ECG9210-04
Home Gateway VDSL2 Router with 802.11b/g capabilities

User Guide

http://www.edgecorenetworks.com

User Guide

Home Gateway VDSL2 Router

VDSL2 Home Gateway Router with
4100BASE-TX (RJ-45) Ports, 2 VDSL Ports (RJ-11)
and 802.11b/g wireless capabilities

EGC9210-04
E022010-DT-R01
150200000095A

Compliances

FCC - Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

You may use unshielded twisted-pair (UTP) for RJ-45 connections - Category 3 or better for 10 Mbps connections, or Category 5 or better for 100 Mbps connections.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

EC Conformance Declaration CE ⓘ

Marking by the above symbol indicates compliance with the Essential Requirements of the R&TTE Directive of the European Union (1999/5/EC). This equipment meets the following conformance standards:

- EN 60950-1 (IEC 60950-1) - Product Safety

- EN 300 328 - Technical requirements for 2.4 GHz radio equipment
- EN 301 489-1 / EN 301 489-17 - EMC requirements for radio equipment

This device is intended for use in the following European Community and EFTA countries:

Austria	Belgium	Cyprus	Czech Republic	Denmark
Estonia	Finland	France	Germany	Greece
Hungary	Iceland	Ireland	Italy	Latvia
Liechtenstein	Lithuania	Luxembourg	Malta	Netherlands
Norway	Poland	Portugal	Slovakia	Slovenia
Spain	Sweden	Switzerland	United Kingdom	

Requirements for indoor vs. outdoor operation, license requirements and allowed channels of operation apply in some countries as described below:

- In Italy the end-user must apply for a license from the national spectrum authority to operate this device outdoors.
- In Belgium outdoor operation is only permitted using the 2.46 - 2.4835 GHz band: Channel 13.
- In France outdoor operation is only permitted using the 2.4 - 2.454 GHz band: Channels 1 - 7.

Note: The user must use the configuration utility provided with this product to ensure the channels of operation are in conformance with the spectrum usage rules for European Community countries as described below.

- This device will automatically limit the allowable channels determined by the current country of operation. Incorrectly entering the country of operation may result in illegal operation and may cause harmful interference to other systems. The user is obligated to ensure the device is operating according to the channel limitations, indoor/outdoor restrictions and license requirements for each European Community country as described in this document.
- This device may be operated indoors only in all countries of the European Community using the 2.4 GHz band: Channels 1 - 13, except where noted below.
- In Italy the end-user must apply for a license from the national spectrum authority to operate this device outdoors.
- In Belgium outdoor operation is only permitted using the 2.46 - 2.4835 GHz band: Channel 13.
- In France outdoor operation is only permitted using the 2.4 - 2.454 GHz band: Channels 1 - 7.

Declaration of Conformity in Languages of the European Community:

Czech Česky	SMC tímto prohlašuje, že tento Radio LAN device je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Estonian Eesti	Käesolevaga kinnitab SMC seadme Radio LAN device vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.

English	Hereby, SMC, declares that this Radio LAN device is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Finnish Suomi	Valmistaja SMC vakuuttaa täten että Radio LAN device tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Dutch Nederlands	Hierbij verklaart SMC dat het toestel Radio LAN device in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG Bij deze SMC dat deze Radio LAN device voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.
French Français	Par la présente SMC déclare que l'appareil Radio LAN device est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE
Swedish Svenska	Härmed intygar SMC att denna Radio LAN device står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Danish Dansk	Undertegnede SMC erklærer herved, at følgende udstyr Radio LAN device overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF
German Deutsch	Hiermit erklärt SMC, dass sich dieser/diese/dieses Radio LAN device in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet". (BMWi) Hiermit erklärt SMC die Übereinstimmung des Gerätes Radio LAN device mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG. (Wien)
Greek Ελληνική	με την παρουσα SMC δηλωνει οτι radio LAN device συμμορφωνεται προσ τισ ουσιωδεισ απαιτησεισ και τισ λοιπεσ σχετικεσ διαταξεισ τησ οδηγιασ 1999/5/εκ.
Hungarian Magyar	Alulírott, SMC nyilatkozom, hogy a Radio LAN device megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Italian Italiano	Con la presente SMC dichiara che questo Radio LAN device è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latvian Latviski	Ar šo SMC deklarē, ka Radio LAN device atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lithuanian Lietuvių	Šiuo SMC deklaruoja, kad šis Radio LAN device atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Maltese Malti	Hawnhekk, SMC, jiddikjara li dan Radio LAN device jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.

Spanish Español	Por medio de la presente SMC declara que el Radio LAN device cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE
Polish Polski	Niniejszym SMC oświadcza, że Radio LAN device jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
Portuguese Português	SMC declara que este Radio LAN device está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovak Slovensky	SMC týmto vyhlasuje, že Radio LAN device spÍňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Slovenian Slovensko	SMC izjavlja, da je ta radio LAN device v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.

Customer Information

1. This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA. On bottom of this equipment is a label that contains, among other information, a product identifier of [INSERT LABEL]. If requested, this number must be provided to the telephone company.
2. If this equipment, ECG9210-04, causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also you will be advised of your right to file a complaint with the FCC if you believe it is necessary.
3. The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modification to maintain uninterrupted service.
4. If you experience trouble with this equipment, you disconnect it from the network until the problem has been corrected or until you are sure that the equipment is not malfunctioning.
5. Please follow instructions for repairing if any (e.g. battery replacement section); otherwise do not alternate or repair any parts of device except specified.
6. Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.
7. If your home has specially wired alarm equipment connected to the telephone line, ensure the installation of this equipment does not disable alarm equipment, consult your telephone company or a qualified installer.

Warnings and Cautionary Messages

Warning: This product does not contain any serviceable user parts.

Caution: Do not plug a phone jack connector in the RJ-45 port. This may damage this device.

Caution: Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

Environmental Statement

The manufacturer of this product endeavours to sustain an environmentally-friendly policy throughout the entire production process. This is achieved though the following means:

- Adherence to national legislation and regulations on environmental production standards.
- Conservation of operational resources.
- Waste reduction and safe disposal of all harmful un-recyclable by-products.
- Recycling of all reusable waste content.
- Design of products to maximize recyclables at the end of the product’s life span.
- Continual monitoring of safety standards.

End of Product Life Span

This product is manufactured in such a way as to allow for the recovery and disposal of all included electrical components once the product has reached the end of its life.

Manufacturing Materials

There are no hazardous nor ozone-depleting materials in this product.

Documentation

All printed documentation for this product uses biodegradable paper that originates from sustained and managed forests. The inks used in the printing process are non-toxic.

About This Guide

Purpose

This guide details the hardware features of the Gateway, including its physical and performance-related characteristics, and how to install the Gateway. It also includes information on how to operate and use the management functions of the Gateway.

Audience

The guide is intended for use by network administrators who are responsible for installing and setting up network equipment; consequently, it assumes a basic working knowledge of LANs (Local Area Networks).

Conventions

The following conventions are used throughout this guide to show information:

Note: Emphasizes important information or calls your attention to related features or instructions.

Caution: Alerts you to a potential hazard that could cause loss of data, or damage the system or equipment.

Warning: Alerts you to a potential hazard that could cause personal injury.

Revision History

This section summarizes the changes in each revision of this guide.

January 2010 Revision

This is the first revision of this guide.

Contents

Chapter 1: Introduction

Overview

This device can serve as a key component in any Ethernet-over-VDSL2 data transport system that consists of an end-user Gateway and a VDSL2 switch connected by standard telephone cable. The VDSL connection delivers an Ethernet data link rated up to both 100 Mbps downstream and 100 Mbps upstream (VDSL2 profile 30A), while simultaneously supporting standard telephone services. The system can be deployed in any multi-dwelling/multi-tenant environment (apartment blocks, hotels, or office complexes) to provide both high-speed Internet access and telephone services without any need for re-wiring. It also provides a built-in 802.11b/g access point for wireless connectivity.

VDSL switches combine both the data and phone signals coming from your Internet and telephone service providers, and pass these signals directly over standard telephone wiring to multiple users in the same building. The Gateway is used to separate these signals and pass them on to a customer’s computer and telephone equipment.

The VDSL2 switch is typically located in a wiring closet or other central location of a multi-dwelling/multi-tenant unit, campus, or enterprise. An Internet connection is provided from the ISP to the customer’s building over fiber optic cable, running Ethernet directly over a 1 to 10 Gbps connection. This kind of WAN connection is referred to as Fiber To The Building (FTTB). Data signals entering a site are first passed through an Ethernet switch that segregates the signals for individual user connections, and are then fed into the switch. Phone signals are also routed from PBX/MDF distribution equipment into the switch. The data and phone signals for each user are combined in the switch, and passed over VDSL lines to individual customers.

The Gateway at the customer end of the VDSL line connects to any PC equipped with a 10BASE-T or 100BASE-TX network interface card. Your existing telephone, modem, or fax machine simply plugs into the Gateway’s phone port. There is no need for splitters, terminators, or filters. In fact, there is no need to modify your home wiring at all. And because the VDSL connection is based on Ethernet, no complex software configuration is required.

The Gateway provides access to a wide range of advanced transport features, including support for real-time video, and other multimedia services requiring guaranteed Quality of Service (QoS). It also provides multiprotocol encapsulation for bridging Windows NetBEUI and Novell’s IPX protocols directly to a remote site for complete access to corporate resources, or for routing TCP/IP traffic for Internet connections.

VDSL Technology

VDSL (Very High Bit-Rate Digital Subscriber Line) is at the high-end of all the DSL technologies, offering the best combination of fiber optics and copper to provide high-speed broadband Internet access. VDSL's primary application is in providing a broadband data service to multi-tenant residential or commercial buildings. In this implementation, fiber optic cable carries the data from a telephone company's central office to the building; then the installed telephone copper wires take the data and deliver it to individual units within that building.

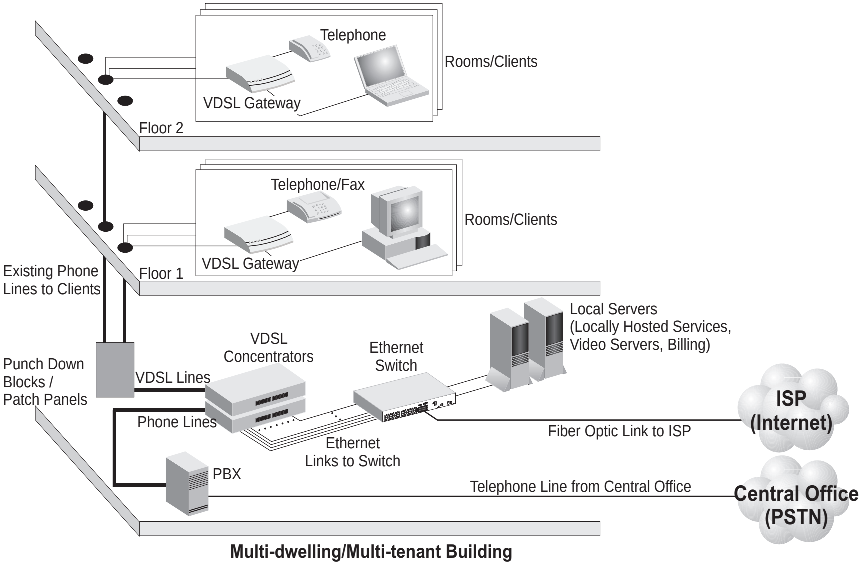


Figure 1-1 Providing Broadband Internet Access through VDSL

VDSL provides high-speed Internet access over existing phone lines by making use of previously unused frequency bandwidth above the voice band (i.e., up to 30 MHz with VDSL2). By placing VDSL signals above the frequency of the voice signal, a VDSL service can coexist on the same line with other telephone services. VDSL can operate symmetrically, providing the same data rate in both directions, or asymmetrically, providing a higher data rate in the downstream (receive) direction than in the upstream (transmit) direction.

VDSL delivers high-performance online applications, such as high-quality video and other switched multimedia services. This Ethernet VDSL2 Gateway provides robust performance, with a data rate up to 100 Mbps downstream and 100 Mbps upstream, and a range up to 200 meters (656 ft).

This system is based on advanced VDSL2 Multi-Carrier Modulation (MCM) technology with adaptive channel equalization that overcomes bridge taps and other line distortions. Reed-Solomon Forward Error Correction and interleaving protects against errors due to impulse noise, and enables recovery from signal interruptions. Frequency Division Duplexing (FDD) separates downstream and upstream channels and allows VDSL signals to coexist with regular telephone services. A power back-off mechanism is also implemented to reduce noise from crosstalk in line bundles.

Features and Benefits

VDSL features (Gateway side) include:

- High-speed Internet access over existing phone lines
- VDSL2 connection provides the following rate/range options (profile 30A):

Table 1-1 Maximum Rates and Distances

Rate	Mode	Max. Range
100 Mbps	Downstream	200 m (656 ft)
100 Mbps	Upstream	

- Concurrent data and telephone services over a single connection
- Always-on digital connection eliminates dial-up delays, providing transparent reconnection when initiating a network request
- Supports ITU-T VDSL2 and interface standards
- Spectral compatibility with VDSL2, Smartphone digital PBX extensions and narrowband interference
- Robust operation on severely distorted lines
- Supports power back-off algorithm that permits a mixed distance deployment
- Wireless 802.11b/g access point
- LEDs indicate VDSL link status, and power
- Simple plug-and-play installation

Additional VDSL2 features (Gateway side) include:

- Fast startup for quick initialization
- Trellis coding modulation for higher performance
- Seamless rate adaptation for enhanced quality in video applications
- Variable tone spacing enables best performance for long and short reach lines
- Improved framing, overhead channel, and interleaving

Gateway services include:

- Multiprotocol encapsulation of Windows NetBEUI, Novell’s IPX and TCP/IP via bridging for complete access to corporate resources
- TCP/IP routing transport using RIP or RIP 2 for Internet access

- Network Address Translation (NAT/NAPT) which enables multiple user Internet access with a single user account, flexible local IP address administration, and firewall protection
- Virtual Server which allows remote users access to various services at your site using a constant IP address
- DMZ Host allows a client to be fully exposed to the Internet for applications which do not work properly behind a firewall
- Dynamic Host Configuration Protocol (DHCP) for dynamic IP address assignment as a server or server relay
- TR-069 CPE WAN Management Protocol support for communication between the Gateway and an Auto-Configuration Server
- TR-098 Multi-Service Delivery Framework for Home Networks

Description of Hardware

This Gateway is a Very High Bit-Rate Digital Subscriber Line (VDSL2) customer premises equipment (CPE) that can connect to a remote site (via bridging) or to the Internet (via routing). It transports data over standard telephone wire at a symmetric data rate up to 100 Mbps downstream and 100 Mbps upstream, and a range up to 200 meters (656 ft).

This unit provides the following ports on the rear panel:

- One RJ-11 port for connection to your VDSL service provider’s incoming line.
- One RJ-11 port for connection to your telephone, modem, or fax machine. The Gateway includes a built-in POTS voice/data splitter, so no external splitter or low-pass filter is required.
- Four RJ-45 ports for connection to a 10/100BASE-TX Ethernet Local Area Network. These ports operate at 10/100 Mbps, half/full duplex. All of these ports support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections. (See “10BASE-T/100BASE-TX Pin Assignments,” page 113.)
- One 802.11b/g antenna for wireless connectivity.
- WPS button for instant wireless connection.
- Wall or ceiling mount kit.

The rear panel also includes a DC power input jack, and a screw hole for grounding the Gateway to earth.

There is also a reset button on the bottom of unit that can be used to restore the device to its factory default settings.

The following figure shows the front components of the Gateway:

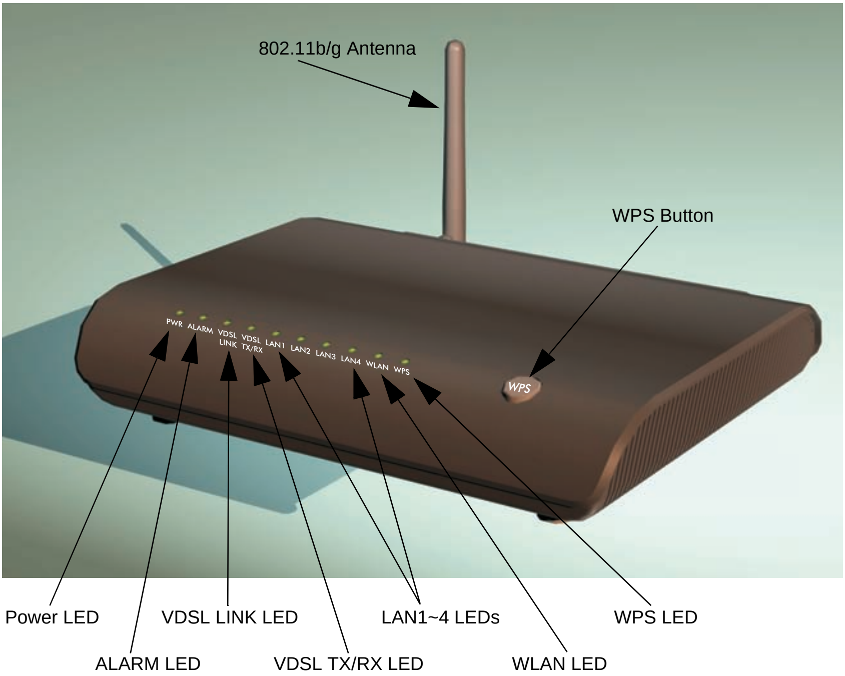


Figure 1-2 Top Panel

The Gateway includes key system and port indicators that simplify installation and network troubleshooting. The LEDs, which are located on the top of the unit for easy viewing, are described in the following table.

Table 1-2 LED Display Status

LED	Color	Status	Description
PWR	Green	On	The unit is being supplied with power.
		Off	The unit is not receiving power.
ALARM	Orange	On	Indicates VDSL link failure.
		Off	Connected to network; VDSL link has been established.
VDSL LINK	Green	On	A stable link has been established with the VDSL network.
		Off	VDSL link has not been established.
		Blinking	The unit is synchronizing (initializing the VDSL link).

Table 1-2 LED Display Status (Continued)

LED	Color	Status	Description
VDSL TX/RX	Green	On	Signal detected on VDSL WAN port.
		Off	No signal detected on VDSL WAN port.
		Blinking	Network traffic is crossing the VDSL WAN port.
LAN1-4	Green	On	Ethernet link signal detected on LAN port.
		Off	No Ethernet link signal detected on LAN port.
		Blinking	Network traffic is crossing the LAN port.
WLAN	Green	On/ Flashing	Indicates the 802.11b/g radio is enabled. Flashing indicates wireless network activity.
		Off	Indicates the 802.11b/g radio is disabled.
WPS	Green	On (for 10 seconds)	Indicates the WPS authentication of a device has been successfully completed.
		Fast Flashing	Indicates the WPS authentication of a client device is in progress.
		Slow Flashing (for 10 seconds)*	Indicates the WPS authentication of a device did not complete after 120 seconds.
		Off	Indicates that WPS is not in progress.

The following figure shows the rear components of the Gateway:

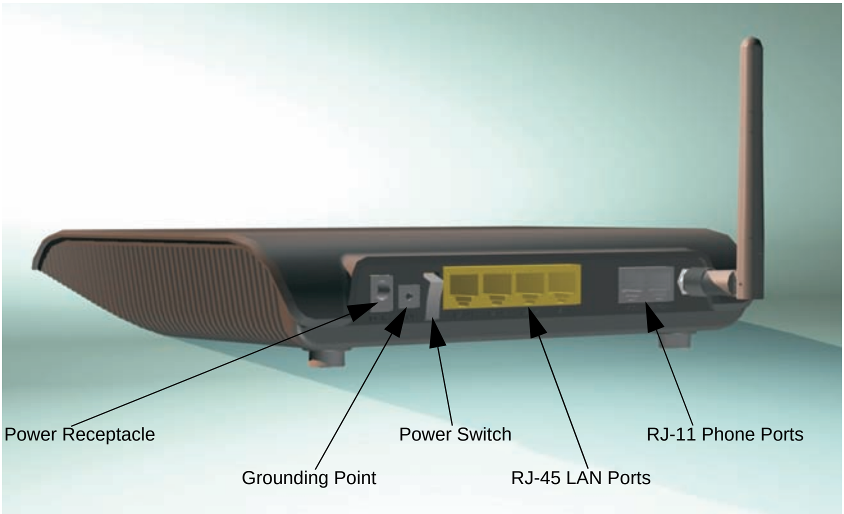


Figure 1-3 Rear Panel

The following figure shows the base components of the Gateway:

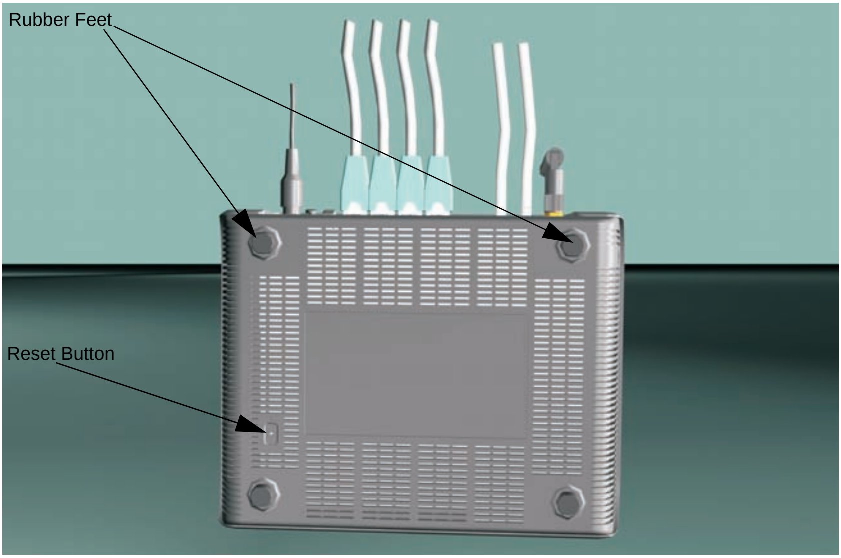


Figure 1-4 Base Panel

The gateway also includes a wall/ceiling mount bracket illustrated in the picture that follows. Align the bracket in the direction indicated, marking four screw holes in the mounting surface with a pencil. Drill four holes in the mounting surface sufficient in size to accomodate the screws that you are using. If drilling into a wall, make sure to use wall-plugs as well.

The mounting bracket also includes two clips for attaching the unit to the backet.

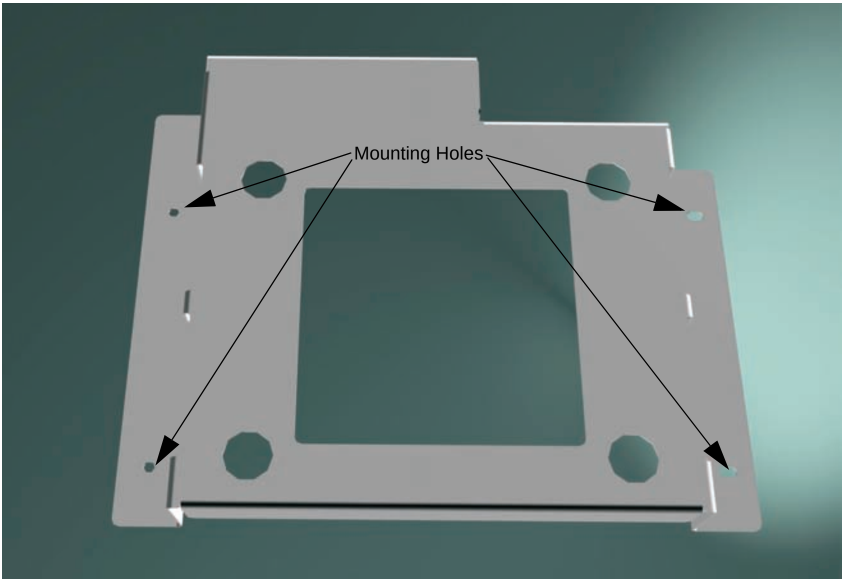


Figure 1-5 Mounting Bracket - Front

Before attaching the bracket to the mounting surface be sure to connect the unit to its required connections, a power source, RJ-11/RJ-45 leads, grounding source, and power on the unit to make sure that it is functioning and providing connectivity.

