
SpeedStream

5600

Series

ADSL Router
Installation Guide



Part No. 007-5600-002, Rev B

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Introduction

About the 5600 Series DSL Router

The SpeedStream™ 5600 Series Ethernet to ADSL router provides ATM-based network access for home users, telecommuters, or remote offices and are equipped with one Ethernet port and one Asymmetric Digital Subscriber Line (**ADSL**) port. These internet sharing devices use Discrete Multitone (**DMT**) technology to set data transmit rates. When the unit is first powered on, it will “train” the line to get the best data transmission rate.

The 5600 Series internet sharing device can be used as either a **router** or a **bridge**. It is configured to operate as a router when it is first installed. To use it as a bridge, you must log into the router and change the mode to *bridge mode*.

Router Mode (factory default mode):

- Provides IP routing between a Local Area Network (LAN) and the Wide Area Network (WAN).
- Can be configured to use
 - **PPP** (factory default)
 - **RFC 1483 routed** encapsulation
 - **RFC 1483 bridged** encapsulation

Bridge Mode:

- Provides high-speed connectivity from an Ethernet LAN to the WAN over the ADSL connection
- Uses **RFC 1483 bridged** encapsulation over ATM

Routing vs. Bridging

What is the difference between routing and bridging?

- **Bridges** determine where to send data packets between local area network (LAN) segments based on the *MAC address* of the sending and receiving computers or devices (nodes) on the network. The MAC address is a unique identifier that is programmed into the network

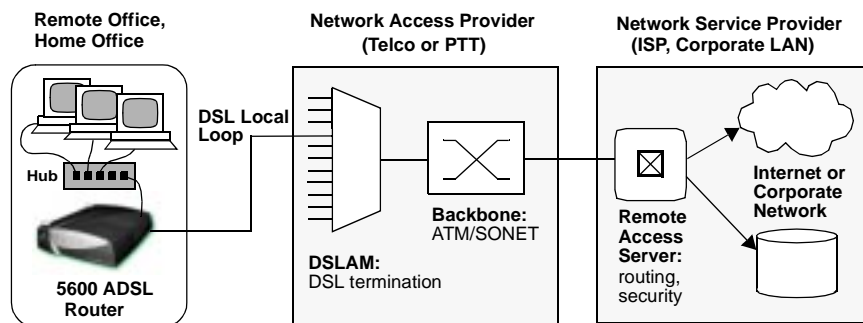
interface card installed in a network node. Bridging is a simple transmission scheme and there is little software management involved in the sending of packets. Packets are simply forwarded from one node to the next.

- **Routers** are much more complex than bridges. Routers send packets from node to node based on *IP addresses*. An IP address can be viewed as a modifiable identifier that is mapped to the MAC address of network node. The IP address of a node may change dynamically or by user configuration. Therefore, there are protocols and databases on the network that must keep track of the IP address assignments for the nodes on the local area network. Other features of a router allow you to restrict the types of data packets that are allowed onto your local area network from the wide area network (WAN) and vice versa.

Where and Why to Use the Router

The 5600 Series router supports multiple or individual users at a remote, small office or in a home office that is connected via ADSL to a central office or network service provider.

The drawing below shows several computers (network nodes) attached via Ethernet cables to an Ethernet hub at the end-user's office. The hub is connected to the 5600 Series router. The device is connected to the outside world (internet) via a telephone jack that has been configured to support DSL service.



The router can also be connected to a single PC equipped with an Ethernet card and connected to a DSL phone jack to provide access to the wide area network (internet).

How to Use this Guide

Refer to the following sections for information on specific topics:

For Information On:	See page:
Hardware installation requirements and procedure	12
Accessing the router's user interfaces	15
Configuring the router/bridge	23
Networking terminology and concepts	29
Technical specifications	35

Hardware Installation

Installation Requirements

To successfully install the 5600 series router, you will need the following:

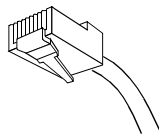
- A computer equipped with an Ethernet network interface card OR an Ethernet hub
- A DSL-ready telephone line installed at the installation site
- If you want to configure the router via the serial port before placing it into service on a network, you will need a computer that has terminal emulation software such as Microsoft HyperTerminal or ProComm.

Package Contents

Your package should contain the items listed below. If anything is missing or damaged, please contact the dealer from whom the equipment was purchased.

