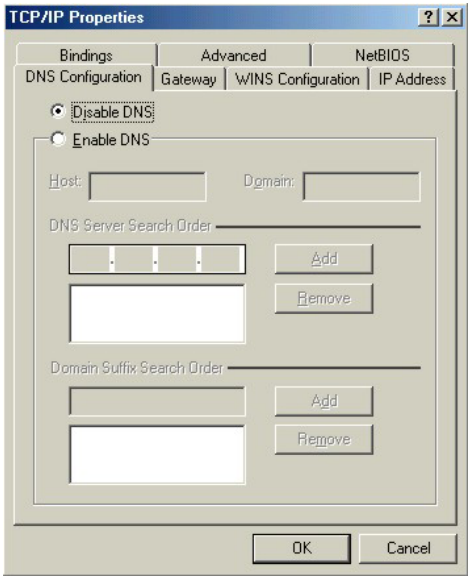
   -If you have a static IP address, select **Specify an IP address** and type your information into the **IP Address** and **Subnet Mask** fields.



3. Click the **DNS** Configuration tab.

   -If you do not know your DNS information, select **Disable DNS**.

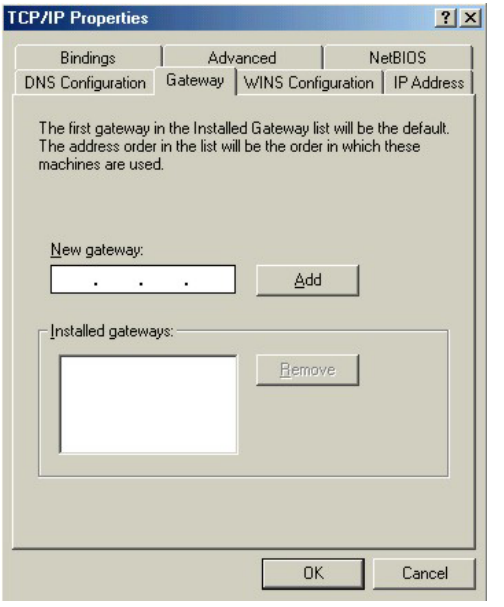
   -If you know your DNS information, select **Enable DNS** and type the information in the fields below (you may not need to fill them all in).



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 Prestige and restart your computer when prompted.

Verifying Settings

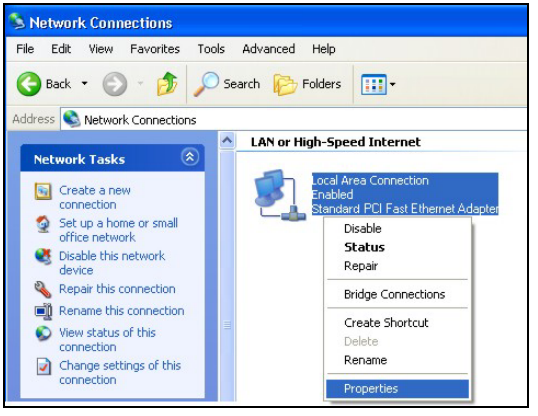
1. Click **Start** and then **Run**.
2. In the **Run** window, type "winipcfg" and then click **OK** to open the **IP Configuration** window.
3. Select your network adapter. You should see your computer's IP address, subnet mask and default gateway.

Windows 2000/NT/XP

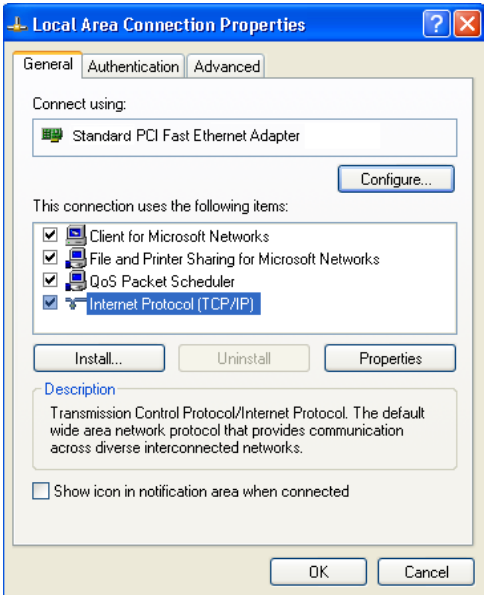
1. For Windows XP, click **start**, **Control Panel**. In Windows 2000/NT, click **Start**, **Settings**, **Control Panel**.