The mounting bracket also includes two clips for attaching the unit to the backet.

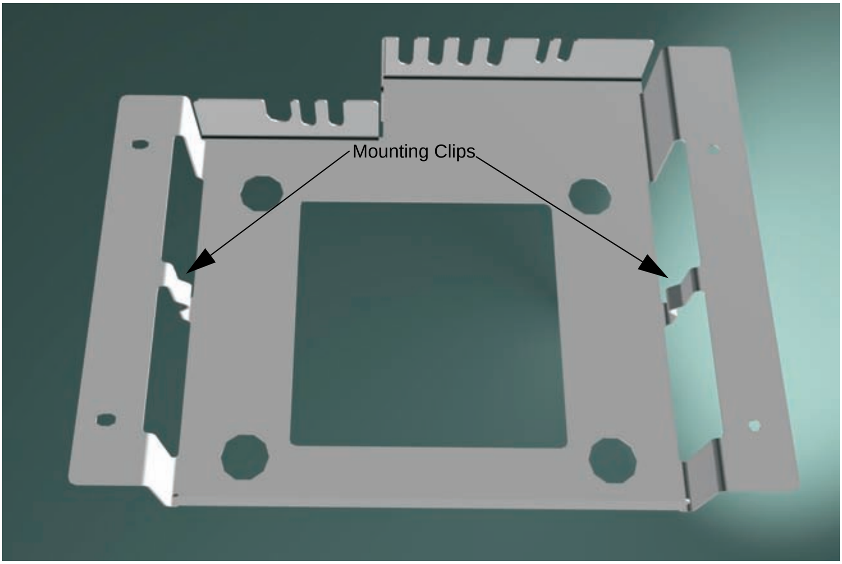


Figure 1-6 Mounting Bracket - Rear

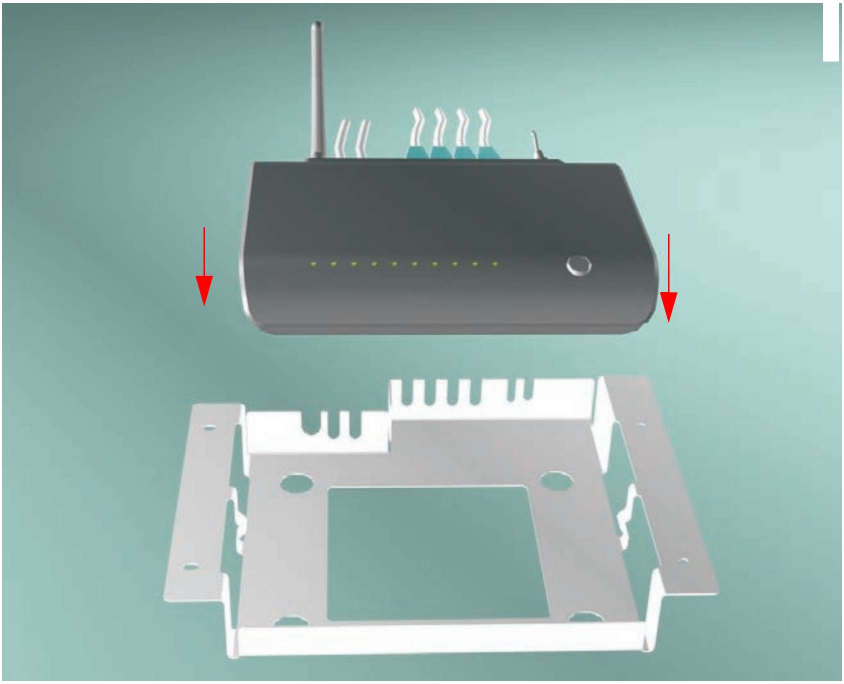


Figure 1-7 Mounting the unit in the bracket

Figure 1-8

Mount the connected unit into the bracket in the direction of the red arrows shown above, making sure the unit clips correctly into the mounting clips.

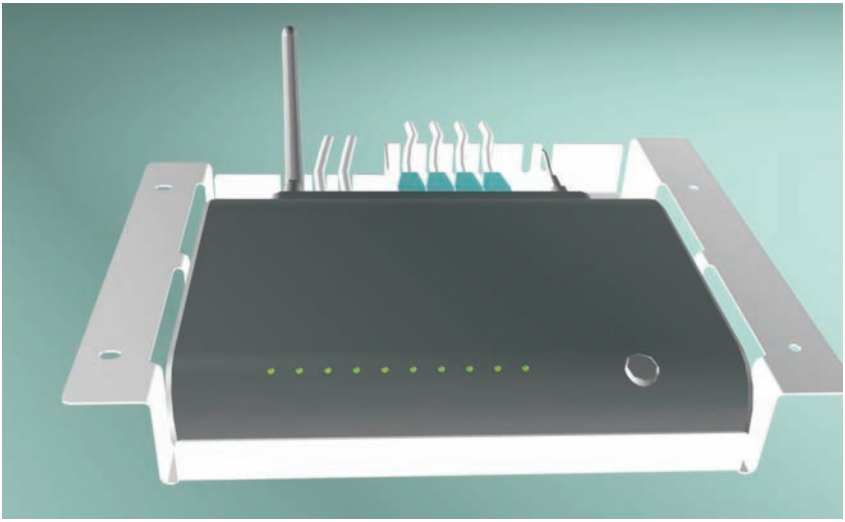


Figure 1-9 Unit in bracket

If mounting the assembled unit to a vertical surface follow the directions of the red arrows indicated below.

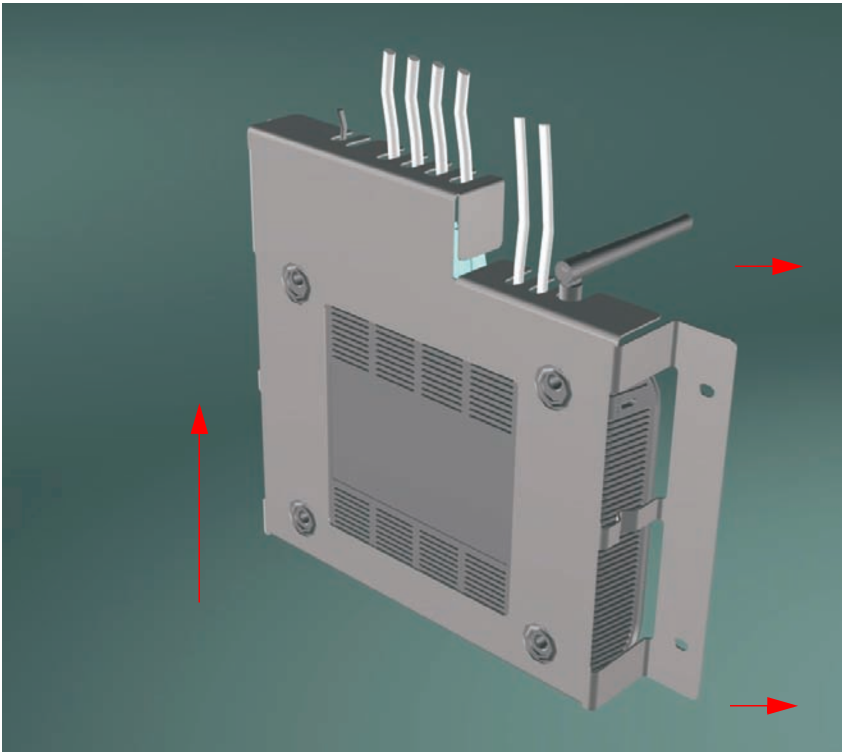


Figure 1-10 Attaching the bracket to the mounting surface

Chapter 2: Installation

Installation Overview

Before installing the Gateway, verify that you have all the items listed in “Package Contents.” If any items are missing or damaged, contact your local distributor. Also, be sure you have all the necessary tools and cabling before installing the Gateway.

Package Contents

After unpacking the Gateway, check the contents of the box to be sure that you have received the following components:

- 1 Ethernet-over-VDSL2 Gateway
- 1 AC power adapter
- 4 rubber foot pads
- CD-ROM containing this User Guide
- 1 Category 5 UTP straight-through network cable (1 m / 3.28 ft)
- 1 standard RJ-11 telephone cable (1 m / 3.28 ft)
- Mounting bracket (Optional)
- Warranty Card

Please inform your dealer if there are any incorrect, missing, or damaged parts. If possible, retain the carton, including the original packing materials in case there is a need to return the Gateway for repair.

System Requirements

Before you start installing the Gateway, make sure you can provide the right operating environment. See the following installation requirements:

- A PC or Macintosh with a 10/100 Mbps Ethernet adapter card installed.
- For Internet access, the computer must be configured for TCP/IP.
- Power requirements: 12 VDC via the included AC power adapter. Make sure that a properly grounded power outlet is within 1.8 m (6 ft) of the Gateway.
- The Gateway should be located in a cool dry place, with at least 5 cm (2 in.) of space on all sides for ventilation.
- Place the Gateway out of direct sunlight, and away from heat sources or areas with a high amount of electromagnetic interference. The temperature and humidity should be within the ranges listed in the specifications.
- Be sure that the Gateway is also accessible for Ethernet and telephone cabling.

Cable Connections

Depending on the wiring configuration used in your house, separate wall jacks may be used for telephone and VDSL services. Otherwise, you will need to connect telephones and your computer directly to the Gateway.

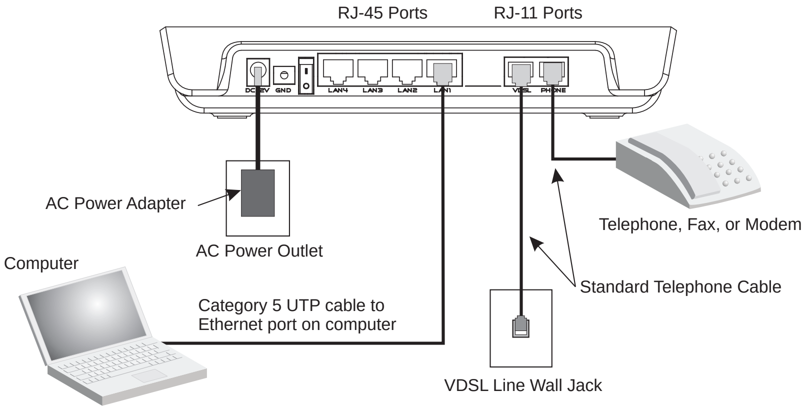


Figure 2-1 Connecting the Gateway

1. Using standard telephone cable, connect the Gateway's RJ-11 VDSL port to the RJ-11 telephone wall jack providing the VDSL service.
2. Connect a telephone or fax machine to the RJ-11 port on the Gateway labeled PHONE.
3. For Ethernet connections, make sure you have installed a 10BASE-T or 100BASE-TX network adapter card in the computers to be connected to the LAN.
4. Prepare straight-through shielded or unshielded twisted-pair cables with RJ-45 plugs at both ends. Use 100-Ohm Category 3, 4, or 5 cable for a 10 Mbps Ethernet connection, or Category 5 cable for a 100 Mbps connection.
5. Connect one end of the cable to the RJ-45 port of the network interface card, and the other end to any of the RJ-45 LAN ports on the Gateway.

   When inserting an RJ-45 plug, be sure the tab on the plug clicks into position to ensure that it is properly seated.

Caution: Do not plug a phone jack connector into any RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

Notes: **1.** When connecting to any network device (such as a PC, hub or switch), you can use either straight-through or crossover cabling. (Refer to Appendix B: "Cables" on page 113 for a description of cable types.)

2. Make sure the twisted-pair cable connected to any of the Gateway's LAN ports does not exceed 100 meters (328 feet).

Powering On

Plug the power adapter cord into the DC 12V power socket on the Gateway, and then plug the power adapter directly into a power outlet. Check the LED marked PWR on the top of the unit to be sure it is on. If the PWR indicator does not light up, refer to Appendix A: “Troubleshooting” on page 111.

If the Gateway is properly configured, it will take about 30 seconds to establish a connection with the VDSL service provider after powering up. During this time the VDSL LINK indicator will flash during synchronization. After the VDSL connection has been established, the VDSL LINK indicator will stay on.

Configuring the TCP/IP Protocols

To connect the Gateway to a computer through its Ethernet port, the computer must have an Ethernet network adapter card installed, and be configured for the TCP/IP protocol. Many service providers configure TCP/IP for client computers automatically using a networking technology known as Dynamic Host Configuration Protocol (DHCP). Other service providers may require you to use a specific IP configuration (known as a static IP address), which must be entered manually.

Carry out the following steps to check that the computer’s Ethernet port is correctly configured for DHCP.

Windows 95/98/NT

1. Click “Start/Settings/Control Panel.”
2. Click the “Network” icon.
3. For Windows NT, click the “Protocols” tab.
4. Select “TCP/IP” from the list of network protocols; this may include details of adapters installed in your computer.
5. Click “Properties.”
6. Check the option “Obtain an IP Address.”

Windows 2000

1. Click “Start/Settings/Network/Dial-up Connections.”
2. Click “Local Area Connections.”
3. Select “TCP/IP” from the list of network protocols.
4. Click on “Properties.”
5. Select the option “Obtain an IP Address.”

Windows XP

1. Click “Start/Control Panel/Network Connections.”

2. Right-click the “Local Area Connection” icon for the adapter you want to configure.
3. Highlight “Internet Protocol (TCP/IP).”
4. Click on “Properties.”
5. Select the option “Obtain an IP address automatically” and “Obtain DNS server address automatically.”

Windows Vista

1. Click Start/Control Panel.
2. Double-click “Network and Sharing Center.”
3. Click “View status.”
4. Click “Properties.” If the “User Account Control” window appears, click “Continue.”
5. Highlight “Internet Protocol Version 6 (TCP/IPv6)” or “Internet Protocol Version 4 (TCP/IPv4),” and click “Properties.”
6. Select the option “Obtain an IP address automatically” and “Obtain DNS server address automatically.”

Mac OS

1. Pull down the Apple Menu. Click “Control Panels” and select “TCP/IP.”
2. In the TCP/IP dialog box, verify that “Ethernet” is selected in the “Connect Via:” field.
3. If “Using DHCP Server” is already selected in the “Configure” field, your computer is already configured for DHCP. Otherwise, select “Using DHCP Server” in the “Configure” field and close the window.
4. Another box will appear asking whether you want to save your TCP/IP settings. Click “Save.”
5. Your service provider will now be able to automatically assign an IP address to your computer.

Chapter 3: Network Planning

Application Examples

VDSL provides significant savings on network installation, equipment, and service fees. Internet services operate over existing phone cabling and a minimal amount of network equipment. The only changes require installing a VDSL CPE (or Gateway as described in this manual) for each client, and a VDSL switch in the basement or wiring closet. Internet service can then be provided over a direct Ethernet connection from your ISP. For non-commercial environments, you can run the switch through a broadband router (such as this Gateway) at the customer’s site. This will allow you to use a single-user account and ISP sharing to significantly reduce network access charges.

Using VDSL provides Internet connections of up to 100 Mbps downstream and 100 Mbps upstream at 200 meters. Installation is extremely economical for multiple-tenant dwellings such as apartment buildings, hotels or school dormitories, as well as commercial buildings.

VDSL provides multiple-user access to the Internet with benefits including:

- Internet services such as e-mail over faster connections than currently possible with other options such as cable modem or ADSL
- Multimedia applications such as video and virtual gaming made available to the broader public for the first time
- Access to corporate intranets at speeds close to that available in the office
- Both local network applications and Internet services are supported for commercial environments

Networking Concepts

Route Determination

Depending on the transport protocol used, this device can handle traffic as a Layer-2 bridge, using only the physical address stored in the packet’s source and destination address fields. Or it can forward traffic as a fully functional Layer-3 router, using a specific route (that is, next hop) for each IP host or subnet that is statically configured or learned through dynamic routing protocols.

Bridging

When Bridge Mode is selected, the Gateway behaves like a wire directly connecting your local network to the ISP. The Gateway simply stores the physical address and corresponding port number of each incoming packet in an address table. This information is subsequently used to filter packets whose destination address is on the same segment (that is, the local network or remote network) as the source address.

Routing

When Router Mode is selected, the Gateway forwards incoming IP packets and uses RIP or RIP-2 for routing path management if enabled. The router supports both static routing and dynamic routing.

- Static routing requires routing information to be stored in the router, either manually or when a connection is set up, using the default gateway designated by your ISP.
- Dynamic routing uses a routing protocol to exchange routing information, calculates routing tables, and responds to changes in the status or traffic on the network.

Dynamic Routing Protocols - This router supports both RIP and RIP-2 dynamic routing protocols. Routing Information Protocol (RIP) is the most widely used method for dynamically maintaining routing tables in small to medium networks. RIP uses a distance vector-based approach to routing. Routes are chosen to minimize the distance vector, or hop count, which serves as a rough estimate of transmission cost. Each router broadcasts an advertisement every 30 seconds, together with any updates to its routing table. This allows all routers on the network to build consistent tables of next hop links which lead to relevant subnets.

RIP-2 is a compatible upgrade to RIP. However, RIP-2 adds useful capabilities for plain text authentication, multiple independent RIP domains, variable length subnet masks, and multicast transmissions for route advertising (see RFC 1388).

Note: If the destination route is not found in the routing table, the router simply transmits the packet to a default router for resolution.

Network Applications

The Gateway can be configured as a bridge for making a transparent connection to a remote site, or as a router for accessing the Internet. These applications are briefly described in the following sections.

Accessing a Remote Site

The Gateway can be configured to act as a transparent bridge between a local PC or LAN attached to the Ethernet ports and a remote site across the WAN VDSL link. Bridging can be used to make two separate networks appear as if they were part of the same physical network. When data enters an Ethernet port on the Gateway, its destination MAC address (physical address) is checked in the address database to see if it is located in the local segment (that is, attached to one of the Gateway’s Ethernet ports). If the destination address is not found, the frame is forwarded to the VDSL port and queued for output. If the destination address is found to belong to one of the local ports, the frame is dropped or “filtered.” However, note that broadcast or multicast frames are always broadcast across the VDSL link.

The source MAC address of each frame is recorded into the address database only if it belongs to the local LAN segment. This information is then used to make subsequent decisions on frame forwarding. The address database can hold up to 512 unique MAC addresses. An entry in the address database will be discarded only if it has not been accessed for a period of time called the aging time. This is to ensure that correct forwarding decisions can still be made when a node is moved to another port, and to keep the table clean.

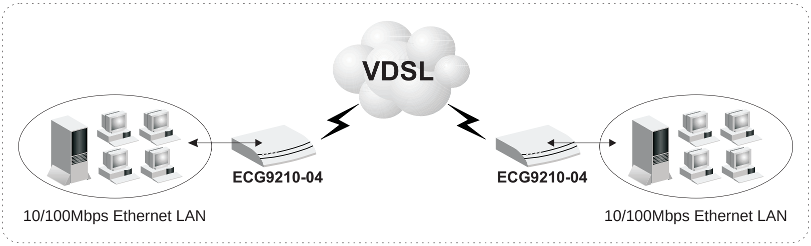


Figure 3-1 Transparent Bridged Network

Accessing the Internet

To access the Internet, which uses the TCP/IP protocol exclusively, the Gateway should be configured to function as a router. One side of the connection is formed by the ports attached to a local 10/100Mbps Ethernet LAN (or directly to a host PC with an Ethernet adapter), while the other is the Layer 3 transport service running on the VDSL port. When the Gateway receives an IP packet over the WAN interface, the destination address is checked in the routing table. If the address is found, the packet is forwarded to the associated interface/port. Otherwise, the packet is dropped. When it receives an IP packet over the LAN interface, it also checks the routing table. If the source and destination address are in the same subnet, no action is required because the packet can be passed on at Layer 2. If the address is found to be in a remote subnet, the packet is forwarded to the next hop router. Otherwise, if not found in the address table, it is sent to the default gateway designated by the ISP.

The routing table contains information on which networks are accessible through each interface. It can be dynamically updated using the Routing Information Protocol (RIP), or statically configured through the web management interface. If you use RIP, the router will exchange information with neighboring routers to learn the best routes to remote networks, and advertise the networks for which it can provide the best route.

When the system is powered on, the Gateway builds its own routing database according to previous static routing entries, and/or collects routing information from adjacent routers through RIP or RIP-2 protocol. RIP (that is, RIP-1) is generally supported by all routers, but RIP-2 carries more information which allows the router to make better choices on the most appropriate path to a remote network. However, RIP-1 is adequate for most networks and involves less overhead.

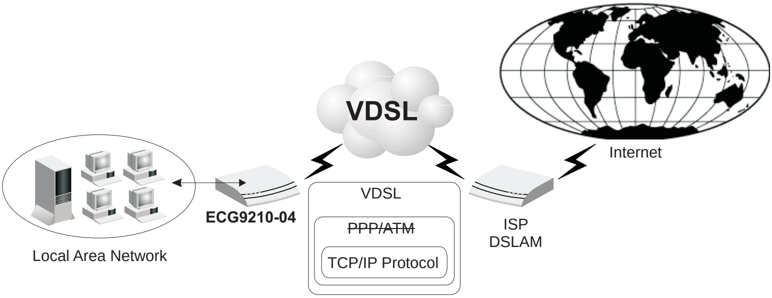


Figure 3-2 Routed Network

Network Services

DHCP Service

Dynamic Host Configuration Protocol (DHCP) allows network clients to dynamically obtain TCP/IP configuration information upon bootup. When a DHCP client starts, it broadcasts a DHCP request. The Gateway can be set up to respond to the client with configuration information (including, an IP address, subnet mask and default IP gateway) or to relay the request to another DHCP server.

The Gateway can be configured with an client pool of up to 254 IP addresses. These addresses are leased to the requesting client for a specified amount of time, or until the device surrenders the address during shut-down. Windows 95, 98, NT, 2000, and Vista hosts as well as other systems that provide DHCP client services can be configured with a TCP/IP address provided by this Gateway.

DNS Service

The DNS protocol is used to map host names to IP addresses. The Gateway can specify a well-known DNS server, or relay service requests directly through to the ISP for resolution.

NAT Functions

Network Address Translation (NAT) allows you to map multiple IP addresses for clients from your local Ethernet through to the Internet using a single IP address for the VDSL port. This allows multiple users to access the Internet using a single-user account from your ISP.

Virtual Server

You can also map multiple local servers to the Gateway’s external IP address. In this way, service requests from Internet users can be redirected to designated servers on the local network. This allows you to define a single access point for all the Internet services provided at your site, such as a local web server or an FTP server. And then, just by entering the external IP address for your site (provided by your ISP), Internet users can access the service they need at the local address to which you redirect them.

NAT allows Internet users through to the services you designate, but because all your internal IP addresses are private, this provides a natural firewall that prevents direct access to local resources by hackers. NAT also simplifies address management because changes to IP addresses for local services will not affect access for Internet users accessing your site. For example, when you update an IP address for an Internet server on your local network, Internet users can continue to access the service via the same external IP address.

User-Definable Application Sensing Tunnel

You can define special applications that require multiple connections such as Internet gaming, videoconferencing, and Internet telephony. The Gateway can then sense the application type and open a multi-port TCP/UDP tunnel for it.

DMZ Host Support

DMZ allows a networked computer to be fully exposed to the Internet. This function is used when the special application sensing tunnel is insufficient to allow an application to function correctly.

Security

The Gateway supports security features that can deny Internet access to specified users, or filter all requests for specific services the administrator does not want to serve. The Gateway’s firewall can also block common hacker attacks, including IP Spoofing, Land Attack, Ping of Death, IP with zero length, Smurf Attack, UDP port loopback, Snork Attack, TCP null scan, and TCP SYN flooding.

It also supports the following additional security features:

- Disable Ping from the LAN or WAN side
- Discard port scans from the WAN side
- Filter specific MAC or IP addresses
- Block certain web sites based a specified URL
- Stateful Packet Inspection which accepts only legitimate packets based on connection type

Virtual Private Network

The Gateway supports three of the most commonly used VPN protocols – PPTP, L2TP and IPSec. These protocols allow remote users to establish a secure connection to their corporate network. If your service provider supports VPNs, then any of these protocols can be used to create an authenticated and encrypted tunnel for passing secure data over the Internet (i.e., a traditionally shared data network). The VPN protocols supported by the Gateway are briefly described below.