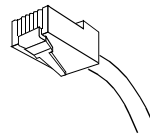
- 5600 series router
- Power supply for either a 220v or a 110v electrical outlet.
- One RJ11 unshielded twisted pair cable (for the DSL connection)
- One RJ45 UTP crossover cable (for connecting to an Ethernet hub)
- One RJ45 UTP cable (for direct Ethernet connection to a PC)
- One serial cable with an RS232 DIN converter (connects to serial port)
- Installation Guide, release notes, and Safety and Certification booklet

RJ45 Ethernet
Connector



The RJ45
connector
is wider
than the RJ11

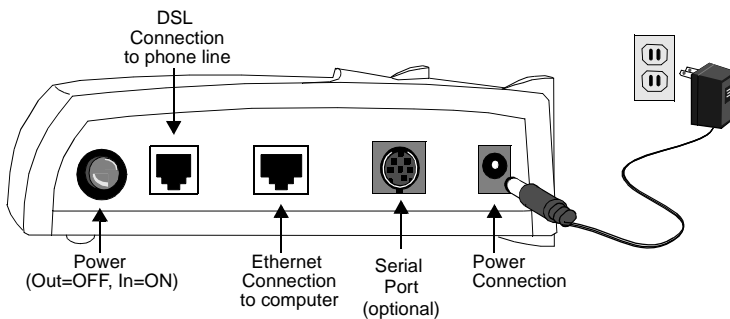
RJ11 DSL
Connector



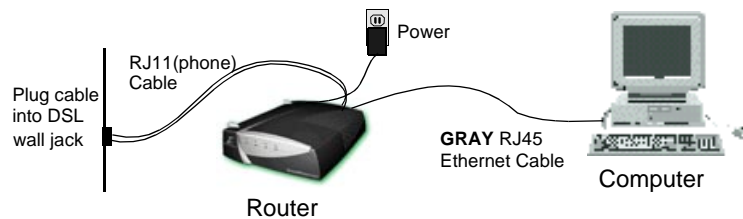
Installation Instructions

NOTE: The labels for the back panel of the router are located on the underside of the unit.

- 1 Be sure the Power switch is in the OFF position.
- 2 Connect the power cable to the power connector on the back of the router; then connect it to a power outlet.



- 3 To connect the router directly to the Ethernet port on a PC, workstation or laptop, use the **gray RJ45 cable**, which is a straight-through UTP copper wire cable. The cable labeled “**XOVER**” on one end is a crossover UTP copper-wire cable that must be used only when connecting the router to an Ethernet hub.
- 4 Connect one end of an RJ11 telephone cable to the router’s **DSL** port and the other end to the DSL service port (wall jack).

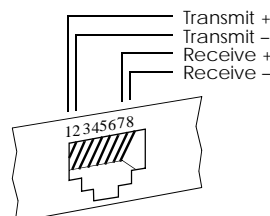


- 5 Depress the router’s power button to turn on the unit.

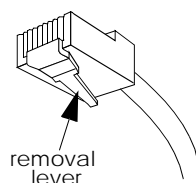
RJ45 Connector Information

The pinout of the router's Category 3 and 5 UTP jack is different than a standard Ethernet UTP jack.

Ethernet loopback connectors will not work on the port and vice versa.



RJ45 Connector

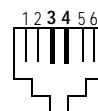


Once the connector is plugged into a board that is installed in a chassis, the removal lever on the connector may be hard to reach. Do not try to pull the connector out of the port without pushing up on the removal lever.

RJ11 Connector Information

The router comes with an RJ11 jack that uses pins 3 and 4. Optionally, the router may be configured to use pins 2 and 5. If so, the markings on the outer casing of the unit will indicate this.

RJ11 Jack
Pinout



Router LEDs on Startup

The router is equipped with four LEDs on the front panel: the System LED (**sys**), Ethernet LED (**enet**), ATM LED (**atm**) and DSL LED (**dsl**).

- 1 First, all four LEDs light up red for a moment as the hardware initializes. Then, the **sys** LED turns solid yellow and then solid green when the unit has finished passing diagnostic tests.
- 2 The **dsl** LED will flash green while the DSL line is training to obtain the optimum transmission rate. If a DSL link cannot be established, the LED will flash green and yellow. When the line is trained, the LED turns solid green.

- 3 The **enet** LED will turn solid green when there is a link detected, then begin to flash green when Ethernet traffic is flowing.
- 4 The **atm** LED will flash green indicating traffic flow.