2. For Windows XP, click **Network Connections**. For Windows 2000/NT, click **Network and Dial-up Connections**.

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



4. Select **Internet Protocol (TCP/IP)** (under the **General** tab in Win XP) and click **Properties**.

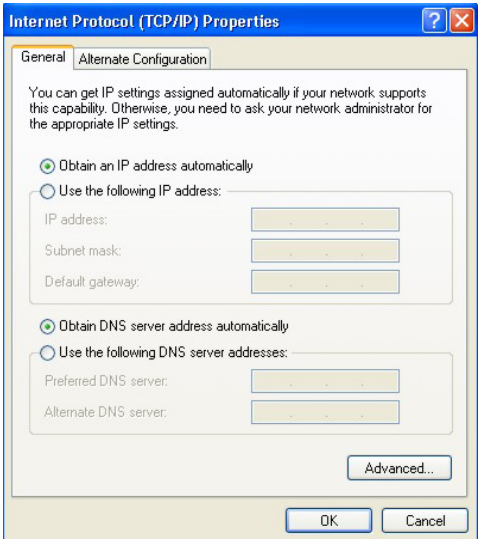


5. The **Internet Protocol TCP/IP Properties** window opens (the **General tab** in Windows XP).

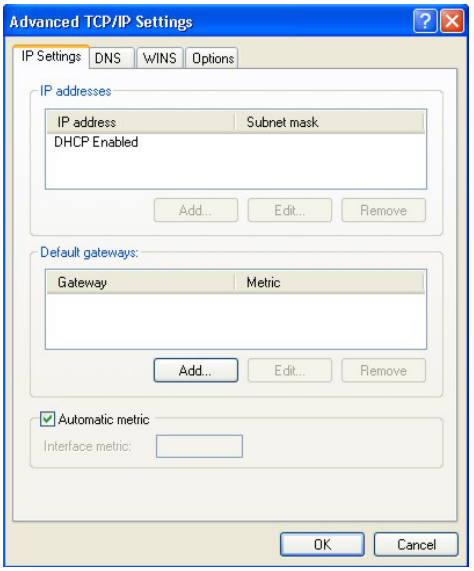
   -If you have a dynamic IP address click **Obtain an IP address automatically**.

   -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**.



6. -If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Setting**s 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.

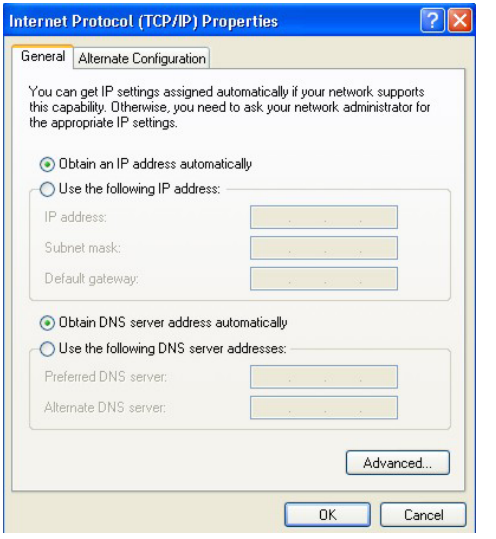
-Click **OK** when finished.

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.