Point-to-Point Tunneling Protocol – Provides a secure tunnel for remote client access to a PPTP security gateway. PPTP includes provisions for call origination and flow control required by ISPs.

Layer Two Tunneling Protocol – L2TP includes most of the features provided by PPTP, but has less overhead and is more suited for managed networks.

IP Security – Provides IP network-layer encryption. IPSec can support large encryption networks (such as the Internet) by using digital certificates for device authentication.

Chapter 4: Initial Configuration

Accessing the Setup Wizard

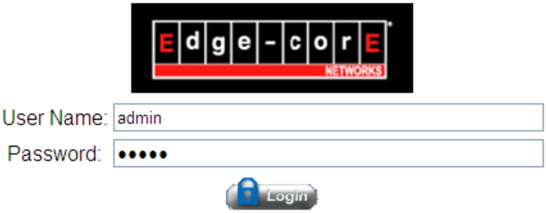
The Gateway provides a Setup Wizard for initial configuration of the unit's operating mode (Bridge or Router as described in "Networking Concepts" on page 29) and WAN IP address (when Router mode is selected).

For initial configuration, connect a PC directly to one of the LAN ports on the back of the unit, and use a web browser (such as Internet Explorer 6.0 or above, or Mozilla Firefox 2.0.0.0 or above) to connect to the Gateway.

The Gateway has a default IP address of 192.168.2.1 and a subnet mask of 255.255.255.0. If your PC is set to "Obtain an IP address automatically" (that is, set as a DHCP client), you can connect immediately to the web interface. Otherwise, you must set your PC IP address to be on the same subnet as the Gateway (that is, the PC and Gateway addresses must both start with 192.168.2.x).

To access the Setup Wizard, follow these steps:

1. Use your web browser to connect to the management interface using the default IP address of 192.168.2.1.
2. Log into the Gateway's management interface by entering the default user name and password both as "admin," and then click OK.

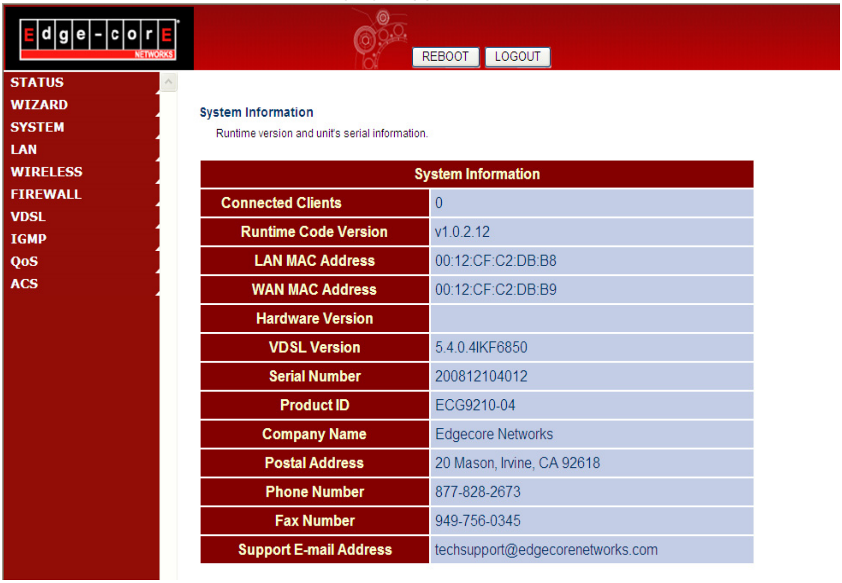


User Name: admin

Password: •••••

Figure 4-1 Login Dialog Box

3. Click WIZARD when the home page appears.



System Information

Runtime version and unit's serial information.

System Information	
Connected Clients	0
Runtime Code Version	v1.0.2.12
LAN MAC Address	00:12:CF:C2:DB:B8
WAN MAC Address	00:12:CF:C2:DB:B9
Hardware Version	
VDSL Version	5.4.0.4IKF6850
Serial Number	200812104012
Product ID	ECG9210-04
Company Name	Edgecore Networks
Postal Address	20 Mason, Irvine, CA 92618
Phone Number	877-828-2673
Fax Number	949-756-0345
Support E-mail Address	techsupport@edgecorenetworks.com

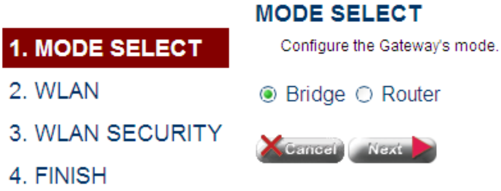
Figure 4-2 Home Page

Using the Setup Wizard

There are only a few basic steps you need to set up the Gateway, and to configure an IP address for the WAN interface (when operating in Router mode).

The Setup Wizard takes you through the configuration procedures shown below:

1. **Select the Operating Mode** – By default, the Gateway is set to operate in Bridge mode, and requires no other features to be set before using the Advanced Setup menu. If you plan on using the Gateway in Bridge mode, just click Next and skip to Step 4. Otherwise, select Router mode, and click Next.



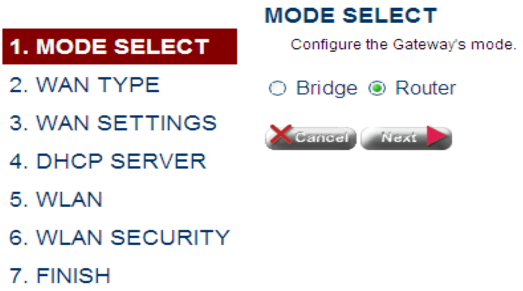
MODE SELECT

Configure the Gateway's mode.

● Bridge ○ Router

Figure 4-3 Mode Selection (Bridge Mode)

If Router mode is selected the information displayed on the screen changes to that shown below.



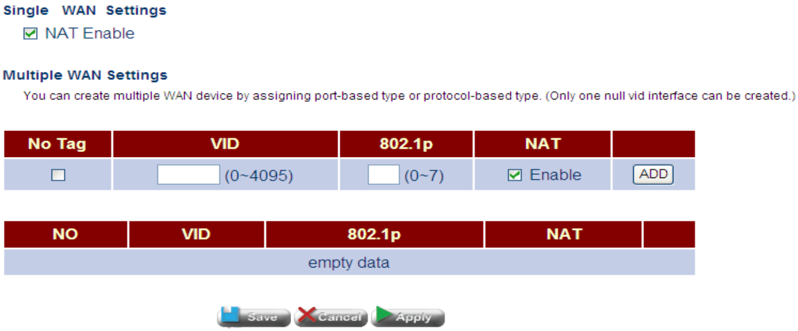
MODE SELECT

Configure the Gateway's mode.

○ Bridge ● Router

Figure 4-4 Mode Selection (Router Mode)

2. **Set the WAN Connection Type** – By default, the Gateway's WAN port is configured for dynamic IP assignment using DHCP. Select the option indicated by your Internet service provider, and click Next.



Single WAN Settings

☑ NAT Enable

Multiple WAN Settings

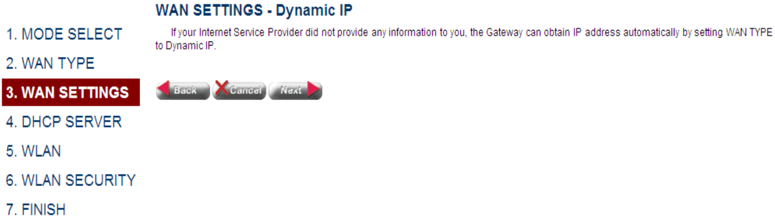
You can create multiple WAN device by assigning port-based type or protocol-based type. (Only one null vid interface can be created.)

No Tag	VID	802.1p	NAT	
□	(0~4095)	(0~7)	☑ Enable	ADD

NO	VID	802.1p	NAT	
empty data				

Figure 4-5 WAN Type

- **Dynamic IP** – If you selected Dynamic IP, the following screen will appear. Click Next to confirm your selection.

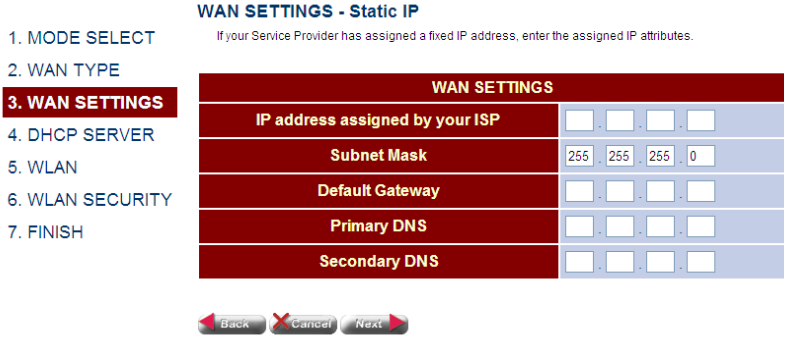


WAN SETTINGS - Dynamic IP

If your Internet Service Provider did not provide any information to you, the Gateway can obtain IP address automatically by setting WAN TYPE to Dynamic IP.

Figure 4-6 WAN Setting (Dynamic IP)

- **Static IP** – If you selected Static-IP, the following screen will appear. Fill in the required settings, and then click Next.



WAN SETTINGS - Static IP

If your Service Provider has assigned a fixed IP address, enter the assigned IP attributes.

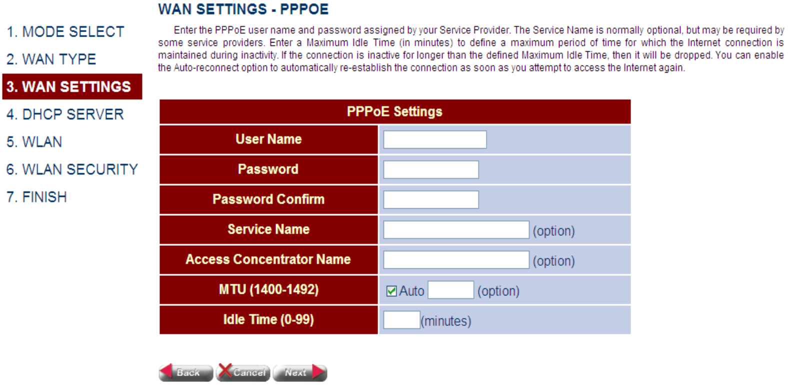
WAN SETTINGS	
IP address assigned by your ISP	. . .
Subnet Mask	255 . 255 . 255 . 0
Default Gateway	. . .
Primary DNS	. . .
Secondary DNS	. . .

Figure 4-7 WAN Setting (Static IP)

Field Attributes

- **IP address assigned by your ISP** – IP address of the WAN interface. Valid addresses consist of four decimal numbers, 0 to 255, separated by periods.
- **Subnet Mask** – This mask identifies the subnet and host portion of the IP address.
- **Default Address** – The IP address of the gateway router which is used if the requested destination address is not on the local subnet, nor in any of the routing tables.
- **Primary DNS** – The IP address of the Primary Domain Name Server on the network. A DNS maps numerical IP addresses to domain names which can be used to identify network hosts by familiar names instead of the IP addresses.
- **Secondary DNS** – The secondary domain name server.

- **PPPoE** – If you selected PPPoE, the following screen will appear. Fill in the required settings, and then click Next.



WAN SETTINGS - PPPOE

Enter the PPPoE user name and password assigned by your Service Provider. The Service Name is normally optional, but may be required by some service providers. Enter a Maximum Idle Time (in minutes) to define a maximum period of time for which the Internet connection is maintained during inactivity. If the connection is inactive for longer than the defined Maximum Idle Time, then it will be dropped. You can enable the Auto-reconnect option to automatically re-establish the connection as soon as you attempt to access the Internet again.

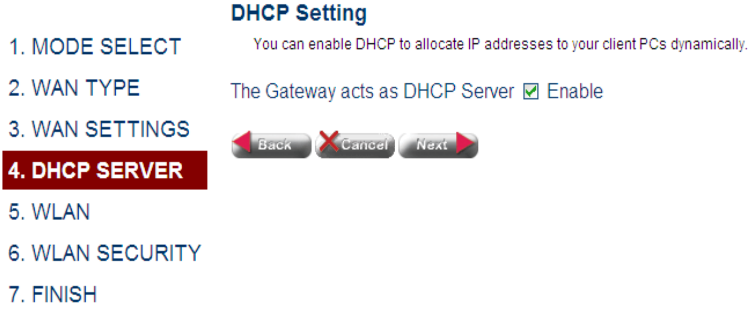
PPPoE Settings	
User Name	
Password	
Password Confirm	
Service Name	(option)
Access Concentrator Name	(option)
MTU (1400-1492)	☑ Auto (option)
Idle Time (0-99)	(minutes)

Figure 4-8 WAN Setting (PPPoE)

Field Attributes

- **User Name** – Sets the PPPoE user name. (Range: 1-32 characters)
- **Password** – Sets a PPPoE password. (Range: 1-32 characters)
- **Password Confirm** – Prompts you to re-enter your password.
- **Service Name** – The service name assigned for the PPPoE connection. The service name is normally optional, but may be required by some service providers. (Range: 1-32 characters)
- **Access Concentrator Name** – The name of the access concentrator to use in PPPoE Active Discovery Offers (PADO). (Range: 1-32 characters)
- **MTU (1400-1492)** – Sets the maximum packet size that the WAN port may transmit. The Maximum Transmission Unit is expressed in bytes. By default, the Gateway will send several test messages to determine the MTU for the upstream connection. (Range: 1400-1492 bytes)
- **Idle Time (0-99)** – The maximum length of inactive time the unit will stay connected to the service provider before disconnecting. Select “Auto-reconnect” to reconnect to the upstream gateway whenever an Internet access request is made. (Range: 1-99 minutes; Default: 2 minutes)

3. **Enable Local DHCP Service** – By default, the Gateway's is configured to provide DHCP service to any client attached to the Gateway's LAN ports. Set the administrative status of this feature, and click Next.

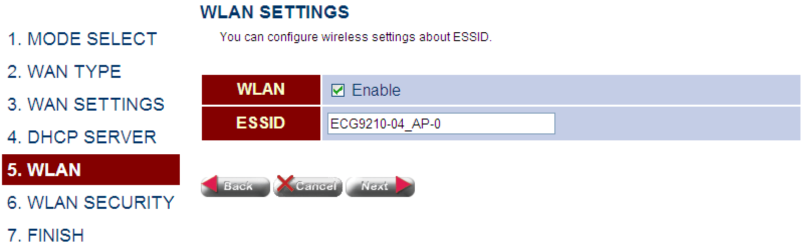

DHCP Setting

You can enable DHCP to allocate IP addresses to your client PCs dynamically.

The Gateway acts as DHCP Server ☑ Enable

Figure 4-9 DHCP Setting

4. **Set Wireless Settings –** The wireless radio on the Gateway is disabled by default. To enable it check the WLAN Enable box. The access point's ESSID is automatically set, but may be changed by altering this field. Click Next to continue with the wireless setup.


WLAN SETTINGS

You can configure wireless settings about ESSID.

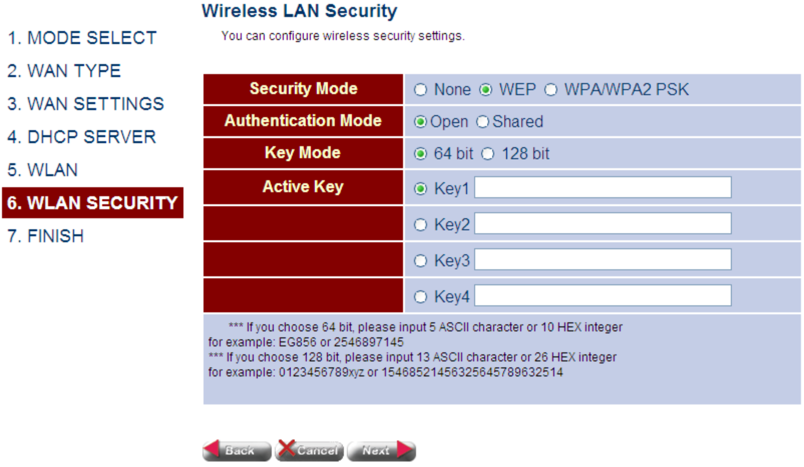
WLAN	☑ Enable
ESSID	ECG9210-04_AP-0

Figure 4-10 WLAN Setting

Field Attributes

- **WLAN** – Enables the wireless radio interface.
- **ESSID –** The name of the wireless network service provided by the VAP. Clients that want to connect to the network must set their SSID to the same as that of the VAP interface. (Default: ECG9210-04_AP-0; Range: 1-32 characters)

5. **Setting WLAN Security (WEP) –** Sets the wireless security encryption key for the wireless network.



Wireless LAN Security

You can configure wireless security settings.

Security Mode	○ None ● WEP ○ WPA/WPA2 PSK
Authentication Mode	● Open ○ Shared
Key Mode	● 64 bit ○ 128 bit
Active Key	● Key1
	○ Key2
	○ Key3
	○ Key4

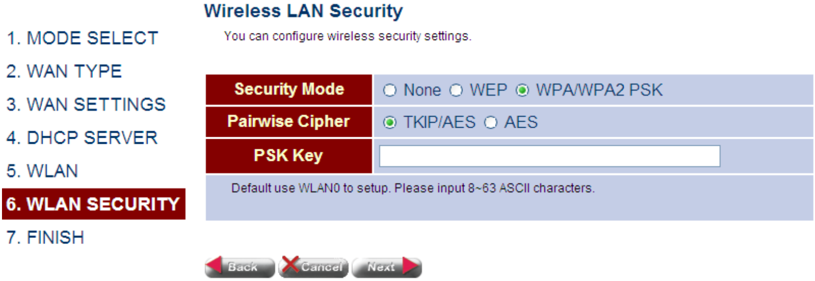
*** If you choose 64 bit, please input 5 ASCII character or 10 HEX integer
for example: EG856 or 2546897145
*** If you choose 128 bit, please input 13 ASCII character or 26 HEX integer
for example: 0123456789xyz or 15468521456325645789632514

Figure 4-11 WLAN Security - WEP

Field Attributes

- **None** – Disables security on the access point. (Default: Disabled)
- **WEP –** WEP is used as the multicast encryption cipher.
- **Authentication Mode –** Defines the mode with which the access point will associate with other clients.
- **Key Mode –** Select 64 Bit, or 128 Bit length. Note that the same size of encryption key must be supported on all wireless clients. (Default: 64 Bit)
- **Active Key –** Selects the key number to use for encryption for the VAP interface. If the clients have all four keys configured to the same values, you can change the encryption key to any of the eight settings without having to update the client keys. (Default: Key 1)

Setting WLAN Security (WPA) – Sets the WPA/WPA2 PSK wireless security encryption key for the wireless network.



1. MODE SELECT
2. WAN TYPE
3. WAN SETTINGS
4. DHCP SERVER
5. WLAN
6. WLAN SECURITY
7. FINISH

Wireless LAN Security

You can configure wireless security settings.

Security Mode	○ None ○ WEP ● WPA/WPA2 PSK
Pairwise Cipher	● TKIP/AES ○ AES
PSK Key	

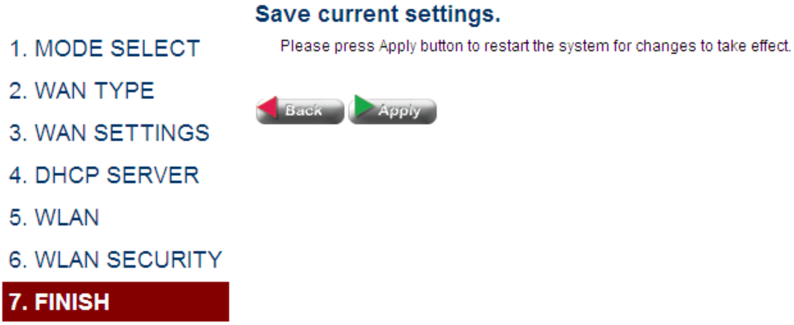
Default use WLAN0 to setup. Please input 8~63 ASCII characters.

Figure 4-12 WLAN Security - WPA

Field Attributes

- **TKIP/AFS –** TKIP/AES is used as the multicast encryption cipher.
- **AES –** AES is used as the multicast encryption cipher. AES-CCMP is the standard encryption cipher required for WPA2.

6. Click Next followed by Apply on the next srceen to save your settings. The unit will save your settings and restart. Note that your configuration changes are not saved until the Setup Wizard is completed and the system restarted.



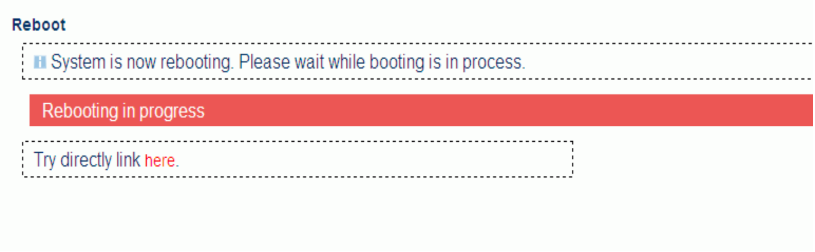
1. MODE SELECT
2. WAN TYPE
3. WAN SETTINGS
4. DHCP SERVER
5. WLAN
6. WLAN SECURITY
7. FINISH

Save current settings.

Please press Apply button to restart the system for changes to take effect.

Figure 4-13 Saving Your Settings

7. When the system restarts, a countdown window displays for about 60 seconds.



Reboot

System is now rebooting. Please wait while booting is in process.

Rebooting in progress

Try directly link here.

Figure 4-14 Reboot

Chapter 5: System Configuration

Using the Web Interface

The Gateway provides a web-based management interface for configuring device features and viewing statistics to monitor network activity. This interface can be accessed by any computer on the network using a standard web browser (such as Internet Explorer 6.0 or above, or Mozilla Firefox 2.0.0.0 or above).

Note: You can also use the Command Line Interface (CLI) to manage the Gateway over a serial connection to the console port or via Telnet or SSH.

To make an initial connection to the management interface, connect a PC to one of the Gateway's LAN ports. Then either set it to "Obtain an IP address automatically" (DHCP service is enabled by default on the Gateway) or configure it with a static address within the same subnet as that used by the Gateway (that is, 192.168.2.x with the subnet mask 255.255.255.0).

To access the configuration menu, follow these steps:

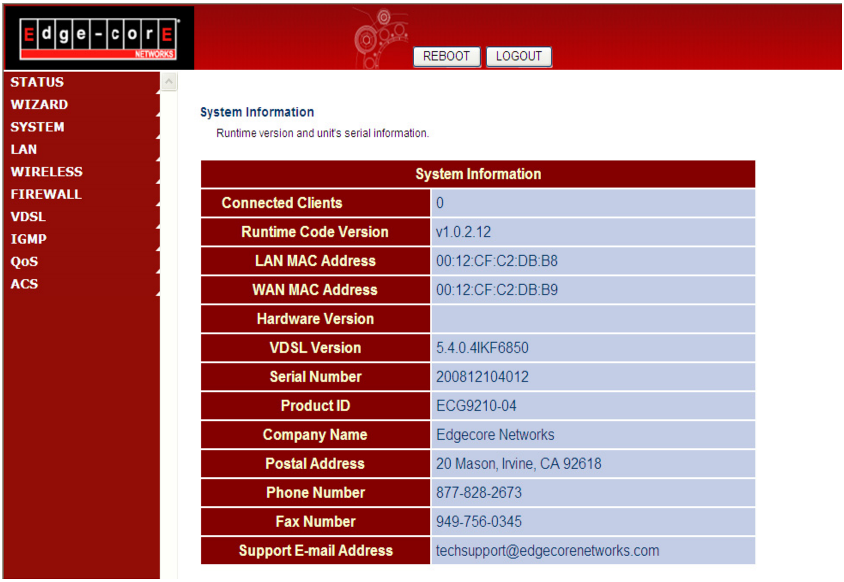
1. Use your web browser to connect to the management interface using the default IP address of 192.168.2.1.