Table 1 Modem LED Indicator Descriptions

	sys	enet	dsl	atm
Unlit	Power not applied	No link detected	NA	DSL line is not trained
Red	NA	NA	DSL Error	NA
Yellow	POST Phase	Carrier not detected	NA	NA
Flashing Yellow	POST Failure	Flashes on collisions	NA	NA
Flashing Green	NA	Carrier detected and traffic is flowing	The DSL line is being trained	ATM cell delineation and traffic flow
Green/ Yellow	NA	NA	DSL is not connected	NA
Green	Operational	Ethernet carrier detected	DSL line is trained and ready	ATM cell delineation

Getting Started

Accessing the Router

There is very little setup required to get your 5600 series router up and running. The 5600 Series router can be accessed and configured in two ways:

- Network access via TELNET, HTTP, or FTP
- Local terminal using a serial connection

The router has no password initially right out of the box. However, be sure to set the password to protect it from being modified by users on the network. Refer to “Setting the Password” on page 24 for details.

Network Access

The easiest way to access the router is through an Ethernet connection between the host computer and the router. This connection can be directly between the two devices or over a local area network (LAN) segment.

To access the router via Ethernet, the host computer must be on the same subnetwork with the router. When you directly connect the router to the host computer through the Ethernet port, the router’s DHCP server will automatically assign a 10.0.0.2 IP address to your computer, if the computer is a DHCP client.

Connecting to the router via Ethernet

- 1 Connect the host to the router’s Ethernet port. Make sure that the **enet** LED on the front of the router is green.
- 2 Make sure that the host computer is configured so that it can be accessed via Ethernet.
 - 2-a If you are using a PC running Windows 95/98, select **Start > Settings > Control Panel >** and click on **Network**.
 - 2-b Select **TCP/IP** from the list of installed network components and select **Properties**.

- 2-c Select the **IP Address** tab and verify that **Obtain an IP address automatically** is selected. If not, then select this button. Click **OK** twice.

Once you have established an Ethernet link to the router, there are three methods you can use to access the router.

HTTP Web-browser Access

Most HTML browsers can be used, though Internet Explorer 4.0 or Netscape 4.0 are recommended. IE 2.0 and Netscape 2.0 and their predecessors are not supported. The HTML interface can be used to access the LAN (or WAN) IP address or it can be used with FTP to upload and download files to and from the router.

To log on to the modem via HTML:

- 1 Bring up your favorite web browser.
- 2 Enter the Ethernet IP address of the router (**10.0.0.1** or **Speedstream**) in the “Location” or “Address” area where you enter web page addresses.
- 3 Refer to “HTML Web Interface” on page 20.

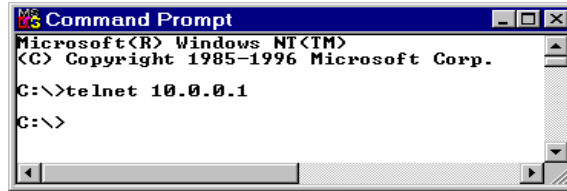
TELNET Access

From the local area network you can use TELNET to log in using the Ethernet IP address. Or, if the unit is configured as a router, it can be accessed from the WAN using the DSL/WAN IP address. Initially out of the box, the router has no WAN IP address so only the Ethernet address can be used for remote access on initial startup.

To log on to the modem via TELNET:

- 1 If using Windows on a PC, select **Start > Programs > Command Prompt**. If on a UNIX system, bring up a shell window.

- 2 When the MSDOS window appears, enter `telnet 10.0.0.1` or `telnet speedstream`.



```
Microsoft(R) Windows NT(TM)
(C) Copyright 1985-1996 Microsoft Corp.
C:\>telnet 10.0.0.1
C:\>
```

- 3 This will bring up a **Telnet** window which will display the command prompt for the router's command line interface.
- 4 Refer to "Command Line Interface" on page 20 for details on the user interface.

FTP Access for Firmware/Configuration Uploads

The router provides an FTP server and can accept FTP client commands from an external host. Using FTP, you can

- Upload a new revision of the router firmware
- Save the router's current configuration to a file on the host computer and then upload the configuration to another 5600 series router.

NOTE: A configuration file saved from a Bridge 1.1.x router can not be loaded on a router running the Router/Bridge 2.0 firmware. However, a configuration file saved from a router running Router/Bridge 1.0 can be uploaded to a router running version 2.0 firmware.