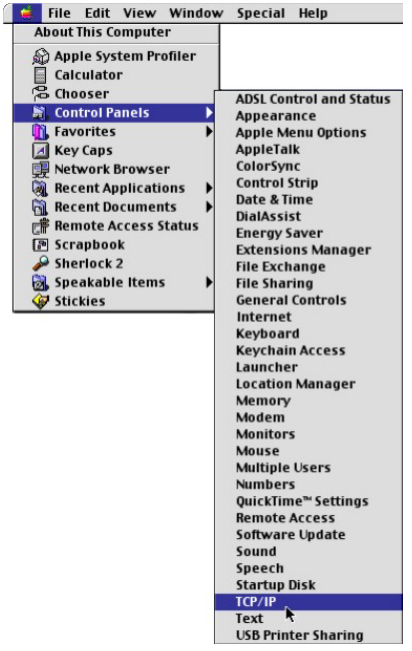
8. Click **OK** to close the **Internet Protocol (TCP/IP) Properties** window.
9. Click **OK** to close the **Local Area Connection Properties** window.
10. Turn on your Prestige and restart your computer (if prompted).

Verifying Settings

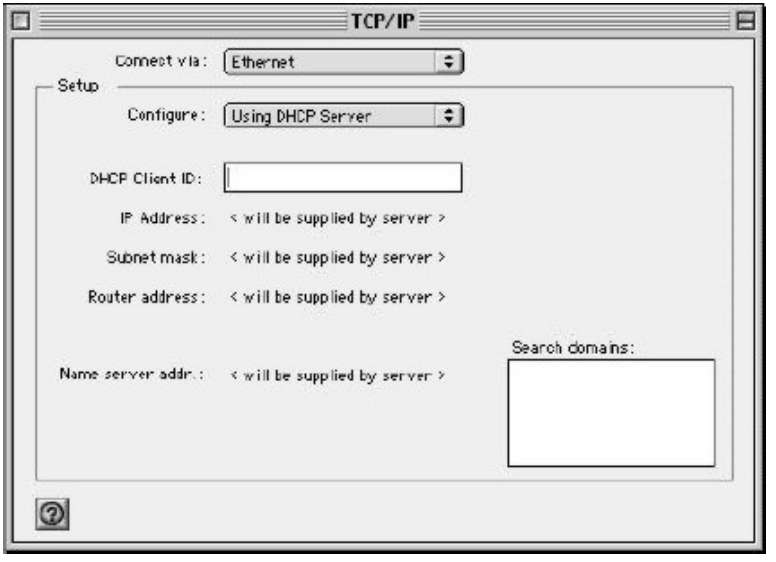
1. Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.
2. In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

Macintosh OS 8/9

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



2. Select **Ethernet built-in** from the **Connect via** list.



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.

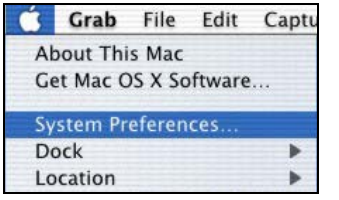
   -Type the IP address of your Prestige in the **Router address** box.
5. Close the **TCP/IP Control Panel**.
6. Click **Save** if prompted, to save changes to your configuration.
7. Turn on your Prestige and restart your computer (if prompted).

Verifying Settings

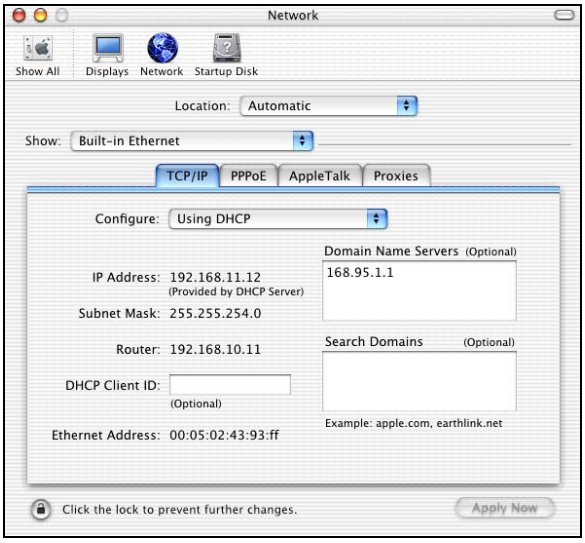
Check your TCP/IP properties in the **TCP/IP Control Panel** window.

Macintosh OS X

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



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.
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 Prestige in the **Router address** box.
5. Click **Apply Now** and close the window.
6. Turn on your Prestige and restart your computer (if prompted).

Verifying Settings

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

Appendix E Index