2. Log into the Gateway's management interface by entering "admin" as both the default user name and password.

Note: It is strongly recommended to change the default password the first time you access the web interface. For information on changing the password, see "Admin Settings" on page 57.

Home Page

When your web browser connects with the Gateway’s web agent, the home page is displayed as shown below. For initial configuration, you can use the Setup Wizard as described in the preceding chapter. To carry out more detailed configuration tasks, use the Advanced Setup Menu, as described in this chapter.



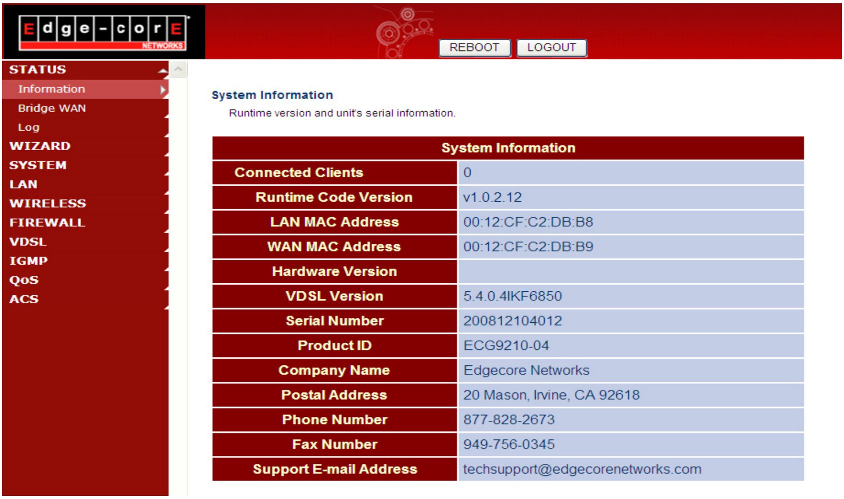
System Information

Runtime version and unit's serial information.

System Information	
Connected Clients	0
Runtime Code Version	v1.0.2.12
LAN MAC Address	00:12:CF:C2:DB:B8
WAN MAC Address	00:12:CF:C2:DB:B9
Hardware Version	
VDSL Version	5.4.0.4IKF6850
Serial Number	200812104012
Product ID	ECG9210-04
Company Name	Edgecore Networks
Postal Address	20 Mason, Irvine, CA 92618
Phone Number	877-828-2673
Fax Number	949-756-0345
Support E-mail Address	techsupport@edgecorenetworks.com

Figure 5-1 Home Page

Click “START WITH ADVANCED SETUP” to open the Advanced Settings menu as shown below. By default, the Gateway is set to Bridge Mode. (For a brief description of Bridge Mode and Router Mode, see “Route Determination” on page 29.)



System Information

Runtime version and unit's serial information.

System Information	
Connected Clients	0
Runtime Code Version	v1.0.2.12
LAN MAC Address	00:12:CF:C2:DB:B8
WAN MAC Address	00:12:CF:C2:DB:B9
Hardware Version	
VDSL Version	5.4.0.4IKF6850
Serial Number	200812104012
Product ID	ECG9210-04
Company Name	Edgecore Networks
Postal Address	20 Mason, Irvine, CA 92618
Phone Number	877-828-2673
Fax Number	949-756-0345
Support E-mail Address	techsupport@edgecorenetworks.com

Figure 5-2 Initial Page for Advanced Settings (Router Mode)

Advanced Settings Menu

The Advanced Settings pages display the main menu on the left side of the screen and sub-menu tabs at the top of screen. The main menu links are used to navigate between key functional categories, while the sub-menus list related topics within each of these categories. The sub-menus display configuration parameters, fixed system information, or network statistics.

The information in this chapter is organized to reflect the structure of the web management screens for easy reference.

The configuration pages include the options listed in the table below. For details on configuring each feature, refer to the corresponding page number.

Note: The displayed pages and settings may differ depending on whether the unit is in Bridge Mode or Router Mode.

Table 5-1 Advanced Settings Menu

Menu	Description	Mode	Page
STATUS	System information, access logs, and DHCP client list	Both	50
Information	Shows firmware/hardware and VDSL code versions, as well as the unit’s serial number	Both	50

Table 5-1 Advanced Settings Menu (Continued)

Menu	Description	Mode	Page
WAN	Shows configuration status (DHCP or static), IP address, subnet mask, DNS servers, gateway address, and WAN link status	Router	51
LAN	Shows IP address, subnet mask, and local DHCP server status	Router	52
Log	Displays a log of all network access and service activity	Both	53
DHCP	Displays addresses currently bound to DHCP clients	Router	54
SYSTEM	Basic administrative settings	Both	54
Mode	Sets the device to operate as s bridge or router	Both	54
Time	Configures NTP settings, including time zone, server, and refresh time	Router	57
Admin	Configures access password, and IP address(es) authorized for remote access over the WAN link	Both	57
Tools	Includes management tools for pinging another device, updating firmware, restoring factory defaults, and rebooting the unit	Both	58
UPnP	Enables UPnP auto-discovery mechanism	Router	59
Services	Enables TFTP, Telnet, and Secure Shell access	Router	60
SNMP	Configures SNMP settings.	Both	61
DNS	Dynamic Name Server	Both	69
WAN	Wide Area Network	Router	69
WAN Type	Configures virtual WAN ports	Both	64
WAN Settings	Configures address configuration options for DHCP, static assignment or PPPoE	Router	64
DDNS	Configures dynamic DNS services for DynDNS and TZO servers	Router	69
LAN	Local Area Network	Both	69
LAN Type	Configures VLANs	Both	69
LAN Settings	Configures IP settings for the LAN, including IP address, DHCP server, and DNS assignment	Both	69
Switch Ports	Configures port connection parameters, including speed and duplex mode	Both	72
ROUTE	Route Configuration	Router	69
Static Routing	Configures and displays static routing entries	Router	73
Dynamic Routing	Configures dynamic route learning from LAN and WAN interfaces	Router	74
Policy Routing	Configures IP policy routing	Router	76
Wireless	Wireless Configuration	Both	77

Table 5-1 Advanced Settings Menu (Continued)

Menu	Description	Mode	Page
Wireless	Configures wireless AP settings	Both	79
Client List	List of all wireless clients currently associated with the AP	Both	85
NAT	Network Address Translation	Router	86
Virtual Server	Maps public to private service addresses	Router	86
Port Mapping	Maps one or more service ports to a local server	Router	87
DMZ	Allows a specified host on the local network to access the Internet without any firewall protection	Router	89
FIREWALL	Firewall Configuration	Both	90
Firewall Settings	Enables or disables the firewall, and sets default policy for addresses not found in the MAC or IP filtering list	Both	90
IP Filtering	Filters IP addresses of clients accessing the Internet	Both	91
ALG	Enables or disables customized NAT traversal filters for SIP, H323, IRC, PPTP, SNMP, TFTP, and IPSEC.	Router	92
Remote Control	Configures remote management access of the WAN port.	Both	93
VDSL	VDSL Configuration	Both	95
Rate Information	Displays general VDSL status information for the VDSL line, BME and specific ports; also displays current rate for various stream types	Both	95
Performance Counters	Displays performance information including common error conditions for the VDSL line	Both	98
SNR	Displays counters for sound-to-noise ratio measurements	Both	99
IGMP	Internet Group Management Protocol	Both	101
IGMP	Configures IGMP Proxy, IGMP Snooping, Fast Leave	Both	102
QoS	Quality of Service	Both	104
QoS Settings	Enables or disables QoS, sets the upstream rate limit, and the queuing mode	Both	104
Traffic Classification	Configures diffServ priorities based on protocol type, source and destination addresses, and TCP/UDP port	Router	105
ACS	Auto-configuration server (TR-069 and TR-098)	Router	108
TR Settings	Configures parameters for establishing connection between Gateway and auto-configuration server	Router	108

Status Information

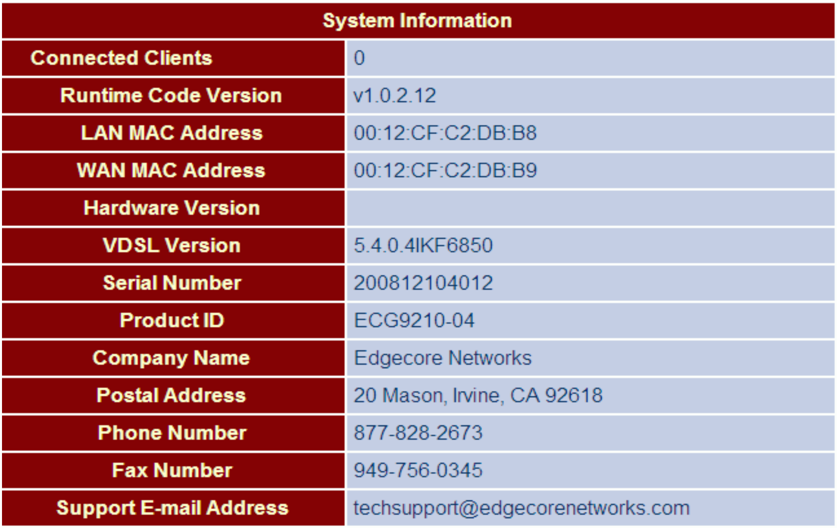
The Status pages display details on the current configuration and status of the Gateway, network access logs, and DHCP client lists.

Note: The Status Information pages display different statistics depending on the mode selected – Bridge or Router. Refer to "Networking Concepts" on page 3-29 for a general description about these operating modes. Refer to "System Mode" on page 5-54 for information on setting the operation mode.

System Information

The System Information page displays firmware/hardware and VDSL code versions, the physical address of the LAN and WAN interfaces, and the unit's serial number.

Click Status, System Info.



System Information	
Connected Clients	0
Runtime Code Version	v1.0.2.12
LAN MAC Address	00:12:CF:C2:DB:B8
WAN MAC Address	00:12:CF:C2:DB:B9
Hardware Version	
VDSL Version	5.4.0.4IKF6850
Serial Number	200812104012
Product ID	ECG9210-04
Company Name	Edgecore Networks
Postal Address	20 Mason, Irvine, CA 92618
Phone Number	877-828-2673
Fax Number	949-756-0345
Support E-mail Address	techsupport@edgecorenetworks.com

Figure 5-3 System Information

Field Attributes

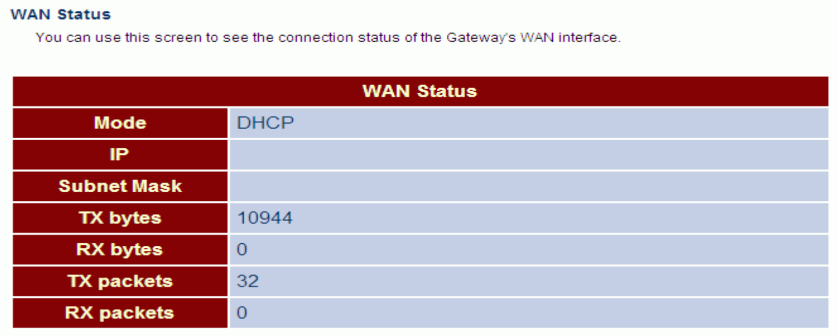
- **Connected Clients** – The number of DHCP clients serviced by the Gateway.
- **Runtime Code Version** – Version number of operation code.
- **LAN MAC Address** – The physical layer address for the LAN interface.
- **WAN MAC Address** – The physical layer address for the WAN interface.
- **Hardware Version** – Hardware version of the main board.
- **VDSL Version** – VDSL firmware version.
- **Serial Number** – Serial number of the main board.
- **Product ID** – The product identification number.

- **Company Name** – The name of the manufacturer.
- **Postal Address** – The postal address of the manufacturer.
- **Phone Number** – The phone number of the manufacturer.
- **Fax Number(option)** – The facsimile number of the manufacturer.
- **Support E-mail Address** – The support email address.

WAN Status

This page shows the administrative status, the IP address configuration mode (DHCP, static assignment, or PPPoE), the IP address, subnet mask, DNS servers, gateway address, and WAN link status.

Click Status, WAN Status.



WAN Status

You can use this screen to see the connection status of the Gateway's WAN interface.

WAN Status	
Mode	DHCP
IP	
Subnet Mask	
TX bytes	10944
RX bytes	0
TX packets	32
RX packets	0

Figure 5-4 WAN Status

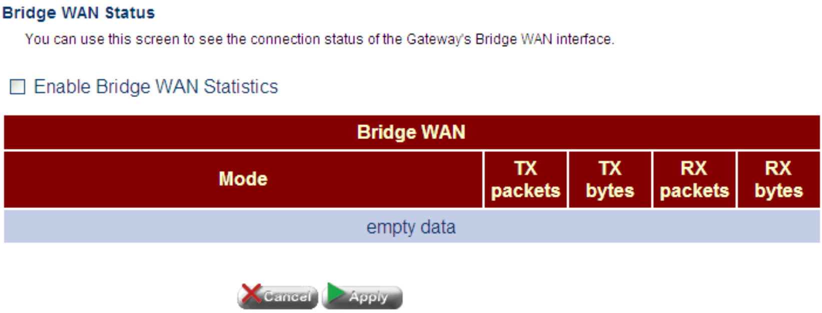
Field Attributes

- **Mode** – The administrative status of the WAN interface (on or off), the IP address configuration mode (DHCP, Static IP, or Pope).
- **TX packets** – The total number of transmitted packets sent by the unit since boot up.
- **TX bytes** – The total number of transmitted bytes sent by the unit since boot up.
- **RX packets** – The total number of packets received by the unit since connection to a network.
- **RX bytes** – The total number of bytes received by the unit since connection to a network.

Bridge WAN Status

This page shows the administrative status of the bridge WAN port.

Click Status, Bridge WAN Status.



Bridge WAN Status

You can use this screen to see the connection status of the Gateway's Bridge WAN interface.

□ Enable Bridge WAN Statistics

Bridge WAN				
Mode	TX packets	TX bytes	RX packets	RX bytes
empty data				

Figure 5-5 Bridge WAN Status

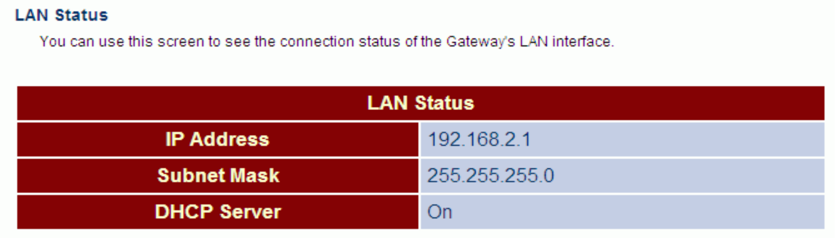
Field Attributes

- **Mode** – The administrative status of the bridge WAN port.
- **TX packets** – The total number of transmitted packets sent by the unit since boot up.
- **TX bytes** – The total number of transmitted bytes sent by the unit since boot up.
- **RX packets** – The total number of packets received by the unit since connection to a network.
- **RX bytes** – The total number of bytes received by the unit since connection to a network.

LAN Status

This page shows the IP address, subnet mask, and local DHCP server status.

Click Status, LAN Status.



LAN Status

You can use this screen to see the connection status of the Gateway's LAN interface.

LAN Status	
IP Address	192.168.2.1
Subnet Mask	255.255.255.0
DHCP Server	On

Figure 5-6 LAN Status

Field Attributes

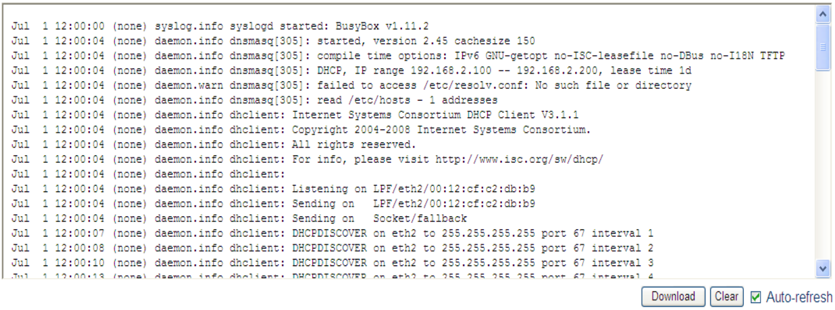
- **IP Address** – IP address of the LAN interface.

- **Subnet Mask** – This mask identifies the subnet and host portion of the IP address.
- **DHCP Server** – Shows if the Gateway’s DHCP server is enabled or disabled.

System Log

This page displays a log of all network access requests by client devices and service responses sent from the Gateway.

Click Status, System Log.



```
Jul  1 12:00:00 (none) syslog.info syslogd started: BusyBox v1.11.2
Jul  1 12:00:04 (none) daemon.info dnsmasq[305]: started, version 2.45 cachesize 150
Jul  1 12:00:04 (none) daemon.info dnsmasq[305]: compile time options: IPv6 GNU-getopt no-ISC-leasefile no-DBus no-I18N TFTP
Jul  1 12:00:04 (none) daemon.info dnsmasq[305]: DHCP, IP range 192.168.2.100 -- 192.168.2.200, lease time 1d
Jul  1 12:00:04 (none) daemon.warn dnsmasq[305]: failed to access /etc/resolv.conf: No such file or directory
Jul  1 12:00:04 (none) daemon.info dnsmasq[305]: read /etc/hosts - 1 addresses
Jul  1 12:00:04 (none) daemon.info dhclient: Internet Systems Consortium DHCP Client V3.1.1
Jul  1 12:00:04 (none) daemon.info dhclient: Copyright 2004-2008 Internet Systems Consortium.
Jul  1 12:00:04 (none) daemon.info dhclient: All rights reserved.
Jul  1 12:00:04 (none) daemon.info dhclient: For info, please visit http://www.isc.org/sw/dhcp/
Jul  1 12:00:04 (none) daemon.info dhclient:
Jul  1 12:00:04 (none) daemon.info dhclient: Listening on LPF/eth2/00:12:cf:c2:db:b9
Jul  1 12:00:04 (none) daemon.info dhclient: Sending on   LPF/eth2/00:12:cf:c2:db:b9
Jul  1 12:00:04 (none) daemon.info dhclient: Sending on   Socket/fallback
Jul  1 12:00:07 (none) daemon.info dhclient: DHCPDISCOVER on eth2 to 255.255.255.255 port 67 interval 1
Jul  1 12:00:08 (none) daemon.info dhclient: DHCPDISCOVER on eth2 to 255.255.255.255 port 67 interval 2
Jul  1 12:00:10 (none) daemon.info dhclient: DHCPDISCOVER on eth2 to 255.255.255.255 port 67 interval 3
Jul  1 12:00:13 (none) daemon.info dhclient: DHCPDISCOVER on eth2 to 255.255.255.255 port 67 interval 4
```

Figure 5-7 System Log

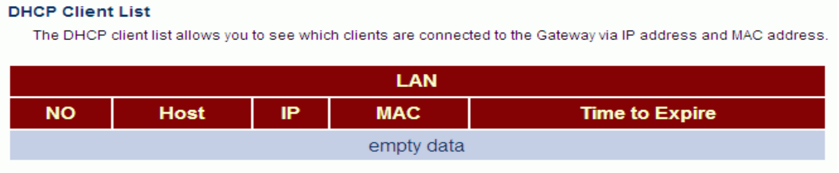
Field Attributes

- *Log Entry* – Shows the date, time, process, and description.
- **Download** – Downloads the log table as an raw text file. In Windows, this is downloaded to Notepad.
- **Clear** – Flushes the log table.
- **Auto Refresh** – Automatically updates the log table every 5 seconds.

DHCP Client List

This page displays the addresses currently bound to DHCP clients.

Click Status, DHCP Client List.



DHCP Client List

The DHCP client list allows you to see which clients are connected to the Gateway via IP address and MAC address.

LAN				
NO	Host	IP	MAC	Time to Expire
empty data				

Figure 5-8 DHCP Client List

Field Attributes

- **LAN Client List** – The list of assigned addresses for the listed LAN.

- **Count Down** – The time after which the connection will expire and the DHCP client must request a new IP address.
- **MAC Address** – The MAC address of the DHCP client.
- **IP Address** – The IP address assigned to the DHCP client.
- **Host** – The host name of the DHCP client.

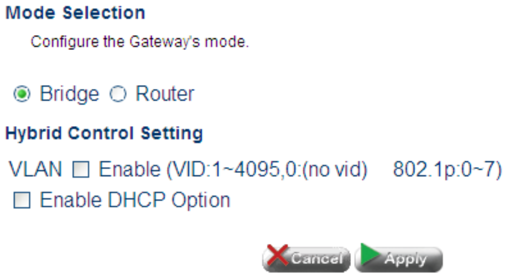
System Configuration

The System pages are used to configure basic administrative settings, including the operating mode (bridge or router), NTP server selection, management access control through a password or specified host address, firmware upgrade, UPnP auto-discovery, and management through TFTP, Telnet or Secure Shell.

System Mode

This page sets the Gateway to operate as s bridge or router. Refer to “Networking Concepts” on page 3-29 for a general description about these operating modes.

Click System, System Mode. Select the required operating mode, and click Apply.



Mode Selection

Configure the Gateway's mode.

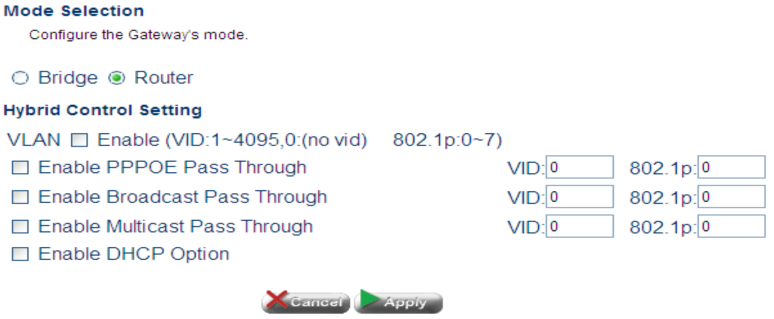
● Bridge ○ Router

Hybrid Control Setting

VLAN □ Enable (VID:1~4095,0:(no vid) 802.1p:0~7)

□ Enable DHCP Option

Figure 5-9 System Mode - Bridge



Mode Selection

Configure the Gateway's mode.

○ Bridge ● Router

Hybrid Control Setting

VLAN □ Enable (VID:1~4095,0:(no vid) 802.1p:0~7)

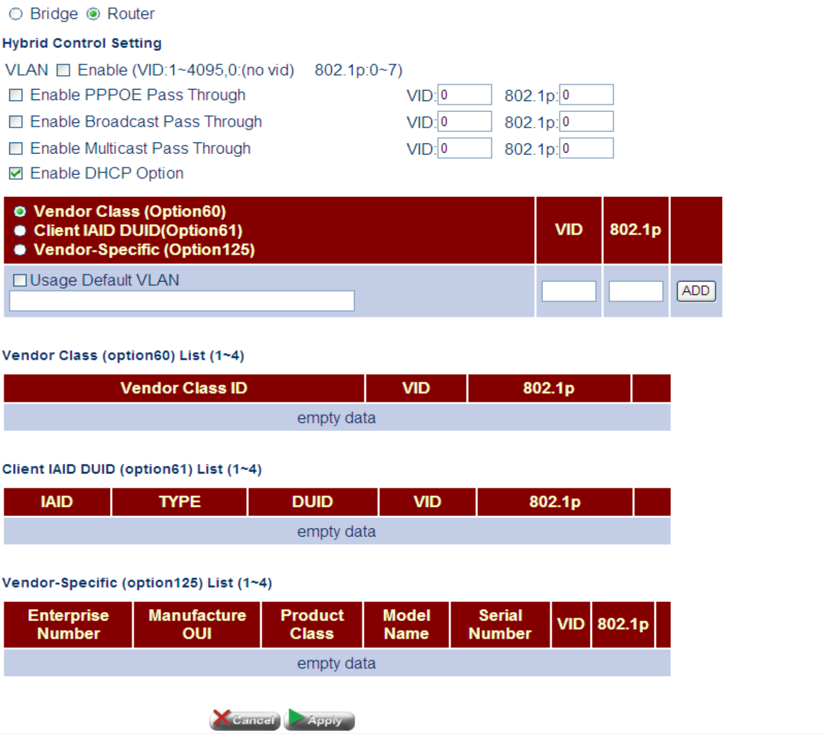
□ Enable PPPOE Pass Through VID: 0 802.1p: 0

□ Enable Broadcast Pass Through VID: 0 802.1p: 0

□ Enable Multicast Pass Through VID: 0 802.1p: 0

□ Enable DHCP Option

Figure 5-10 System Mode - Router



○ Bridge ● Router

Hybrid Control Setting

VLAN ☐ Enable (VID:1~4095,0:(no vid) 802.1p:0~7)

☐ Enable PPPOE Pass Through VID: 0 802.1p: 0

☐ Enable Broadcast Pass Through VID: 0 802.1p: 0

☐ Enable Multicast Pass Through VID: 0 802.1p: 0

☑ Enable DHCP Option

● Vendor Class (Option60) ○ Client IAID DUID(Option61) ○ Vendor-Specific (Option125)	VID	802.1p	
☐ Usage Default VLAN			ADD

Vendor Class (option60) List (1~4)

Vendor Class ID	VID	802.1p	
empty data			

Client IAID DUID (option61) List (1~4)

IAID	TYPE	DUID	VID	802.1p	
empty data					

Vendor-Specific (option125) List (1~4)

Enterprise Number	Manufacture OUI	Product Class	Model Name	Serial Number	VID	802.1p	
empty data							

Figure 5-11 System Mode - Router - DHCP Enabled

Field Attributes

- **Bridge** – Sets the Gateway to function as a Layer-2 bridge, using only the physical address stored in the packet's source and destination address fields to pass traffic.
- **Router** – Sets the Gateway to function as a Layer-3 router, using a specific route (that is, next hop) for each IP host or subnet that is statically configured or learned through dynamic routing protocols.