To log into the router via FTP:

- 1 If using Windows on a PC, select **Start > Programs > Command Prompt**. If on a UNIX system, bring up a shell window.
- 2 When the MSDOS window appears, enter: `ftp 10.0.0.1`
- 3 At the `USER` prompt, enter the username "**Anonymous**"
- 4 At the FTP command prompt, type in: `binary`
- 5 Refer to "Command Line Interface" on page 20 for details on the user interface.

To save the current configuration from the router:

- 1 After logging in to the FTP prompt and switching to binary mode, change to the directory on your computer where you wish to store the configuration file. For example, if it is to be stored on a floppy disk, insert the diskette in the drive and type: `lcd a:\`
- 2 Type: `get system.cfg`

To upload a saved configuration file to the router:

- 1 After logging in to the FTP prompt and switching to binary mode, change to the directory on your computer where the configuration file is stored. For example, if it is stored on a floppy disk, insert the diskette in the drive and type: `lcd a:\`

To back up your current firmware revision:

- 1 After logging in to the FTP prompt and switching to binary mode, change to the location where the firmware file is to be stored. For example, if it is to be stored on a floppy disk, type: `lcd a:\`
- 2 Type: `get exec.img`

To download a new revision of firmware:

- 1 After logging in to the FTP prompt and switching to binary mode, change to the directory where the firmware file is stored. For example, if it is stored on a floppy disk, type: `lcd a:\`
- 2 Type: `put 5660.img`
- 3 The router will reboot when download is complete.

Local Terminal using Serial Connection

A terminal can be connected directly to the RS232 serial port. This requires the use of a terminal emulation software package such as Procomm or Microsoft HyperTerminal. Any standard terminal that supports baud rates of 9600 or greater can be connected to the modem's serial port. By default, the router is configured to communicate at a baud rate of 38400.

Logging on via the Serial Port

When you first connect to the router through the serial port, the router will be in “auto-baud” mode where it is waiting for keyboard input to set the baud rate. In the auto-baud mode, the router starts at 9600 baud and looks for the [Enter] key being pressed. If the data received is not an [Enter], the baud rate increases up to the default rate of 38400.

To log on to the modem via HyperTerminal:

- 1 If using Windows on a PC, select **Start > Programs > Accessories > HyperTerminal**.
- 2 Enter a **Connection** name and click **OK**.
- 3 Select **COM1** and click **OK**.
- 4 Enter the following parameters:

Bits per second	38400
Data bits	8
Parity	None
Stop bits	1
Flow Control	None
- 5 Click **OK**.
- 6 When the **HyperTerminal** window appears, you must press the [Enter] key several times to get the “Command->” prompt. The [Enter] key may have to be pressed up to 5 times to get the prompt.

Types of User Interfaces

The modem provides two user interfaces:

- **HTML interface** – provides simple setup screens for quick configuration and an advanced configuration interface.
- **Command-line user interface** – allows quick configuration and provides status and configuration information. Only the command-line interface is available over the serial port connection.

HTML Web Interface

The HTML interface for the router first displays a page showing the current configuration of the router. The first page also provides links to the following functions:

Simple Setup	Presents configuration forms where you can enter the minimum configuration parameters needed to configure the router for use on the network.
Advanced Setup	Leads to a more detailed interface with several links that allow more in-depth configuration of functions available on the router. This interface provides the following links: <ul style="list-style-type: none">• Configuration Procedures• Status and Statistics• Command List
Configuration Summary	Redisplays the tables showing the current router configuration.
Change Mode	Switches from router to bridge or from bridge to router mode.
Set Password	Sets the login password on the modem. To reset the router to not require a password, do not enter any text in the new password fields and click on Set .

Command Line Interface

The command-line interface is a convenient way to quickly access the router and perform simple configuration procedures. The command-line interface is accessible via the serial port using a terminal emulation package. The command-line is also accessible remotely if you have a computer that can reach the router using the LAN IP address (Ethernet IP address) or the WAN IP address.

Command Prompt/Error Prompt

The following are the keyboard conventions used during a command session. Normally, the command line prompt is:

```
Command->
```

However, if there has been a “soft” error during power-on self test (POST), the prompt will display as:

```
post_error->
```

If you see this prompt, you can connect to the router via serial port and reboot the router. When the router reboots, the POST error messages will be displayed to the serial console. Contact Efficient Networks Customer Support to report the problem.