The Gateway must reboot after each mode change. It takes about 60 seconds for the router to reboot and start forwarding traffic on the LAN and WAN interfaces.

Also note that the menus provided by the Gateway differ for the bridge and router operating modes as noted in Table 5-1, "Advanced Settings Menu," on page 47.

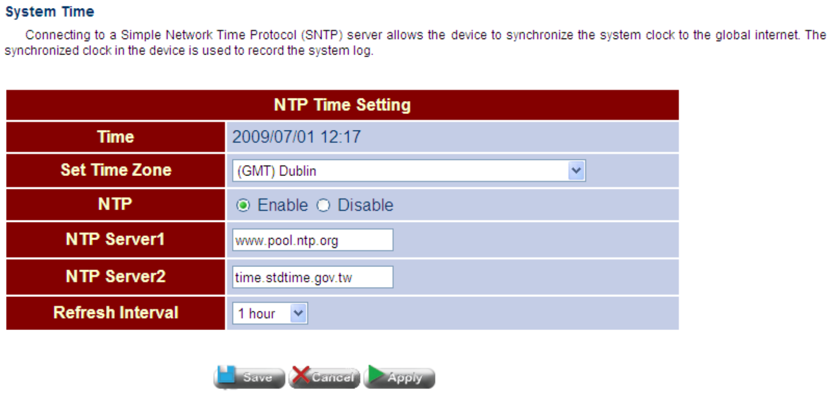
- **VLAN Enable** – Enables VLANs. (Router mode only)
- **Enable PPPOE Pass Through** – Enables PPPoE Pass Through

- **Enable Broadcast Pass Through** – Enables Broadcast Pass Through.
- **VID** – Specifies the VLAN ID.
- **802.1p** – Specifies quality of service level.
- **Enable DHCP Option** –
- **Option 60** – Option 60 allows a DHCP server to differentiate between the two kinds of client machines and process the requests from the two types of modems appropriately. The DHCP server and client send a vendor class option that contains an ASCII-encoded string with three parts delimited by a / character. The first part is AAPLBSDPC, which advertises BSDP capability. The second part is the client's architecture ("ppc" or "i386"). The third part is a system identifier.
- **Option 61** – Specifies the client MAC address.

System Time

This page configures the local time zone, and Network Time Protocol (NTP) settings, including the NTP server to use and the refresh time.

Click System, System Time. Set the time zone, enable NTP service, specify an NTP server, set the time at which to refresh date and time information, and click Apply.



System Time

Connecting to a Simple Network Time Protocol (SNTP) server allows the device to synchronize the system clock to the global internet. The synchronized clock in the device is used to record the system log.

NTP Time Setting	
Time	2009/07/01 12:17
Set Time Zone	(GMT) Dublin
NTP	● Enable ○ Disable
NTP Server1	www.pool.ntp.org
NTP Server2	time.stdtime.gov.tw
Refresh Interval	1 hour

Figure 5-12 System Time

Field Attributes

- **Time** – The current date and time configured on the Gateway.
- **Set Time Zone** – Sets the time zone as an offset from Greenwich Mean Time (GMT).
- **NTP** – Enables or disables client requests for NTP service.
- **NTP Server 1/2** – The URL or IP address of the NTP server to use.
- **Refresh Interval** – Specifies the interval at which the Gateway will request a time update from the NTP server.

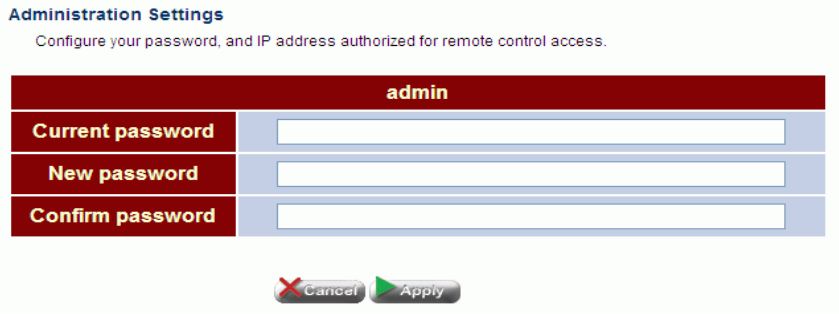
Admin Settings

The Administrative Settings page allows you to configure the management access password, and IP address(es) authorized for remote management access over the WAN link.

To protect access to the management interface, you need to configure a new password as soon as possible. If a new password is not configured, then anyone having access to the Gateway may be able to compromise the unit's security by entering the default password.

Management access to the Gateway through the WAN port is enabled by default. To prevent access by unauthorized hosts, enter the IP address for one or more known hosts. Once any entry is added to the Remote Management Client List, access attempts from any other host will be blocked.

Click System, Admin Settings. Set a new password, specify host stations authorized for remote management access, and click Apply.



Administration Settings

Configure your password, and IP address authorized for remote control access.

admin	
Current password	
New password	
Confirm password	

Figure 5-13 Admin Settings

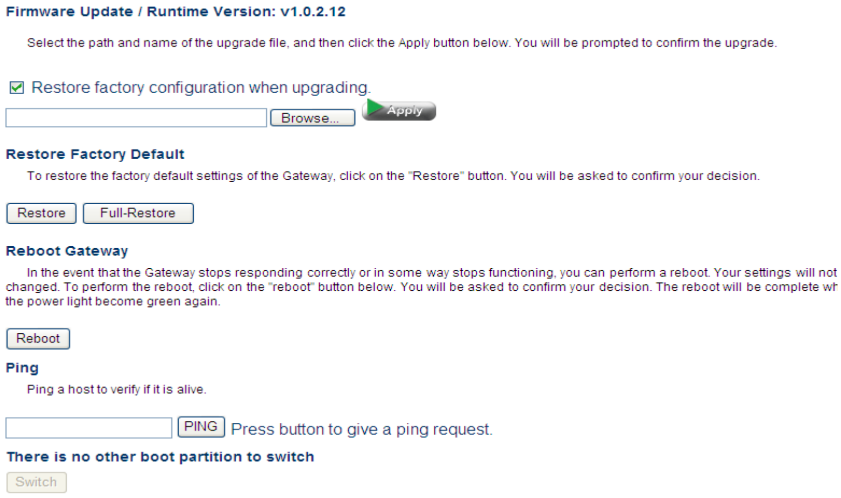
Field Attributes

- **Current Password** – The password for management access. (Default: admin; Length: 3-16 characters, case sensitive)
- **New Password** – Prompts you to enter a new password for access.
- **Confirm Password** – Re-enter the new password.

System Tools

This page provides facilities for pinging another device, updating firmware, restoring factory defaults, and rebooting the unit.

Click System, System Tools. Follow the instructions shown on the web page to perform any of the listed tasks.



Firmware Update / Runtime Version: v1.0.2.12

Select the path and name of the upgrade file, and then click the Apply button below. You will be prompted to confirm the upgrade.

☑ Restore factory configuration when upgrading.

Restore Factory Default

To restore the factory default settings of the Gateway, click on the "Restore" button. You will be asked to confirm your decision.

Reboot Gateway

In the event that the Gateway stops responding correctly or in some way stops functioning, you can perform a reboot. Your settings will not changed. To perform the reboot, click on the "reboot" button below. You will be asked to confirm your decision. The reboot will be complete wh the power light become green again.

Ping

Ping a host to verify if it is alive.

Press button to give a ping request.

There is no other boot partition to switch

Figure 5-14 System Tools

Field Attributes

- **Firmware Update** – Allows you to download new firmware by selecting a file stored on your management station.
- **Restore Factory Default** – Restores the factory defaults.
- **Reboot Gateway** – Click the Reboot button to restart the Gateway. When prompted, confirm that you want reset the Gateway. A timer will display the amount time remaining in the boot up process.
- **Ping** – Performs a loopback test on a specified IP address.

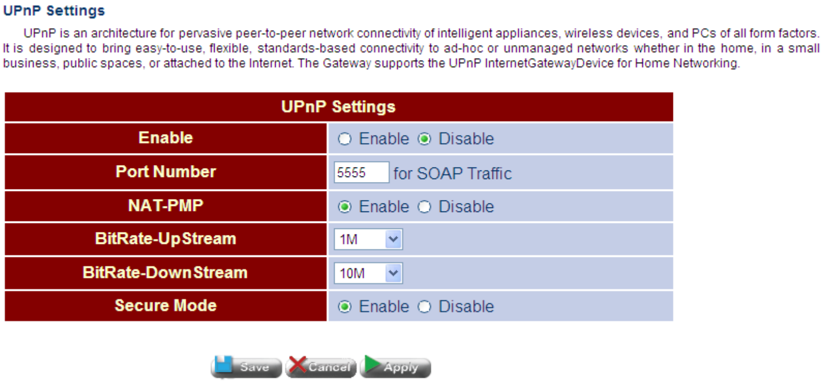
UPnP

This page is used to enable or disable the UPnP auto-discovery mechanism.

Universal Plug and Play (UPnP) is a set of protocols that allows devices to connect seamlessly and simplifies the deployment of home and office networks. UPnP achieves this by using UPnP device control protocols designed upon open, Internet-based communication standards.

Note that only devices within the same broadcast domain can be discovered through UPnP. When the Gateway is discovered by another device, a brief description of the Gateway can be viewed, and the management interface can be accessed by clicking on the Gateway icon.

For example, to access or manage the Gateway with the aid of UPnP under Windows Vista, open the Network and Sharing Center, and enable Network Discovery. Then click on the node representing your local network under the Network Sharing Center. An entry for the Gateway will appear in the list of discovered devices. Right click on the entry for the Gateway, and select “View Device webpage” to access the Gateway’s web management interface, or select “Properties” to display a list of device attributes advertised by the Gateway through UPnP.



UPnP Settings

UPnP is an architecture for pervasive peer-to-peer network connectivity of intelligent appliances, wireless devices, and PCs of all form factors. It is designed to bring easy-to-use, flexible, standards-based connectivity to ad-hoc or unmanaged networks whether in the home, in a small business, public spaces, or attached to the Internet. The Gateway supports the UPnP InternetGatewayDevice for Home Networking.

UPnP Settings	
Enable	○ Enable ● Disable
Port Number	5555 for SOAP Traffic
NAT-PMP	● Enable ○ Disable
BitRate-UpStream	1M
BitRate-DownStream	10M
Secure Mode	● Enable ○ Disable

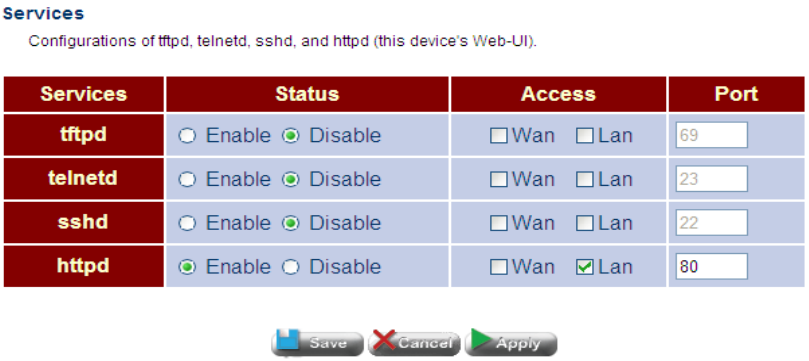
Figure 5-15 UPnP

- **EnablePing** – Enables UPnP on the unit.
- **Port Number** – Specifies a port number for SOAP traffic.
- **NAT-PMP** – Enables/disables NAT Port Mapping Protocol.
- **BitRate-UpStream** – Specifies the upload speed of your connection. (Default: 1 Mbps; Options: 1 Mbps, 10 Mbps, 100 Mbps)
- **BitRate-DownStream** – Specifies the download speed of your connection. (Default: 10 Mbps; Options: 1 Mbps, 10 Mbps, 100 Mbps)
- **Secure Mode** – Enables/disables secure mode.

Service Settings

This page allows you to enable or disable TFTP, Telnet, and Secure Shell access. Note that these functions are only used for the command line interface, not the web interface.

Click System, Service Settings. Enable or disable the required service, and click Apply.



Services

Configurations of tftpd, telnetd, sshd, and httpd (this device's Web-UI).

Services	Status	Access	Port
tftpd	○ Enable ● Disable	□ Wan □ Lan	69
telnetd	○ Enable ● Disable	□ Wan □ Lan	23
sshd	○ Enable ● Disable	□ Wan □ Lan	22
httpd	● Enable ○ Disable	□ Wan ☑ Lan	80

Figure 5-16 Service Settings

Field Attributes

- **tftpd** – Trivial File Transfer Protocol used to download firmware to the Gateway.
- **telnetd** – Replicates the serial port's command line interface via Telnet.
- **sshd** – Replicates the serial port's command line interface over a secure interface. When the client contacts the Gateway via the SSH protocol, the Gateway generates a public-key that the client uses along with a local user name and password for access authentication. SSH also encrypts all data transfers passing between the Gateway and SSH-enabled management stations, and ensures that data traveling over the network arrives unaltered.
- **Port** – The UDP port number to use for these services. (Range: 0-65535)

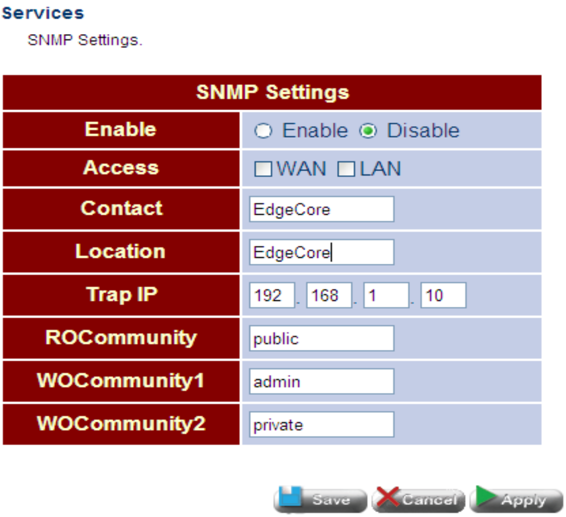
SNMP

Simple Network Management Protocol (SNMP) is a communication protocol designed specifically for managing devices on a network. Equipment commonly managed with SNMP includes switches, routers and host computers. SNMP is typically used to configure these devices for proper operation in a network environment, as well as to monitor them to evaluate performance or detect potential problems.

Managed devices supporting SNMP contain software, which runs locally on the device and is referred to as an agent. A defined set of variables, known as managed objects, is maintained by the SNMP agent and used to manage the device. These objects are defined in a Management Information Base (MIB) that provides a standard presentation of the information controlled by the agent. SNMP defines both the format of the MIB specifications and the protocol used to access this information over the network.

The access point includes an onboard agent that supports SNMP versions 1, 2c, and 3 clients. This agent continuously monitors the status of the access point, as well as the traffic passing to and from wireless clients. A network management station can access this information using SNMP management software that is compliant with MIB II. To implement SNMP management, the access point must first have an IP address and subnet mask, configured either manually or dynamically. Access to the onboard agent using SNMP v1 and v2c is controlled by community strings. To communicate with the access point, the management station must first submit a valid community string for authentication.

Access to the access point using SNMP v3 provides additional security features that cover message integrity, authentication, and encryption; as well as controlling notifications that are sent to specified user targets.



Services

SNMP Settings.

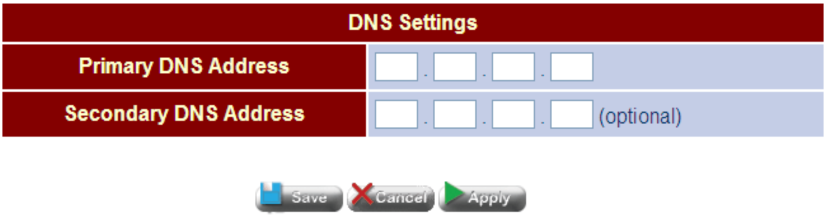
SNMP Settings	
Enable	○ Enable ● Disable
Access	□ WAN □ LAN
Contact	EdgeCore
Location	EdgeCore
Trap IP	192 . 168 . 1 . 10
ROCommunity	public
WOCommunity1	admin
WOCommunity2	private

Figure 5-17 SNMP

- **SNMP** – Enables or disables SNMP management access and also enables the access point to send SNMP traps (notifications). (Default: Disable)
- **Contact** – A text string that describes the system contact. (Maximum length: 255 characters)
- **Location** – A text string that describes the system location. (Maximum length: 255 characters)
- **Trap IP** – The IP address of the SNMP server.
- **ROCommunity** – Defines the SNMP community access string that has read-only access. Authorized management stations are only able to retrieve MIB objects. (Maximum length: 23 characters, case sensitive; Default: public)
- **WOCommunity1/2** – Defines the SNMP community access string that has write only access. (Maximum length: 23 characters, case sensitive)

DNS

The Domain Name System (DNS) distributes the responsibility of assigning domain names and mapping those names to IP addresses by designating authoritative name servers for each domain. Authoritative name servers are assigned to be responsible for their particular domains, and in turn can assign other authoritative name servers for their sub-domains.



DNS Settings	
Primary DNS Address	□ . □ . □ . □
Secondary DNS Address	□ . □ . □ . □ (optional)

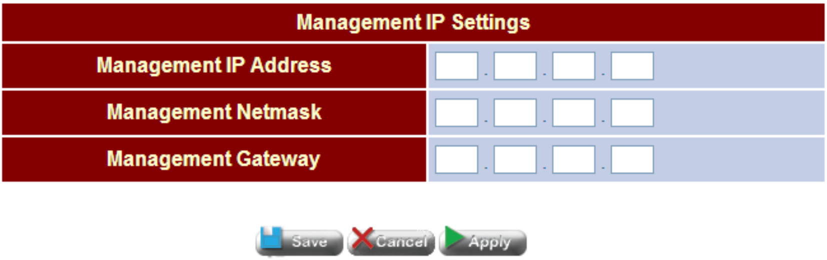
Figure 5-18 DNS

- **Primary and Secondary DNS Address** – The IP address of Domain Name Servers on the network. A DNS maps numerical IP addresses to domain names and can be used to identify network hosts by familiar names instead of the IP addresses.

  If you have one or more DNS servers located on the local network, type the IP addresses in the text fields provided. Otherwise, leave the addresses as all zeros (0.0.0.0).

Management IP

The Management IP page configures the IP address through which the unit can be managed using a web-browser.



Management IP Settings	
Management IP Address	□ . □ . □ . □
Management Netmask	□ . □ . □ . □
Management Gateway	□ . □ . □ . □

Figure 5-19 Management IP

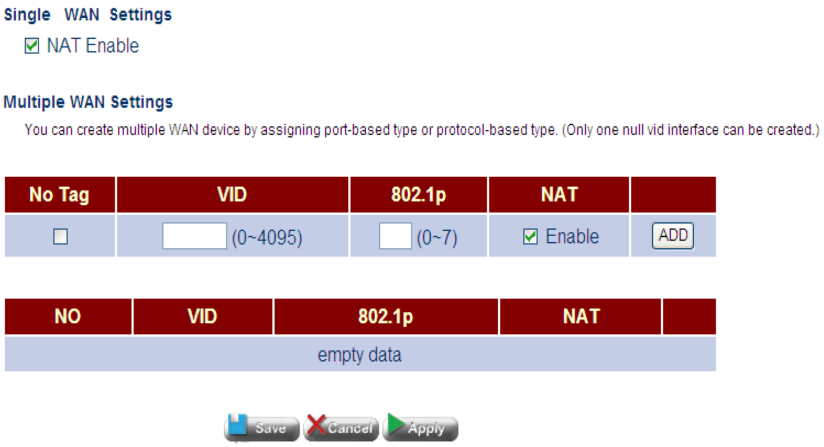
- **Management IP Address** – The IP address through which the unit can be managed.
- **Management Netmask** – Specifies the subnet mask for network traffic.
- **Management Gateway** – Specifies the gateway address for routing to the unit.

WAN Configuration

The WAN pages are used to configure the address assignment method for the WAN interface, and to configure dynamic DNS service.

WAN Type

The WAN Type page allows the user to create multiple WANs by VLAN.



Single WAN Settings

☑ NAT Enable

Multiple WAN Settings

You can create multiple WAN device by assigning port-based type or protocol-based type. (Only one null vid interface can be created.)

No Tag	VID	802.1p	NAT	
□	(0~4095)	(0~7)	☑ Enable	ADD

NO	VID	802.1p	NAT	
empty data				

Figure 5-20 WAN Type

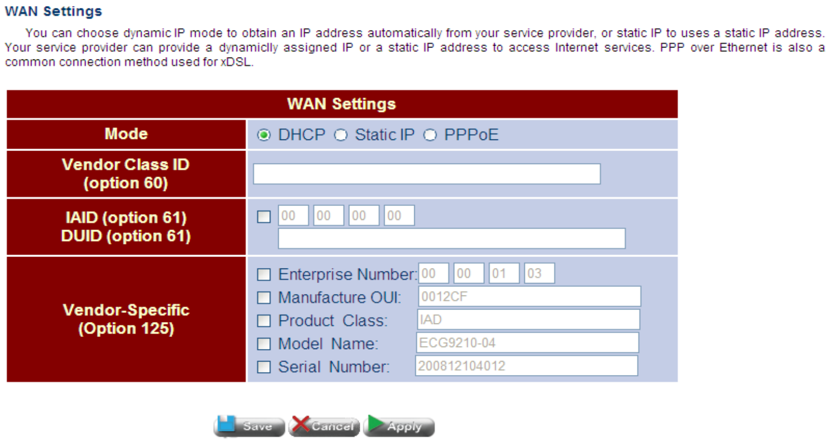
- **No Tag** – Specifies no VLAN tag.
- **VID** – The VLAN ID.
- **NAT** – Enables/disables NAT on the specified VLAN.
- **Add** – Applies the settings and creates the WAN.

WAN Settings

This page configures address assignment options for the WAN interface, using DHCP, a static address, or PPPoE. The WAN interface should connect directly to a Layer 3 device at your service provider’s central office or to another gateway device at your office. You therefore need to use the method and parameter settings given to you by your service provider or network administrator.

Dynamic IP Address

Click WAN, WAN Settings. Be sure the WAN interface is enabled. Then select Dynamic IP Address mode, fill in the appropriate string for the DHCP options as required, and click Apply.



WAN Settings

You can choose dynamic IP mode to obtain an IP address automatically from your service provider, or static IP to uses a static IP address. Your service provider can provide a dynamiclly assigned IP or a static IP address to access Internet services. PPP over Ethernet is also a common connection method used for xDSL.