Command Line Interface Conventions

The following are the keyboard conventions used during a command session.

At the Command-> prompt:

help	Displays the conventions described below.
?	Displays the top-level command set.
<cmd> ?	Displays help for the command <cmd>. For example, to see all “set” commands, type set ? .
ESC- or ESC+	Scrolls through the last commands executed. Type ENTER to execute the command displayed.
CTRL-U	Erases the entire line.
[Backspace]	Backs up one character
[Control-C]	Aborts the current command-line entry.
[ESC]	Can be used to put the command line into the vi-style line editing mode.

Some commands have required and optional parameters. If you type the command name and press [Enter], you will be prompted for each parameter. When being prompted for a command argument:

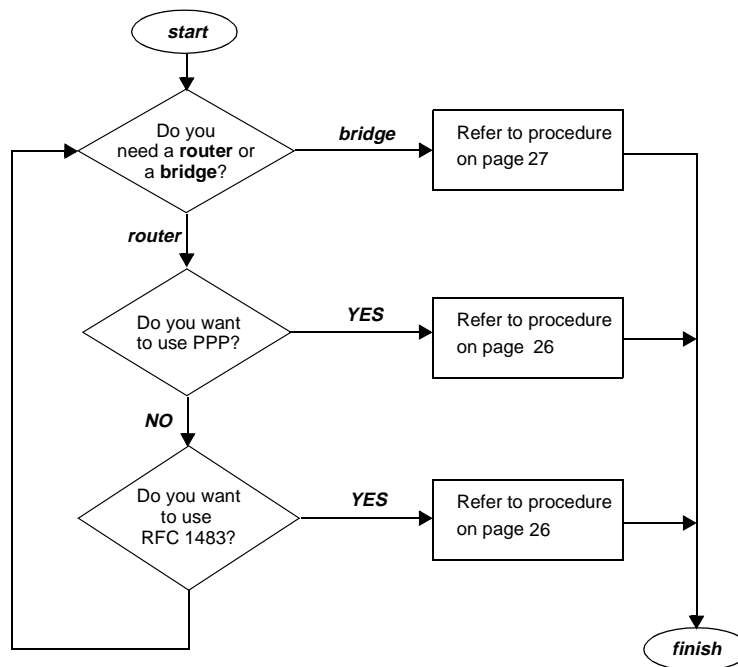
+ or -	Scrolls through the keywords. This control only works for arguments that are keywords.
---------------	--

Configuring the Router

How do you want to use the Router?

The router is configured with several default configuration settings and these settings will be appropriate for most installations (see page 25 for default configuration settings). However, to assess whether these settings will work for you, you need to decide how you are planning to use the router. The flowchart below allows you to choose a simple configuration procedure to use to configure your router. More complex configurations can be configured using the Advanced Setup feature of the HTML interface.

NOTE: Your service provider should have notified you which encapsulation method to use, PPP or RFC 1483. Refer to “Encapsulation Methods: PPP and RFC 1483” on page 30 for descriptions of PPP and RFC 1483.



Setting the Password

The router has no password protection as configured from the factory. As soon as you log into the router, you should set the password. This can be done from the HTML interface by clicking on the **Set Password** link or from the command line interface using the `set password` command.

Password protection can be disabled again by entering the current password and a blank for the new password. If the password is forgotten, the router can be set to the factory default state from the serial port during the boot process.

To reset router to the factory default state:

- 1 Log into the router through the serial port and get to the command prompt.
- 2 Enter the “reboot” command
- 3 During the boot process, the screen will start displaying a series of periods (“.”). Enter the word “default” while the dots are being displayed.

NOTE: The default boot process will reset all user-configurable parameters on the router to factory defaults.

It is wise to restrict physical access to the router to prevent the accidental or malicious defaulting of your configuration.

Factory Default Configuration

The router is shipped from the factory with particular default settings. You may or may not need to change these depending on what kind of network the router is installed.

Configurable Item	Default Settings
Operating Mode	Router
Ethernet Interface	IP Address 10.0.0.1 Network Mask 255.0.0.0
IP Gateway (Default Route) Address	None
DSL (WAN) Interface	IP Address None Network Mask None
ATM VPI/VCI Number	0/32
Data Encapsulation Protocol	PPP
PPP Authentication	Username ENI-Router Password ENI-Router
PPP Multiplexing method	LLC/SNAP encapsulation
Hostname	speedstream
Domain name	router.invalid
DHCP server	Enabled
DNS	Enabled
DNS Resolver or Forwarders	None specified
NAPT	Enabled
RIP	Enabled; uses RIP2 in passive mode
IP Filtering	Disabled
Spanning Tree (bridge only)	Disabled

Router PPP Configuration

The modem is configured by default from the factory to be in router mode using PPP encapsulation. This greatly simplifies the configuration procedure.

To configure the router via HTML:

- 1 On the main page, click on **Simple Setup**.
- 2 If your service provider has specified a VPI/VCI number to use, enter the numbers in the VPI and VCI fields.
- 3 Enter the PPP username and password specified by your service provider.
- 4 Select **Set**. This will set the new VPI/VCI parameters on the router . Select **Refresh** after a minute or two to see the new configuration.

RFC 1483 Configuration

There are two types of RFC 1483 encapsulation that can be used: RFC 1483 *bridged* and RFC 1483 *routed*.

RFC 1483 Routed encapsulation operates at the IP layer and will route only IP packets. RFC 1483 bridged encapsulation method handles non-IP packets, which the unit supports only while configured for use as a bridge. The method you will use depends on the configuration parameters specified by your internet service provider.

The procedure that follows assumes that you have a unit that is configured with factory defaults.

To configure the modem via HTML:

- 1 On the main page, look in the Configuration Summary table and click on the title **Encapsulation Protocol**.
- 2 If your service provider has specified a different VPI/VCI number to use, enter the numbers in the VPI and VCI fields. Otherwise, enter the default VPI and VCI values.
- 3 Select the desired RFC 1483 encapsulation.

- 4 Select **Max** as the rate.
- 5 Enter an IP address and netmask to use for the DSL/WAN interface.
- 6 Select **Modify VC**.
- 7 Select the “**Advanced Setup**” button in the top left panel.
- 8 Select the “**Command List**” button in the top left panel.
- 9 From the command list on the left, select “ipgateway”.
- 10 Enter the “**Enter new IP address**” field, enter the IP address of an IP gateway (default route) that is on the same subnet as the router.
- 11 When the response appears at the bottom of the screen, it will have link that says “REBOOT REQUIRED”. Click on that link and reboot the router. Select **Refresh** after a minute or two to see the new configuration.

Bridge Configuration

The first thing you must do to use the 5600 series router as a bridge is change it to bridge mode.

To change mode from the HTML interface:

- 1 On the first page, select **Change to Bridge Mode**”.
- 2 When the display appears, select the radio button labeled **Bridge**.
- 3 When the response appears at the bottom of the screen, it will have link that says “REBOOT REQUIRED”. Click on that link and reboot the router. Select **Refresh** after a minute or two to see the new configuration.

The only other possible configuration parameters you may need to set would be the VPI/VCI numbers as specified by your service provider. When the unit comes back up in bridge mode, select the **Simple Setup** link to configure it.

Testing the Configuration

After completing the configuration process, you may test the operation of the router by starting a Web browser and accessing a remote web site such as **http://www.efficient.com**. Alternatively, you can open an MS DOS (or shell) window and issue a “ping <ip_address>” command to a known host on the wide-area network.

Terminology and Concepts

Acronyms

ADSL	Asymmetric Digital Subscriber Line
ATM	Asynchronous Transfer Mode
ATU	ADSL Termination Unit
CHAP	Challenge-Handshake Authentication Protocol
CO	Central Office
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Service
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer
Firmware	Software, in binary form, stored within a flash PROM
ICMP	Internet Control Message Protocol
IPCP	IP Control Protocol
ISP	Internet Service Provider
LCP	Link Control Protocol
NAP	Network Access Provider
NAPT	Network Address Port Translation
NCP	Network-layer Control Protocol
NSP	Network Service Provider
OCD	Out-of-cell Delineation (ATM error condition)
PAP	Password Authentication Protocol
POST	Power On Self Test
PPP	Point-to-Point Protocol
PTT	Post Telephone and Telegraph (European Telco)
PVC	Permanent Virtual Circuit
SOHO	Small Office, Home Office
SMTP	Simple Mail Transport Protocol
SNMP	Simple Network Management Protocol
RIP	Routing Information Protocol
RT	Remote Termination

Technical Concepts

This section provides very brief descriptions of some of the features available on the 5600 series router/bridge.