WAN Settings	
Mode	● DHCP ○ Static IP ○ PPPoE
Vendor Class ID (option 60)	
IAID (option 61) DUID (option 61)	□ 00 00 00 00
Vendor-Specific (Option 125)	□ Enterprise Number: 00 00 01 03 □ Manufacture OUI: 0012CF □ Product Class: IAD □ Model Name: ECG9210-04 □ Serial Number: 200812104012

Figure 5-21 WAN Settings (DHCP)

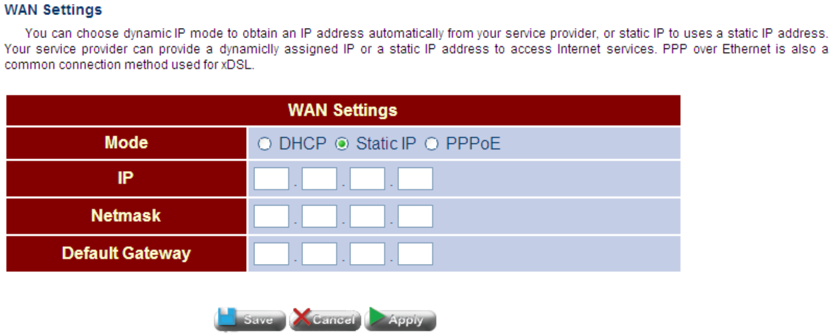
Field Attributes

- **Mode** – Select Dynamic IP Address to obtain a address from an upstream DHCP server.
- **Class Identifier** (Option 60) – Vendor Class Identifier is used identify the vendor class and configuration of the Gateway to the DHCP server, which then uses this information to decide on how to service the client or the type of information to return.
- **Client Identifier** (Option 61) – Client Identifier is a unique identifier for the Gateway which is sent to the DHCP server. DHCP servers use this value to index their database of address bindings. This value must therefore be unique for all clients in an administrative domain.
- **ENumber** (Option 125) – Vendor Idenifying Vendor-Specific Information tag specified in the form of of a string of numerals xx xx xx xx.

The general framework for these DHCP options are set out in RFC 2132, but the specific string to use should be supplied by your service provider or network administrator.

Static IP Address

Click WAN, WAN Settings. Be sure the WAN interface is enabled. Then select Static IP Address mode, fill in the appropriate settings as required, and click Apply.



WAN Settings

You can choose dynamic IP mode to obtain an IP address automatically from your service provider, or static IP to uses a static IP address. Your service provider can provide a dynamiclly assigned IP or a static IP address to access Internet services. PPP over Ethernet is also a common connection method used for xDSL.

WAN Settings	
Mode	○ DHCP ● Static IP ○ PPPoE
IP	___ . ___ . ___ . ___
Netmask	___ . ___ . ___ . ___
Default Gateway	___ . ___ . ___ . ___

Figure 5-22 WAN Settings (Static)

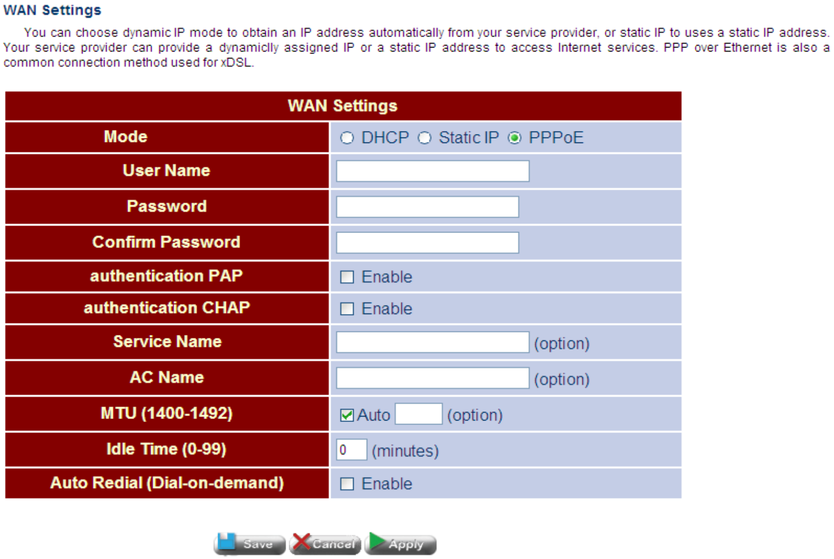
Field Attributes

- **Mode** – Select Static IP Address to manually set an address for the Gateway.
- **IP** – IP address of the WAN interface.
- **Netmask** – This mask identifies the subnet and host portion of the IP address.
- **Default Gateway** – The IP address of the gateway router which is used if the requested destination address is not on the local subnet, nor in any of the routing tables.

PPPoE

Point-to-Point Protocol over Ethernet (PPPoE) emulates a dial-up connection. It allows an ISP to use existing network configuration settings to implement VDSL service without significant changes.

Click WAN, WAN Settings. Be sure the WAN interface is enabled. Then select PPPoE mode, fill in the appropriate settings as required, and click Apply.



WAN Settings

You can choose dynamic IP mode to obtain an IP address automatically from your service provider, or static IP to uses a static IP address. Your service provider can provide a dynamiclly assigned IP or a static IP address to access Internet services. PPP over Ethernet is also a common connection method used for xDSL.

WAN Settings	
Mode	○ DHCP ○ Static IP ● PPPoE
User Name	
Password	
Confirm Password	
authentication PAP	□ Enable
authentication CHAP	□ Enable
Service Name	(option)
AC Name	(option)
MTU (1400-1492)	☑ Auto (option)
Idle Time (0-99)	0 (minutes)
Auto Redial (Dial-on-demand)	□ Enable

Figure 5-23 WAN Settings (PPPoE)

Field Attributes

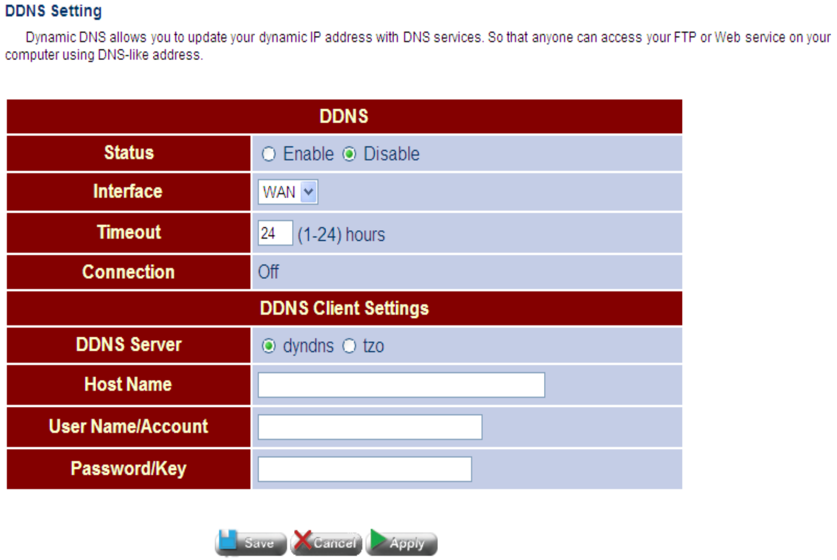
- **Mode** – Select PPPoE to obtain a address using this protocol.
- **User Name** – Sets the PPPoE user name. (Range: 1-32 characters)
- **Password** – Sets a PPPoE password. (Range: 1-32 characters)
- **Service Name** – The service name assigned for the PPPoE connection. The service name is normally optional, but may be required by some service providers. (Range: 1-32 alphanumeric characters)
- **Confirm Password** – Re-enter your new password.
- **AC Name** – The name of the access concentrator to use in PPPoE Active Discovery Offers (PADO).
- **MTU (1400-1492)** – Sets the maximum packet size that the WAN port may transmit. The Maximum Transmission Unit is expressed in bytes. By default, the Gateway will send several test messages to determine the MTU for the upstream connection. (Range: 1400-1492 bytes)
- **Idle Time (0-99)** – The maximum length of inactive time the unit will stay connected to the service provider before disconnecting. Select “Auto-reconnect” to reconnect

to the upstream gateway whenever an Internet access request is made. (Range: 1-99 minutes; Default: 2 minutes)

DDNS

The DDNS Settings page is used to configure dynamic DNS services for DynDNS and TZO servers. DDNS provides clients accessing the Internet with a method to tie a specific host name to their computer’s dynamically assigned IP address. DDNS allows your host name to follow your IP address automatically by changing your DNS records when your IP address changes. To set up an DDNS account, visit the web sites of these service providers at www.dyndns.org or www.tzo.com.

Click WAN, DDNS. Enable DDNS, set the timeout, enter the client information provided by your DDNS service provider, and click Apply.



DDNS Setting

Dynamic DNS allows you to update your dynamic IP address with DNS services. So that anyone can access your FTP or Web service on your computer using DNS-like address.

DDNS	
Status	○ Enable ● Disable
Interface	WAN
Timeout	24 (1-24) hours
Connection	Off
DDNS Client Settings	
DDNS Server	● dyndns ○ tzo
Host Name	
User Name/Account	
Password/Key	

Figure 5-24 DDNS Settings

Field Attributes

- **Status** – Enables DDNS. (Default: Disabled)
- **Interface** – Selects the WAN interface.
- **Timeout** – The maximum time between updates.
- **Connection** – Shows if a connection has been established with the DDNS server.
- **DDNS Server** – The DDNS service provider, DynDNS or TZO.
- **Host Name** – The prefix to identify your presence on the DDNS server.
- **User Name/Account** – Your user name for DDNS service.

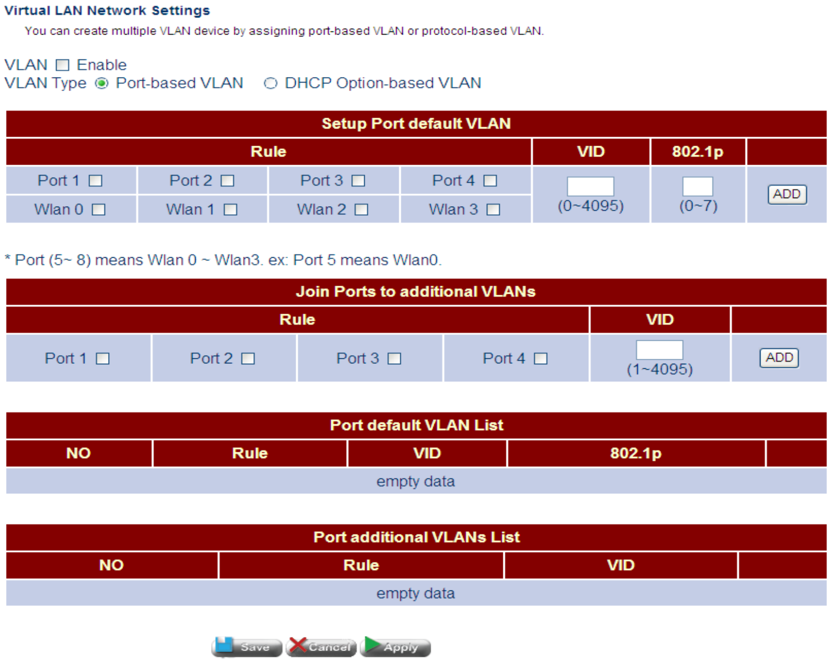
Password/Key – Your password for DDNS service.

LAN Configuration

The LAN pages are used to configure an IP address for management access through the LAN interface, configure the local DHCP server, and DNS service. These pages are also used to configure port connection parameters, including speed and duplex mode.

LAN Type

LAN Type settings enable VLANs on the units four LAN ports. You may configure up to four VLANs in total.



Virtual LAN Network Settings

You can create multiple VLAN device by assigning port-based VLAN or protocol-based VLAN.

VLAN □ Enable
VLAN Type ● Port-based VLAN ○ DHCP Option-based VLAN

Setup Port default VLAN						
Rule				VID	802.1p	
Port 1 □	Port 2 □	Port 3 □	Port 4 □	(0~4095)	(0~7)	ADD
Wlan 0 □	Wlan 1 □	Wlan 2 □	Wlan 3 □			

* Port (5~ 8) means Wlan 0 ~ Wlan3. ex: Port 5 means Wlan0.

Join Ports to additional VLANs					
Rule				VID	
Port 1 □	Port 2 □	Port 3 □	Port 4 □	(1~4095)	ADD

Port default VLAN List				
NO	Rule	VID	802.1p	
empty data				

Port additional VLANs List			
NO	Rule	VID	
empty data			

Figure 5-25 LAN Type

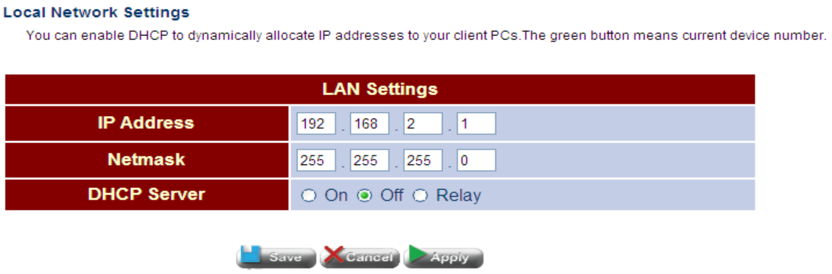
Field Attributes

- **VLAN** – Enables or disables VLANs. (Default: Disabled)
- **VLAN Type** – Selects port-based VLANs by default.
- **Port 1~4** – Selects a physical port to apply a VLAN tag to.
- **VID** – Specifies a VLAN ID. (Range: 0-4095)
- **802.1p** – Specifies quality of service level.
- **Add** – Adds the VLAN to the physical port.

LAN Settings

This page is used to configure IP settings for the LAN, including an IP address for management access, a local DHCP server, and DNS service.

Click LAN, LAN Settings. Enable the LAN interface, set an IP address for management access from the LAN side, configure the DHCP server and DNS service, then click Apply.

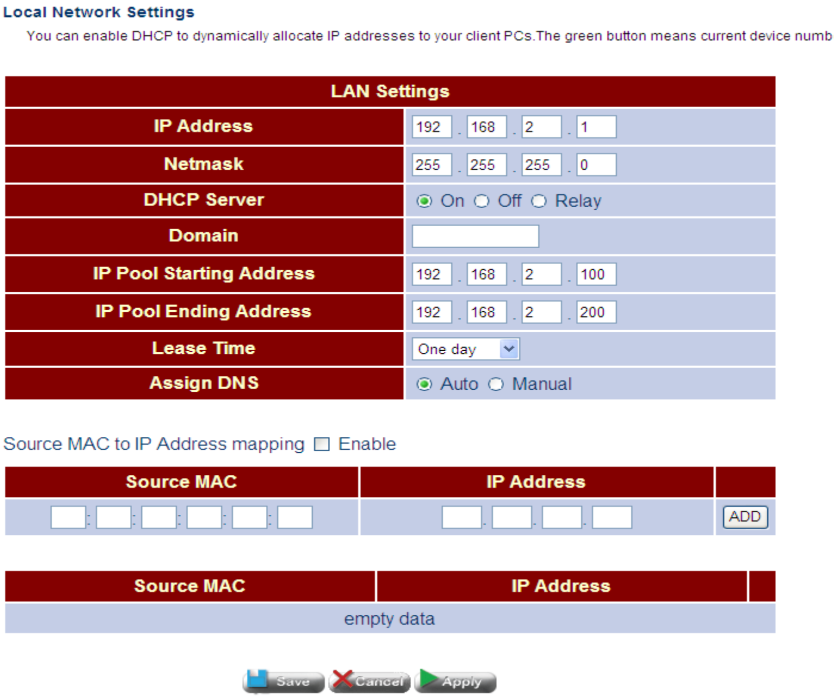


Local Network Settings

You can enable DHCP to dynamically allocate IP addresses to your client PCs.The green button means current device number.

LAN Settings	
IP Address	192 . 168 . 2 . 1
Netmask	255 . 255 . 255 . 0
DHCP Server	○ On ● Off ○ Relay

Figure 5-26 LAN Settings



Local Network Settings

You can enable DHCP to dynamically allocate IP addresses to your client PCs.The green button means current device numb

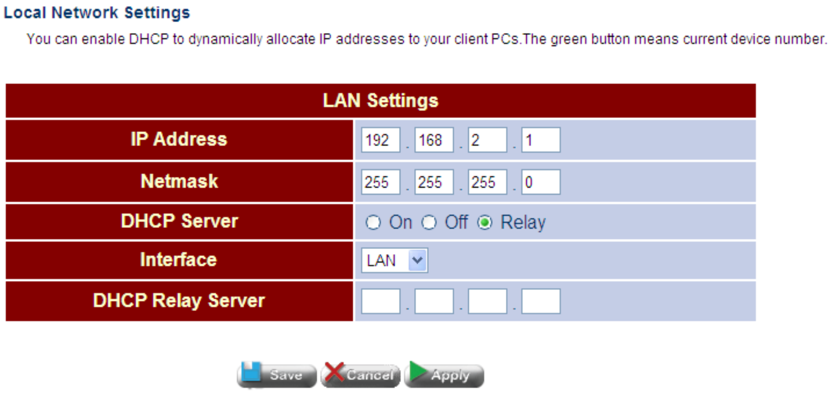
LAN Settings	
IP Address	192 . 168 . 2 . 1
Netmask	255 . 255 . 255 . 0
DHCP Server	● On ○ Off ○ Relay
Domain	
IP Pool Starting Address	192 . 168 . 2 . 100
IP Pool Ending Address	192 . 168 . 2 . 200
Lease Time	One day
Assign DNS	● Auto ○ Manual

Source MAC to IP Address mapping □ Enable

Source MAC	IP Address	
: : : : :	. . .	ADD

Source MAC	IP Address	
empty data		

Figure 5-27 LAN Settings (DHCP Enabled)



Local Network Settings

You can enable DHCP to dynamically allocate IP addresses to your client PCs.The green button means current device number.

LAN Settings	
IP Address	192 . 168 . 2 . 1
Netmask	255 . 255 . 255 . 0
DHCP Server	○ On ○ Off ● Relay
Interface	LAN
DHCP Relay Server	. . .

Figure 5-28 LAN Settings (DHCP Relay)

Field Attributes

- **IP Address** – IP address used for management access from the LAN side.
- **Netmask** – This mask identifies the subnet and host portion of the IP address.

The following attributes only apply to Router mode:

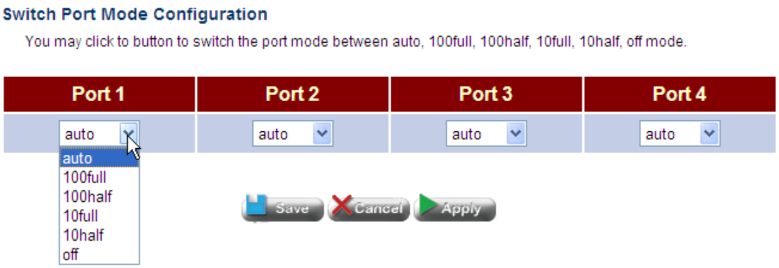
- **DHCP Server** – Enables or disables the local DHCP server.
- **Domain** – DNS suffix appended to unqualified names that are used by this client.
- **Class ID** – Vendor Class Identifier (Option 60) is used identify the vendor class and configuration of the client to the DHCP server, which then uses this information to decide on how to service the client or the type of information to return.
- **Client ID** – Client Identifier (Option 61) is a unique identifier for the client which is sent to the DHCP server. DHCP servers use this value to index their database of address bindings. This value must therefore be unique for all clients in an administrative domain.
- **Option 125** – Vendor Idenifying Vendor-Specific Information tag specified in the form of of a string of numerals xx xx xx xx.
- **IP Pool Starting Address** – The initial IP address in a range that the DHCP server allocates to DHCP clients. Note that the address pool range is always in the same subnet as the Gateway's IP address. The maximum clients that the unit can support is 253.
- **IP Pool Ending Address** – The ending IP address in a range that the DHCP server allocates to DHCP clients.
- **Lease Time** – The amount of time an IP address is leased to the requesting client. When the time limit expires, the client has to request a new IP address.
- **Assign DNS** – Specifies whether to use the DNS servers assigned by the DHCP server, or to manually specify the DNS servers.
- **Primary DNS Address** – The first server to query for domain name resolution.

- **Secondary DNS Address** – The backup DNS server.

Switch Ports

This page is used to configure port connection parameters, including speed and duplex mode.

Click LAN, Switch Ports. Set the required connection parameters for any port, and click Apply.



Switch Port Mode Configuration

You may click to button to switch the port mode between auto, 100full, 100half, 10full, 10half, off mode.

Port 1	Port 2	Port 3	Port 4
auto	auto	auto	auto

Figure 5-29 Switch Ports

Field Attributes

- **Port** – The four ports on the LAN interface.
- *Mode* – The connection mode for a port.
  - **auto** – Uses auto-negotiation to obtain the optimal settings.
  - **100full** - Forces 100 Mbps full-duplex operation
  - **100half** - Forces 100 Mbps half-duplex operation
  - **10full** - Forces 10 Mbps full-duplex operation
  - **10half** - Forces 10 Mbps half-duplex operation
  - **off** – Disables this port.

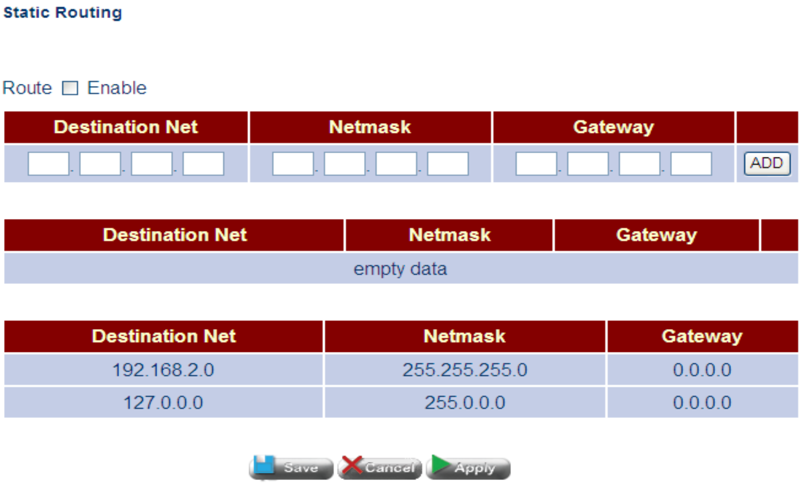
Route Configuration

The ROUTE pages are used to configure either static routing entries, or to enable or disable dynamic routing, or to enable policy routing on the LAN and WAN interfaces.

Static Routing

The Gateway can dynamically configure routes to other network segments using RIP. However, static routes can also be manually entered in the routing table. Static routes may be required to access network segments where dynamic routing is not supported, or can be set to force the use of a specific route to a subnet, rather than using dynamic routing. Static routes do not automatically change in response to changes in network topology, so only configure a small number of stable routes to ensure network accessibility.

Click ROUTE, Static Routing. Enable the static route table, enter the destination network, the network mask, the gateway device, and click Apply.



Static Routing

Route □ Enable

Destination Net	Netmask	Gateway	
□.□.□.□	□.□.□.□	□.□.□.□	ADD

Destination Net	Netmask	Gateway	
empty data			

Destination Net	Netmask	Gateway
192.168.2.0	255.255.255.0	0.0.0.0
127.0.0.0	255.0.0.0	0.0.0.0

Figure 5-30 Static Routing

Field Attributes

- **Route** – Enables the static routing table.
- **Destination Net** – IP address of the destination network, subnetwork, or host.
- **Netmask** – Network mask for the associated IP subnet. This mask identifies the host address bits used for routing to specific subnets.
- **Gateway** – IP address of the next router hop used for this route.

Dynamic Routing

The Gateway supports RIP (also referred to as RIP-1) and RIP-2 dynamic routing protocols. Routing Information Protocol (RIP) is the most widely used method for dynamically maintaining routing tables. RIP uses a distance vector-based approach to routing. Routes are chosen to minimize the distance vector, or hop count, which serves as a rough estimate of transmission cost. Each router broadcasts its advertisement every 30 seconds, together with any updates to its routing table. This allows all routers on the network to build consistent tables of next hop links which lead to relevant subnets.