Digital Subscriber Line (DSL)

DSL describes a family of digital services provided by local telephone companies to local subscribers. There are many forms of DSL: Asymmetric DSL (ADSL), Symmetric (or single pair) DSL (SDSL), and many others. The router supports ADSL, which provides rates of up to 6 Mbps downstream from the customer and up to 640 Kbps upstream from the customer. DSL can carry voice and data signals at the same time in both directions.

Asynchronous Transfer Mode

ATM is a fast, cell-based technology defined by the ITU-T. It works by taking an ordinary, variable-length data packet and segmenting it into 53-byte cells prior to transmission. The data is transmitted over *virtual channels* that are designated by specific unique identifiers (virtual channel identifiers or VCIs). There can be multiple VCIs in one *virtual path*. The virtual path also has a unique virtual path identifier (VPI).

Data transmitted over ATM VCs is routed by ATM switches. At the destination node, the cells are reassembled into packets.

Only one virtual path is supported on the device. In router mode, only one virtual channel is supported. However, in bridge mode, up to 16 virtual channels can be configured to be used as individual bridge ports.

Encapsulation Methods: PPP and RFC 1483

The 5600 series router transmits data via ATM Virtual Channels (VCs). The data is encapsulated using Point-to-Point Protocol (PPP) or RFC

1483 encapsulation. A brief explanation of these two encapsulation methods follows.

Point-to-Point Protocol (PPP)

PPP is a single or multi-link interface between two packet switching devices, such as a bridge or router. PPP has built-in negotiation for addresses and connection parameters and can route multiple protocols over a single link. One benefit of using PPP is it offers interoperability of multi-vendor equipment as well as support for dynamic configuration between the connecting devices.

RFC 1483

Request for Comment (RFC) 1483 is an interoperability specification set by the Internet Engineering Task Force (IETF) that outlines methods for multiprotocol encapsulation over ATM. RFC 1483 describes two encapsulation methods for carrying network interconnect traffic over ATM Adaptation Layer 5 (AAL5): Logical Link Control (LLC)/SNAP encapsulation and VC multiplexing.

By default, the router uses the first method, LLC Encapsulation, which allows multiplexing of multiple protocols over a single ATM virtual circuit. The second method, VC multiplexing, uses a separate VC for each carried protocol.

This unit supports two types of 1483 encapsulation: *routed* and *bridged*. RFC 1483 Routed encapsulation operates at the IP layer and will route only IP packets. RFC 1483 bridged encapsulation is supported only when the unit is operating in bridge mode.

Dynamic Host Configuration Protocol (DHCP)

The router provides two user-configurable Dynamic Host Configuration Protocol (DHCP) modes:

- DHCP server (enabled by default from the factory)
- DHCP relay agent

DHCP Relay

The router can be configured to operate as a DHCP relay agent. This allows local machines on the LAN to acquire their IP addresses via DHCP requests and replies that are forwarded through the router to/from a DHCP server on the WAN. In this case, the DHCP requests are forwarded to a specific DHCP server on the WAN network and the DHCP reply is forwarded back to the LAN network.

The DHCP relay agent can be configured with a Primary and a Secondary DHCP Server IP address. The Secondary address is only used if the Primary is unreachable. Any DHCP requests that are received by the router are relayed to the Primary DHCP server at the specified IP address. This DHCP server is then responsible for assigning the DHCP information to the DHCP client. Typically, this DHCP server will exist in the WAN space.

DHCP Server

When operating as a DHCP server, the router will dynamically assign IP addresses to LAN nodes. The DHCP server verifies a device's identity, leases it an IP address for a predetermined period of time, and reclaims the address for reassignment at the end of the lease period. The DHCP server supports DHCP client hosts on the LAN side only. The router will ignore all DHCP requests which arrive from the WAN interface.

NOTE: The router has an option to set the Ethernet IP address on the router and not reboot. When configuring the DHCP server to hand out a range of addresses on a new subnet and changing the Ethernet IP address of the router, you must reboot the router. Otherwise, the DHCP server and the Ethernet IP address currently being used by the router will be out of sync. In this situation, the router will issue error messages to the console and the DHCP server will not be able to properly give out addresses. Always reboot the router when changing the Ethernet IP address; verify that the DHCP server is configured to give out addresses for the correct IP subnet of the Ethernet interface.

Domain Name Service (DNS)

The router supports Domain Name Service (DNS) which provides hostname-to-IP address resolution for LAN-side clients. There are two

distinct DNS functions provided by the router: the *DNS resolver* and the *DNS server*.

DNS Resolver

The DNS resolver is the entity that creates a DNS request for transmission to a DNS server (which may be co-located in the router or be an external DNS server). The DNS resolver is only used by certain user interface commands that allow a hostname argument as well as an IP address argument.

The DNS resolver requires the user to configure a single DNS server IP address to which to direct DNS requests. This IP address may be the router itself in the situation where the DNS server is enabled on the router or it may be any reachable IP address at which a DNS server is available.

DNS Server

The DNS server is the entity that responds to DNS requests. The DNS server provides IP address-to-hostname resolution and hostname-to-IP address resolution for LAN clients via DNS requests. It may also be configured to provide this service for WAN clients. The DNS server also supports hostname-to-IP address resolution for user interface commands where appropriate in response to requests submitted by the DNS resolver. The DNS server is enabled by default from the factory and provides the router with the default hostname “**speedstream**”.

Public and Private Networks and the use of NAT

An IP address must be unique among all networks reachable from a given host using the IP protocols. The United States Internet Registry ensures the uniqueness of the IP addresses on the Internet. The Internet Registry assigns an entire IP network number to each site connected to the Internet. Each IP address at a site is unique as long as the site assigns a different host number to each host on its network. Thus each host is ensured a globally unique IP address that is known as a *public* IP address.

However, there has been concern over the eventual exhaustion of the public address space. This has led the Registry to set aside IP network numbers for *private* addressing. These numbers are not assigned to anyone by the Internet Registry and are open for use by any site. IP addresses are

unique within the private address space, but two private address spaces are not guaranteed unique.

Use of private address spaces has some disadvantages including the need to re-address any host that must change from a private address to a public address. Plus the privately addressed hosts are unable to communicate with all hosts in an internet. These problems can be handled by the use of *Network Address Port Translation* (NAPT).

NAPT is an extension to *Network Address Translation* (NAT). With NAT, a network address translator (the router, in this case) sits between an organization's network and the Internet, or between two organization's networks and translates IP addresses from private internal addresses to globally unique external addresses. NAPT, however, allows many network addresses and their TCP/UDP ports to be translated to a single network address and its TCP/UDP ports. With NAPT, a few of your internal hosts can share a single public address. When a host needs to access the Internet, the router will translate an address for it. When packets from the host are sent to the Internet, the router replaces the internal address with the external address. When packets come back for that address, the router reverses the substitution.

Technical Reference

5660 DSL Router/Bridge Specifications

Size	5.5W in. x 7D in. x 1.5H in. (14W cm x 17.8D cm x 3.8H cm)
Weight	1.25 lbs. (0.57 Kg)
Power	Integrated 110-240 VAC; 50-60 Hz power supply; 0.1A @ 110VAC, 0.05A @ 240VAC
Temperature	Operating: 0° to 40° C Non-Operating, storage: -10°C to 85° C
Humidity	Operating humidity: 10% to 90% noncondensing Non-operating storage humidity: 5% to 95% non-condensing
Ringer Equivalency	REN=0.8B
Performance	Meets or exceeds requirements for T1E1.4 line connected equipment for noise, line balance, return loss, reach and line disturbance.
Cabling	Unshielded Twisted Pair (UTP) Category 3, 4, or 5
Local Console	RS232 using Mini DIN (38400 baud default)

5621 DSL Router/Bridge Specifications

Size	5.5W in. x 7D in. x 1.5H in. (14W cm x 17.8D cm x 3.8H cm)
Weight	1.25 lbs. (0.57 Kg)
Power	Integrated 110-240 VAC, 50-60 Hz power supply 0.2A @ 110VAC, 0.1A @ 240VAC
Temperature	Operating: 0° to 40° C Non-Operating, storage: -10°C to 85° C
Humidity	10% to 90% noncondensing Non-operating storage humidity: 5% to 95% non-condensing
Ringer Equivalency	REN=0.8B
Performance	Meets or exceeds requirements for T1E1.4 line connected equipment for noise, line balance, return loss, reach and line disturbance. DMT: up to 640 Kbps upstream; up to 6.144 Mbps downstream
Cabling	Unshielded Twisted Pair (UTP) Category 3, 4, or 5
Local Console	RS232 using Mini DIN (38400 baud default)

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