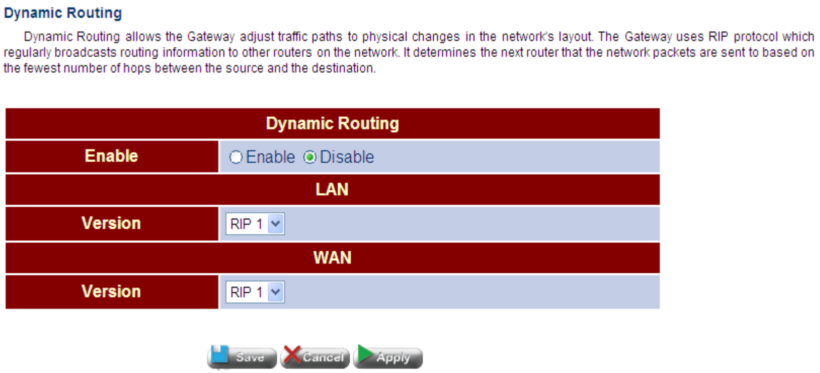
RIP can utilize any of the following methods to prevent loops from occurring:

- Split horizon – Never propagate routes back to an interface port from which they have been acquired.
- Poison reverse – Propagate routes back to an interface port from which they have been acquired, but set the distance-vector metrics to infinity. (This provides faster convergence.)
- Triggered updates – Whenever a route gets changed, broadcast an update message after waiting for a short random delay, but without waiting for the periodic cycle.

RIP-2 is a compatible upgrade to RIP-1. RIP-2 adds useful capabilities for plain text authentication, multiple independent RIP domains, variable length subnet masks, and multicast transmissions for route advertising (RFC 1723).

There are several serious problems with RIP that should be considered. First of all, RIP-1 has no knowledge of subnets, both RIP versions can take a long time to converge on a new route after the failure of a link or router during which time routing loops may occur, and its small hop count limitation of 15 restricts its use to smaller networks. Moreover, RIP-1 wastes valuable network bandwidth by propagating routing information through broadcasts; it also considers too few network variables to make the best routing decision.

If the local network connected to the LAN interface does not include any routers, then it is not necessary to configure either static or dynamic routing for this interface. Also, if the path from the Gateway back to the router (that is, the remote gateway) at the ISP’s central office does not pass through any other routers, then this gateway will always be the first hop, and again it will not be necessary to configure either static or dynamic routing.



Dynamic Routing

Dynamic Routing allows the Gateway adjust traffic paths to physical changes in the network's layout. The Gateway uses RIP protocol which regularly broadcasts routing information to other routers on the network. It determines the next router that the network packets are sent to based on the fewest number of hops between the source and the destination.

Dynamic Routing	
Enable	○ Enable ● Disable
LAN	
Version	RIP 1
WAN	
Version	RIP 1

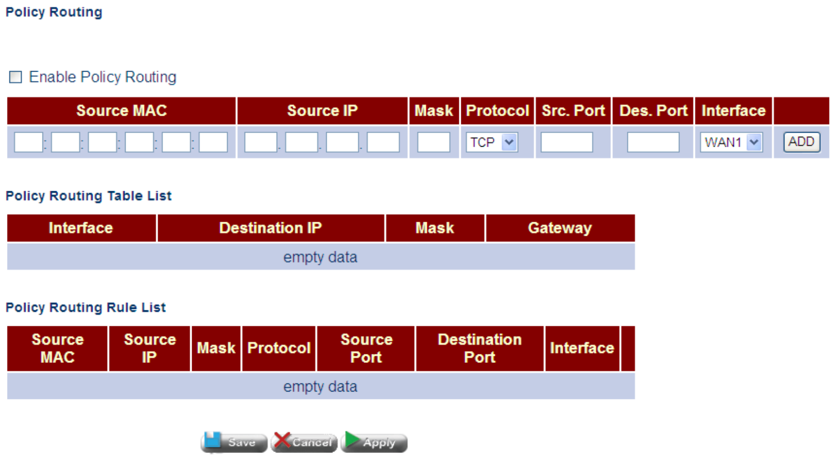
Figure 5-31 Dynamic Routing

Field Attributes

- **Enable** – Enables dynamic routing for both the LAN and WAN interface.
- **LAN Version** – Specifies RIP-1 or RIP-2 on the LAN interface.
- **WAN Version** – Specifies RIP-1 or RIP-2 on the WAN interface.

Policy Routing

Policy routing enables the user to route LAN trafiic to the WAN port according to source IP, source port, and Protocol.



Policy Routing

□ Enable Policy Routing

Source MAC	Source IP	Mask	Protocol	Src. Port	Des. Port	Interface	
: : : : :	. . .		TCP			WAN1	ADD

Policy Routing Table List

Interface	Destination IP	Mask	Gateway
empty data			

Policy Routing Rule List

Source MAC	Source IP	Mask	Protocol	Source Port	Destination Port	Interface	
empty data							

Figure 5-32 Policy Routing

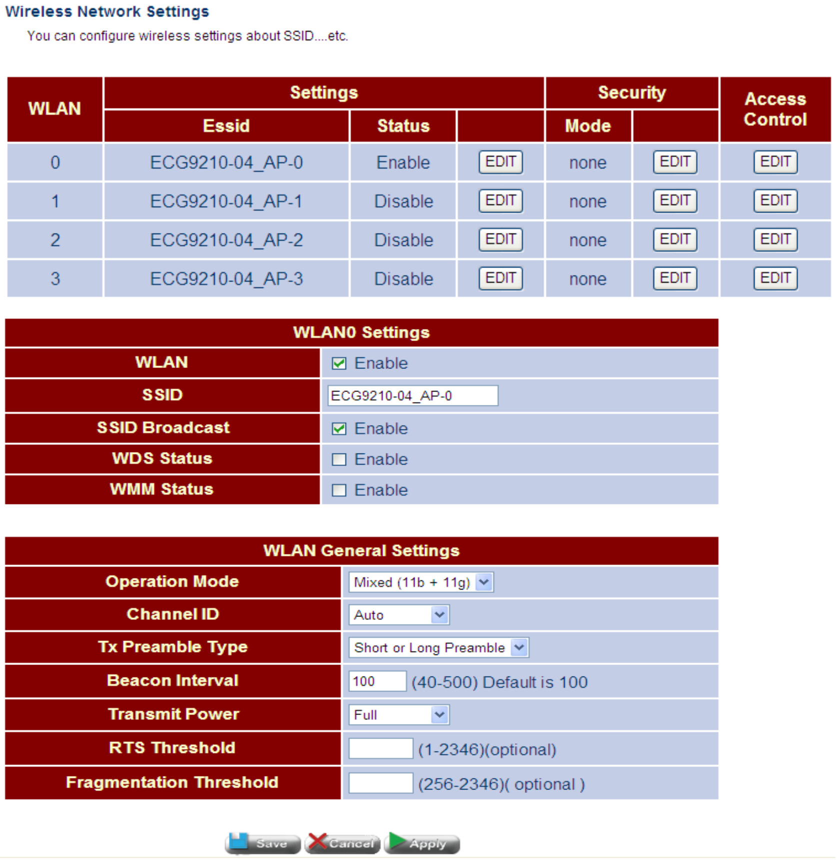
Field Attributes

- **Enable Policy Routing** – Enables policy routing to the WAN interface.
- **Source IP** – Specifies the source IP address.
- **Mask** – Specifies an IP mask.
- **Protocol** – Specifies the port type, TCP, UDP or both.
- **Src. Port** – Specifies the soruce port.
- **Des. Port** – Specifies the destination port.
- **Interface** – Specifes the virtual WAN interface.
- **Add** – Adds the entry to the Policy Routing Rule List.
- **Del** – Deletes an entry from the Policy Routing List.

Wireless Configuration

The IEEE 802.11b/g interfaces include configuration options for radio signal characteristics and wireless security features.

The unit’s access point function can operate in three modes, mixed 802.11b/g, 802.11b only, or 802.11g. Also note that 802.11g is backward compatible with 802.11b, at slower data transmit rates.



Wireless Network Settings

You can configure wireless settings about SSID....etc.

WLAN	Settings			Security		Access Control
	Essid	Status		Mode		
0	ECG9210-04_AP-0	Enable	EDIT	none	EDIT	EDIT
1	ECG9210-04_AP-1	Disable	EDIT	none	EDIT	EDIT
2	ECG9210-04_AP-2	Disable	EDIT	none	EDIT	EDIT
3	ECG9210-04_AP-3	Disable	EDIT	none	EDIT	EDIT

WLAN0 Settings	
WLAN	☑ Enable
SSID	ECG9210-04_AP-0
SSID Broadcast	☑ Enable
WDS Status	□ Enable
WMM Status	□ Enable

WLAN General Settings	
Operation Mode	Mixed (11b + 11g)
Channel ID	Auto
Tx Preamble Type	Short or Long Preamble
Beacon Interval	100 (40-500) Default is 100
Transmit Power	Full
RTS Threshold	(1-2346)(optional)
Fragmentation Threshold	(256-2346)(optional)

Figure 5-33 Wireless Setup

Field Attributes

- **WLAN** – Specifies a wireless LAN (WLAN) interface.
- **ESSID –** The name of the wireless network service provided by the VAP. Clients that want to connect to the network must set their SSID to the same as that of the VAP interface. (Default: “ECG9210”; Range: 1-32 characters)

- **Status –** Displays whether the wireless interface is enabled or not.
- **Mode –** Specifies the security mode.
- **Access Control –** Configures the access control method.

WLAN Settings

- **WLAN Enable –** Enables the communication for the VAP wireless interface.
- (Default: Enabled)
- **SSID –** The name of the wireless network service provided by the VAP.
- **SSID Broadcast –** Enables broadcasting of the SSID to the local wireless network. (Default: Enabled)
- **WDS Status –** Enables the WDS status.

WLAN General Settings

- **Operation Mode –** Defines the radio mode for the VAP interface. (Default: 802.11b/g Mixed)
- **Channel ID –** The radio channel that the access point uses to communicate with wireless clients. When multiple access points are deployed in the same area, set the channel on neighboring access points at least five channels apart to avoid interference with each other. For example, you can deploy up to three access points in the same area using channels 1, 6, 11. Note that wireless clients automatically set the channel to the same as that used by the access point to which it is linked. Selecting Auto Select enables the access point to automatically select an unoccupied radio channel.
- **Tx Preamble Type –** The radio preamble (sometimes called a header) is a section of data at the head of a packet that contains information that the wireless device and client devices need when sending and receiving packets. You can set the radio preamble to long or short. A short preamble improves throughput performance, whereas a long preamble is required when legacy wireless devices are part of your network.
- **Beacon Interval –** The rate at which beacon signals are transmitted from the access point. The beacon signals allow wireless clients to maintain contact with the access point. They may also carry power-management information.
  (Range: 40-500 TUs; Default: 100 TUs)
- **Transmit Power –** Adjusts the power of the radio signals transmitted from the access point. The higher the transmission power, the farther the transmission range. Power selection is not just a trade off between coverage area and maximum supported clients. You also have to ensure that high-power signals do not interfere with the operation of other radio devices in the service area. (Default: Full; Range: Half, Quarter, One Eigth, Min.)
- **RTS Threshold –** Sets the packet size threshold at which a Request to Send (RTS) signal must be sent to a receiving station prior to the sending station starting communications. The access point sends RTS frames to a receiving station to negotiate the sending of a data frame. After receiving an RTS frame, the station sends a CTS (clear to send) frame to notify the sending station that it can start sending data.

If the RTS threshold is set to 0, the access point always sends RTS signals. If set to 2347, the access point never sends RTS signals. If set to any other value, and the packet size equals or exceeds the RTS threshold, the RTS/CTS (Request to Send / Clear to Send) mechanism will be enabled.

The access points contending for the medium may not be aware of each other. The RTS/CTS mechanism can solve this “Hidden Node Problem.” (Range: 0-2346 bytes: Default: none)

- **Fragmentation Threshold –** Packet Fragmentation can also be used to improve throughput in noisy/congested situations. Although packet fragmentation is often thought of as something bad, and does add a large overhead, reducing throughput, sometimes it is necessary. (Range: 256-2346)

WLAN Security

The unit’s wireless interface is configured by default as an “open system,” which broadcasts a beacon signal including the configured SSID. Wireless clients with a configured SSID of “ANY” can read the SSID from the beacon, and automatically set their SSID to allow immediate connection to the wireless network.

To improve wireless network security, you have to implement two main functions:

- Authentication – It must be verified that clients attempting to connect to the network are authorized users.
- Traffic Encryption – Data passing between the unit and clients must be protected from interception and eavesdropping.

For a more secure network, the access point can implement one or a combination of the following security mechanisms:

- Wired Equivalent Privacy (WEP)
- IEEE 802.1X
- Wi-Fi Protected Access (WPA) or WPA2

The security mechanisms that may be employed depend on the level of security required, the network and management resources available, and the software support provided on wireless clients.

WEP Security

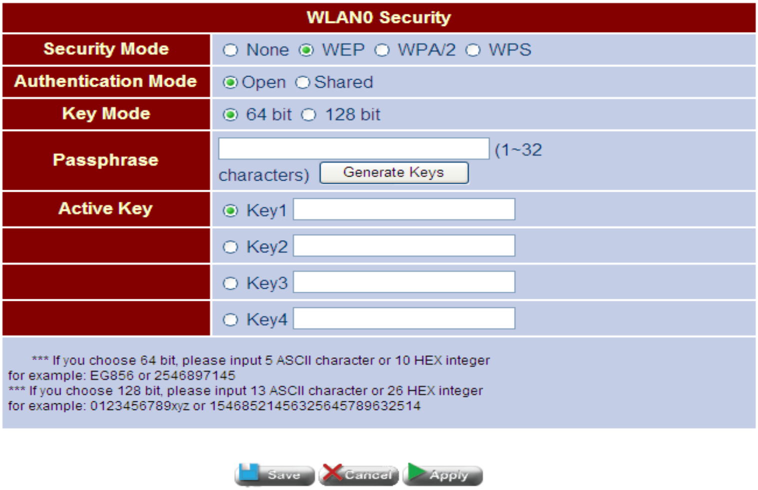
WEP provides a basic level of security, preventing unauthorized access to the network, and encrypting data transmitted between wireless clients and the access point. WEP uses static shared keys (fixed-length hexadecimal or alphanumeric strings) that are manually distributed to all clients that want to use the network.

WEP is the security protocol initially specified in the IEEE 802.11 standard for wireless communications. Unfortunately, WEP has been found to be seriously flawed and cannot be recommended for a high level of network security. For more robust wireless security, the access point provides Wi-Fi Protected Access (WPA) for improved data encryption and user authentication.

Setting up shared keys enables the basic IEEE 802.11 Wired Equivalent Privacy (WEP) on the access point to prevent unauthorized access to the network.

If you choose to use WEP shared keys instead of an open system, be sure to define at least one static WEP key for user authentication and data encryption. Also, be sure that the WEP shared keys are the same for each client in the wireless network.

Note that all clients share the same keys, which are used for user authentication and data encryption. Up to four keys can be specified. These four keys are used for all VAP interfaces on the same radio.



WLAN0 Security	
Security Mode	○ None ● WEP ○ WPA/2 ○ WPS
Authentication Mode	● Open ○ Shared
Key Mode	● 64 bit ○ 128 bit
Passphrase	(1~32 characters) Generate Keys
Active Key	● Key1
	○ Key2
	○ Key3
	○ Key4

*** If you choose 64 bit, please input 5 ASCII character or 10 HEX integer
for example: EG856 or 2546897145
*** If you choose 128 bit, please input 13 ASCII character or 26 HEX integer
for example: 0123456789xyz or 15468521456325645789632514

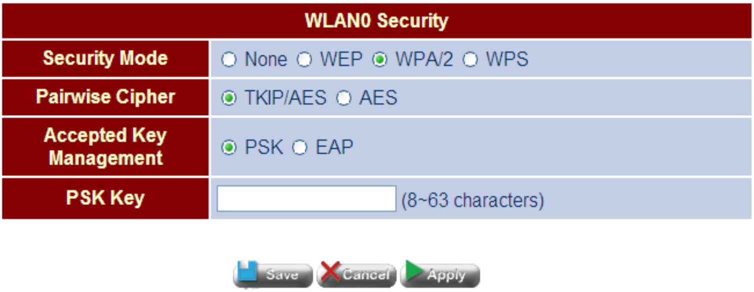
Figure 5-34 WEP Security

Field Attributes

- **Security Mode –** Specifies the security mode to be used for authentication.
- **Authentication Mode –** Specifies open or shared authentication.
- **Key Mode –** Specifies 64 Bit or 128 Bit security. (Default: 64 bit)
- **Passphrase –** Specifes a passphrase used for authentication. (Default: none; Range 1-32 characters)
- **Active Key –** Specifies a WEP key for authentication.

WPA2 Security

WPA was introduced as an interim solution for the vulnerability of WEP pending the ratification of the IEEE 802.11i wireless security standard. In effect, the WPA security features are a subset of the 802.11i standard. WPA2 includes the now ratified 802.11i standard, but also offers backward compatibility with WPA. Therefore, WPA2 includes the same 802.1X and PSK modes of operation and support for TKIP encryption.

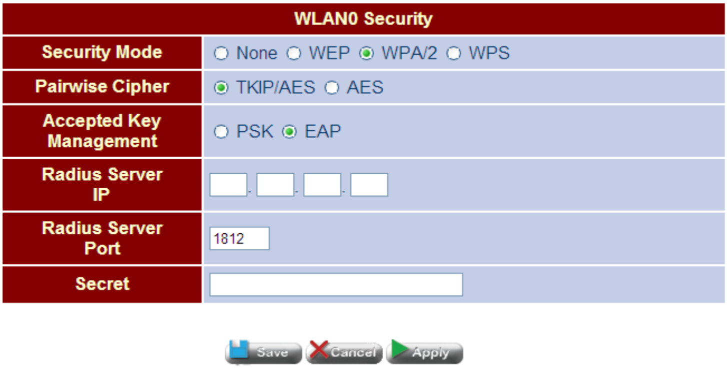


WLAN0 Security	
Security Mode	○ None ○ WEP ● WPA/2 ○ WPS
Pairwise Cipher	● TKIP/AES ○ AES
Accepted Key Management	● PSK ○ EAP
PSK Key	(8~63 characters)

Figure 5-35 WPA2 PSK Security

Field Attributes

- **TKIP/AES** – Uses Temporal Key Integrity Protocol (TKIP) or AES keys for encryption. WPA specifies TKIP as the data encryption method to replace WEP. TKIP avoids the problems of WEP static keys by dynamically changing data encryption keys. WPA/WPA2 mixed modes allow both WPA and WPA2 clients to associate to a common SSID interface. In mixed mode, the unicast encryption cipher (TKIP or AES-CCMP) is negotiated for each client.
- **AES –** Uses Advanced Encryption Standard (AES) keys for encryption. WPA2 uses AES Counter-Mode encryption with Cipher Block Chaining Message Authentication Code (CBC-MAC) for message integrity. The AES Counter-Mode/ CBCMAC Protocol (AES-CCMP) provides extremely robust data confidentiality using a 128-bit key. Use of AES-CCMP encryption is specified as a standard requirement for WPA2. Before implementing WPA2 in the network, be sure client devices are upgraded to WPA2-compliant hardware.
- **PSK –** Displays the pre-shared key if WPA/WPA2 has been enabled.
- **EAP –** IEEE 802.1X access security uses Extensible Authentication Protocol (EAP) and requires a configured RADIUS authentication server to be accessible in the enterprise network. If you select WPA or WPA2 Enterprise mode, be sure to configure the RADIUS settings.
- **PSK Key –** Specifies a pre-shared key. (Default: none; Range: 8-63 characters)



WLAN0 Security	
Security Mode	○ None ○ WEP ● WPA/2 ○ WPS
Pairwise Cipher	● TKIP/AES ○ AES
Accepted Key Management	○ PSK ● EAP
Radius Server IP	. . .
Radius Server Port	1812
Secret	

Figure 5-36 WPA2 EAP Security

Field Attributes

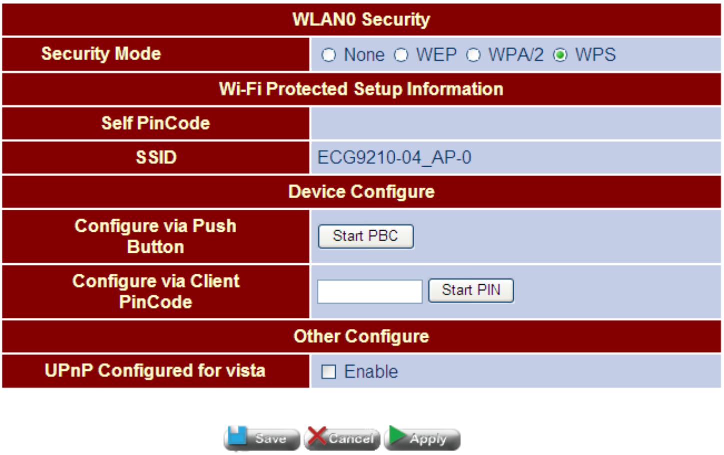
- **RADIUS Server IP** – Specifies a RADIUS server IP address.
- **RADIUS Server Port –** Specifies a RADIUS server port number. (Default: 1812)
- **Secret** – Specifies a secret text string.

WPS Security

The WPS protocol itself consists as a series of EAP message exchanges that is triggered by a user action and relies on an exchange of descriptive information that should precede that user's action.

The descriptive information is transferred through a new IE that's added to the Beacon, Probe Response and optionally to the Probe Request and Association Request/Response messages. Other than purely informative TLVs, those IEs will also hold the possible, and the currently deployed, configuration methods of the device. The WPS IE, has a type field with a value of '221', and OUI of 00-50-F2-04. The Data part of the IE is constructed out of TLVs that describe the device and its capabilities.

After the identification of the device's capabilities on both ends, a human trigger is to initiate the actual session of the protocol. The session consists of 8 messages, that are followed in the case of a successful session by a message to indicate the protocol is done. The exact stream of messages may change when configuring different kinds of devices (AP or STA) or using different physical media (wired or wireless).



WLAN0 Security	
Security Mode	○ None ○ WEP ○ WPA/2 ● WPS
Wi-Fi Protected Setup Information	
Self PinCode	
SSID	ECG9210-04_AP-0
Device Configure	
Configure via Push Button	Start PBC
Configure via Client PinCode	Start PIN
Other Configure	
UPnP Configured for vista	□ Enable

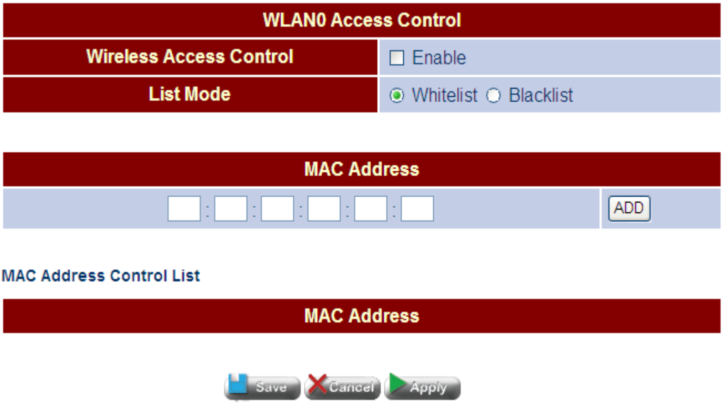
Figure 5-37 WPS Security

Field Attributes

- **Self PinCode** – Displays a PIN code for authentication.
- **SSID** – Displays the SSID.
- **Configure via Push Button** – Starts a scan for neighboring access points.
- **Configure via Client PinCode** – Allows the user to enter a PIN code for authentication.
- **UPnP Configured for vista** – Enables support for Windows Vista.

Access Control

Wireless clients can be authenticated for network access by checking their MAC address against a local database configured on the access point. You can configure a list of up to 32 wireless client MAC addresses in the filter list to either allow or deny network access.



WLAN0 Access Control	
Wireless Access Control	□ Enable
List Mode	● Whitelist ○ Blacklist

MAC Address	
□ : □ : □ : □ : □ : □	ADD

MAC Address Control List

MAC Address

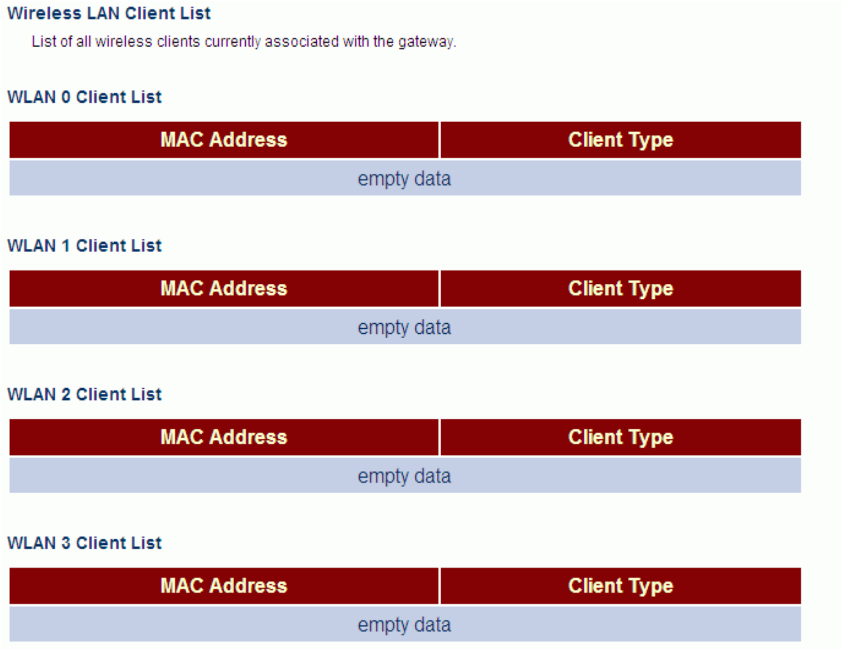
Figure 5-38 Access Control

Field Attributes

- **Wireless Access Control** – Enables access control.
- **List Mode** – Specifies whether the MAC address is to be allowed (Whitelist) or denied (Blacklist).
- **MAC Address** – Specifies a MAC address to add to the access control list.
- **MAC Address Control List** – Displays the MAC address entries to be allowed or denied access to the access point.

Client List

The Client List displays all current clients associated with the access point.



Wireless LAN Client List

List of all wireless clients currently associated with the gateway.

WLAN 0 Client List

MAC Address	Client Type
empty data	

WLAN 1 Client List

MAC Address	Client Type
empty data	

WLAN 2 Client List

MAC Address	Client Type
empty data	

WLAN 3 Client List

MAC Address	Client Type
empty data	

Figure 5-39 Client List

Field Attributes

- **MAC Address** – Displays the MAC address of the currently associated client.
- **Client Type** – Displays the type of client associated with the access point.

NAT Configuration

Network Address Translation (NAT) is a method of mapping between a single global address on the WAN interface to multiple local addresses on the LAN interface. For the Gateway, the internal (local) IP addresses are those assigned to PCs or other network devices by the DHCP server, and the external IP address is the single address assigned to the WAN port.

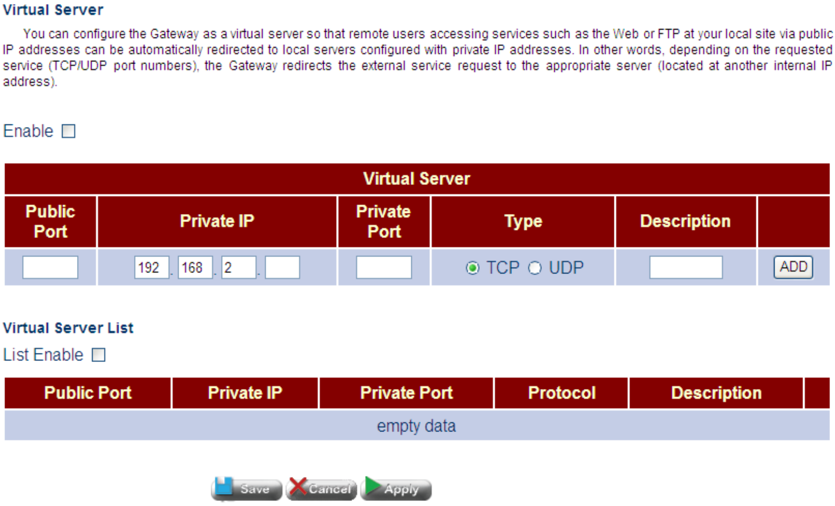
Virtual Server

If you configure the Gateway as a virtual server, remote users accessing services such as web sites or FTP servers on your local network through public IP addresses can be automatically redirected to local servers configured with private IP addresses. In other words, depending on the requested service (designated by the TCP/UDP port number), the Gateway redirects the external service request to the appropriate server (located at an internal IP address). This secures your network from direct attack by hackers, and provides more flexible management by allowing you to change internal IP addresses without affecting outside access to local network services.

For example, if you set Type/Public Port to TCP/80 (HTTP or web) and the Private IP/Port to 192.168.2.2/80, then all HTTP requests from outside users will be transferred to 192.168.2.2 on port 80. Therefore, by just entering the IP address provided by the ISP, Internet users can access the service they need at the local address to which you redirect them.

The more common TCP service port numbers include: HTTP: 80, FTP: 21, Telnet: 23, and POP3: 110.

Click NAT, Virtual Server. Specify the IP address of the local server, the private port number, TCP or UDP type, the public port number, and click Apply.



Virtual Server

You can configure the Gateway as a virtual server so that remote users accessing services such as the Web or FTP at your local site via public IP addresses can be automatically redirected to local servers configured with private IP addresses. In other words, depending on the requested service (TCP/UDP port numbers), the Gateway redirects the external service request to the appropriate server (located at another internal IP address).

Enable □

Virtual Server					
Public Port	Private IP	Private Port	Type	Description	
	192 . 168 . 2 .		● TCP ○ UDP		ADD

Virtual Server List

List Enable □

Public Port	Private IP	Private Port	Protocol	Description	
empty data					

Figure 5-40 Virtual Server

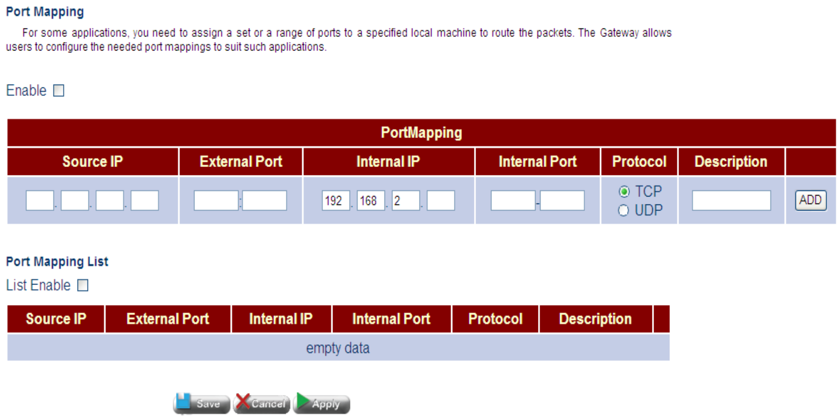
Field Attributes

- **Public Port** – Specifies the WAN port number.
- **Private IP** – The IP address of a server on the local network. The specified address must be in the same subnet as the Gateway and its DHCP server address pool.
- **Private Port** – Specifies the local LAN TCP/UDP port number. (Range: 1-65535)
- **Type** – Specifies the port type, TCP or UDP. (Default: TCP)
- **Description** – A helpful character string to identify the virtual server.

Port Mapping

Some applications, such as Internet gaming, videoconferencing, Internet telephony and others, require multiple connections. These applications cannot work with one-to-one address/port translation. If you need to run applications that require multiple connections, use port mapping to specify the additional public ports to be opened for each application.

Click NAT, Port Mapping. Specify the TCP/UDP port range, the IP address of a local server, and click Apply.



Port Mapping

For some applications, you need to assign a set or a range of ports to a specified local machine to route the packets. The Gateway allows users to configure the needed port mappings to suit such applications.

Enable □

PortMapping

Source IP	External Port	Internal IP	Internal Port	Protocol	Description	
. . .	:	192 . 168 . 2 .	-	● TCP ○ UDP		ADD

Port Mapping List

List Enable □

Source IP	External Port	Internal IP	Internal Port	Protocol	Description	
empty data						

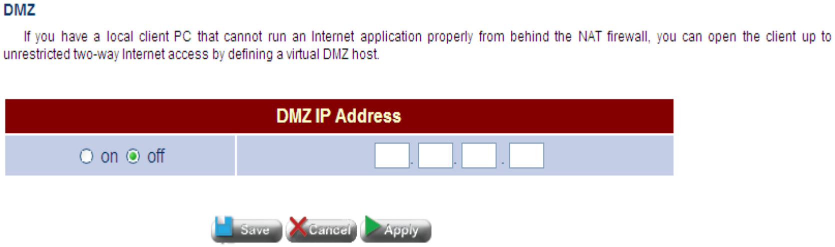
Figure 5-41 Port Mapping

Field Attributes

- **Enable** – Enables port mapping.
- **Port Mapping** – Specifies one of two port mapping lists.
- **Source IP** – Species a source IP address to route from.
- **External Port** – Specifies an external port, or port range.
- **Internal IP** – Specifies an internal port to route through.
- **Internal Port** – Specifies an internal port, or port range.
- **Protocol** – Specifies the use of a single TCP/UDP port or range of ports.
- **Port** – A TCP/UDP port or range of ports to assign to a specific application.
- **Description** – A useful text string that describes the port mapping.
- **List Enable** – Enables all specified port maps.

DMZ

This page is used to allow a specified host on the local network to access the Internet without any firewall protection. Some Internet applications, such as interactive games or videoconferencing, may not function properly behind the Gateway’s firewall. By specifying a Demilitarized Zone (DMZ) host, the PC's TCP ports are completely exposed to the Internet, allowing unrestricted two-way communications. The host PC should be assigned a static IP address and this address configured as the DMZ host IP.



DMZ

If you have a local client PC that cannot run an Internet application properly from behind the NAT firewall, you can open the client up to unrestricted two-way Internet access by defining a virtual DMZ host.

DMZ IP Address	
○ on ● off	___ . ___ . ___ . ___

Figure 5-42 DMZ

Field Attributes

- **DMZ IP Address** – Selects one of two IP addresses to enable for DMZ service.
- **on/off** – Enables/disables the DMZ IP address.

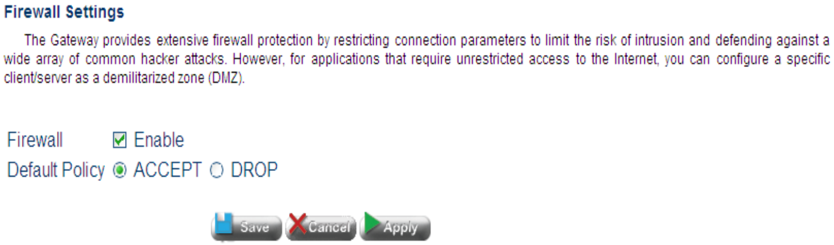
Firewall Configuration

The Gateway provides extensive firewall protection by restricting connection parameters to limit the risk of intrusion and defending against a wide array of common hacker attacks.

Firewall Settings

This page is used to enable or disable the firewall, and set the default forwarding policy for addresses not found in the MAC or IP filtering list.

Click FIREWALL, Firewall Settings. Enable the firewall, set the default forwarding policy, and click Apply.



Firewall Settings

The Gateway provides extensive firewall protection by restricting connection parameters to limit the risk of intrusion and defending against a wide array of common hacker attacks. However, for applications that require unrestricted access to the Internet, you can configure a specific client/server as a demilitarized zone (DMZ).

Firewall ☑ Enable

Default Policy ● ACCEPT ○ DROP

Figure 5-43 Firewall Settings

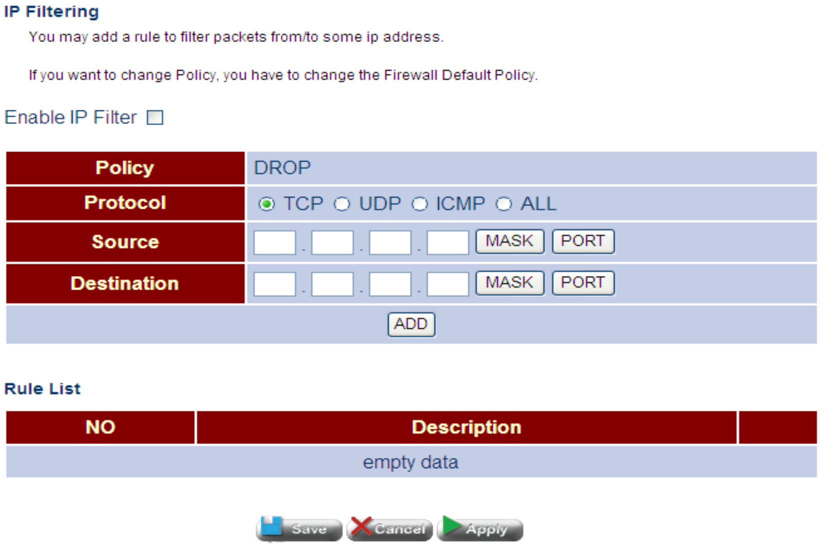
Field Attributes

- **Enable** – Enables or disables the firewall. (Default: Disabled)
- **Default Policy** – Accepts or drops packets not found in the MAC or IP address filtering tables. (Default: Accept)

IP Filtering

This page is used to filter the IP addresses of clients attempting to access the Internet based on the source or destination IP address and TCP/UDP port of each packet. Address filtering allows the Gateway to permit or deny specified packets passing through to the Internet.

Click FIREWALL, IP Filtering. Mark the check box to enable IP address filtering. Set the addresses to be filtered, the TCP/UDP port, specify whether the matching packets are to be passed on or dropped, and then click ADD to enter each address in the table. Once all of the address entries have been specified, click Apply.



IP Filtering

You may add a rule to filter packets from/to some ip address.

If you want to change Policy, you have to change the Firewall Default Policy.

Enable IP Filter □

Policy	DROP
Protocol	● TCP ○ UDP ○ ICMP ○ ALL
Source	. . . MASK PORT
Destination	. . . MASK PORT
ADD	

Rule List

NO	Description	
	empty data	

Figure 5-44 IP Filtering

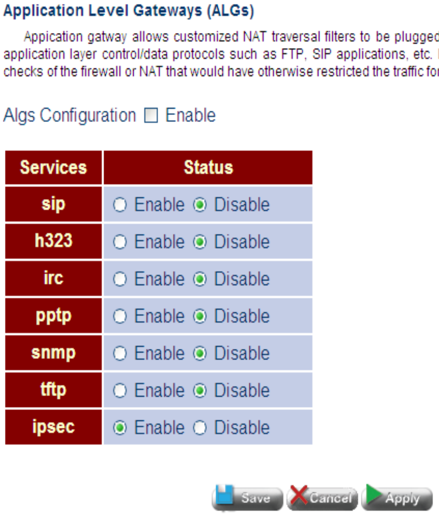
Field Attributes

- **Policy** – Specifies to deny packets matching an entry.
- **Enable IP Filter** – Enables filtering of all packets in the IP Filtering List.
- **Protocol** – Specifies a port typem TCP, UDP, ICMP or all.
- **Source/Destination** – Specifies whether the address is contained in the packet's source or destination field.
- **Mask** – The network prefix which indicates the number of significant bits used to identify the network portion of the address.
- **Port** – Specifies the TCP/UDP port number. (Range: 0-65535)

ALG Configuration

This page is used to enable or disable customized Application Layer Gateway (ALG) traversal filters for SIP, H323, IRC, PPTP, SNMP, and TFTP applications.

Click FIREWALL, ALG Configuration. Enable ALG traversal filters for the required applications, and click Apply.



Application Level Gateways (ALGs)

Appication gatway allows customized NAT traversal filters to be plugged into the gateway to support address and port translation for certain application layer control/data protocols such as FTP, SIP applications, etc. Legitimate application data can thus be passed through the security checks of the firewall or NAT that would have otherwise restricted the traffic for not meeting its limited filter criteria.

Algs Configuration □ Enable

Services	Status
sip	○ Enable ● Disable
h323	○ Enable ● Disable
irc	○ Enable ● Disable
pptp	○ Enable ● Disable
snmp	○ Enable ● Disable
tftp	○ Enable ● Disable
ipsec	● Enable ○ Disable

Figure 5-45 ALG Configuration

Field Attributes

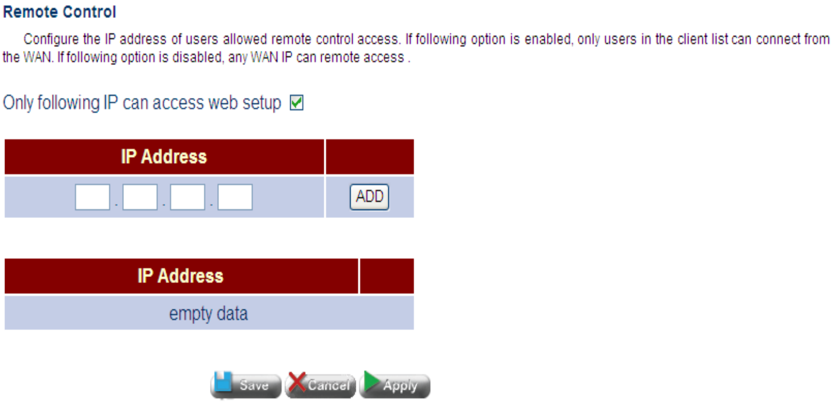
- **ALG Configuration** – Allows Application Layer Gateway (ALG) traversal filters to be used to support address and port translation for specified application layer control/data protocols.
- **Services** – Services for which customized NAT traversal filters are supported.
  - **SIP** – Session Initiation Protocol is used for Internet conferencing, telephony, events notification and instant messaging.
  - **H.323** – ITU-T standard that defines protocols used to provide audio-visual communication sessions on any packet-based network. It is widely deployed by service providers to support both voice and video services over IP networks.
  - **IRC** – Internet Relay Chat
  - **PPTP** – Point-to-Point Tunneling Protocol is a method for implementing virtual private networks.
  - **SNMP** – Simple Network Management Protocol.
  - **TFTP** – Trivial File Transfer Protocol.

- **IPSEC** – Internet Protocol Security is a protocol suite for securing Internet Protocol (IP) communications by authenticating and encrypting each IP packet of a data stream.

- **Status** – Enables or disables filter for specified protocol.

Remote Control

The Remote Control function configures the IP addresses of users who may have exclusive control of the VDSL/Router from the WAN port.



Remote Control

Configure the IP address of users allowed remote control access. If following option is enabled, only users in the client list can connect from the WAN. If following option is disabled, any WAN IP can remote access .

Only following IP can access web setup ☑

IP Address	
□ . □ . □ . □	ADD

IP Address	
empty data	

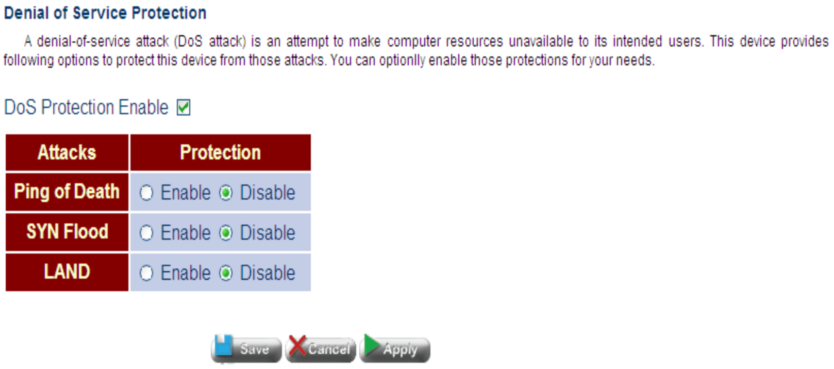
Figure 5-46 Remote Control

Field Attributes

- **Only following IP can access web setup** – Enables only specified IP addresses to have management access of the device.
- **IP Address** – Specifies an IP address for management access.

Denial of Service

A denial-of-service attack (DoS attack) is an attempt to make computer resources unavailable to its intended users. This device provides following options to protect this device from those attacks. You can optionlly enable those protections for your needs.



Denial of Service Protection

A denial-of-service attack (DoS attack) is an attempt to make computer resources unavailable to its intended users. This device provides following options to protect this device from those attacks. You can optionlly enable those protections for your needs.

DoS Protection Enable ☑

Attacks	Protection
Ping of Death	○ Enable ● Disable
SYN Flood	○ Enable ● Disable
LAND	○ Enable ● Disable

Figure 5-47 DoS

Field Attributes

- **DoS Protection Enable** – Enables DoS protection.
- **Attacks** – Lists the type of DoS attack the unit provides protection from.
- **Protection** – Enables/disables the DoS for the specified attack.

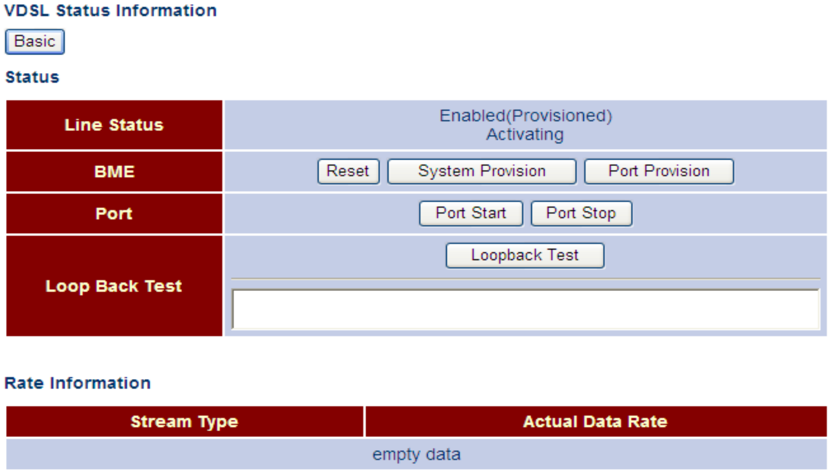
VDSL Configuration

VDSL connection parameters can be applied globally to all VDSL ports on the Gateway.

VDSL Status and Rate Information

This page is used to display the status of the VDSL line, provision the BME and VDSL ports, run loop-back tests for diagnostic purposes; and also to display the current rate for various stream types and other VDSL line information.

Use any of the functions listed in the VDSL Status table for the System Provision, Port Provision, or to stop ports. Or display the basic or detailed list of rate information.



VDSL Status Information

Status

Line Status	Enabled(Provisioned) Activating
BME	Reset System Provision Port Provision
Port	Port Start Port Stop
Loop Back Test	Loopback Test

Rate Information

Stream Type	Actual Data Rate
empty data	

Figure 5-48 VDSL Status and Rate Information

Field Attributes

VDSL Status, Provisioning, Diagnostics

- **Line Status** – Displays the line status of the VDSL link, including administrative status, and port state (Activating, Provisioned or Showtime).
- **BME** – Includes the following OAM functions for the Gateway's Burst Mode Engine (that is, VDSL port controller).
  - **Reset** – Resets power to the BME.
  - **System Provision** – Assigns default values to BME system parameters, including vendor ID for T1/E1 and ITU, revision number, option mask to enable PM mode, PM alert and diagnostic modes.
  - **Port Provision** – Loads the parameters stored in FLASH to the VDSL port.

- **Port** – Starts or stops the VDSL port.

Rate and Line Information

- **BME** – The number of VDSL ports supported by the BME.
- **Downstream/Upstream Line Rate** – This rate includes payload (user data) and any applicable framing overhead.
- **Fast Downstream/Upstream Payload Rate** – The actual payload carried on the fast channels.
- **Slow Downstream/Upstream Payload Rate** – The actual payload carried on the interleaved channels.
- **Downstream Attainable Payload Rate** – The maximum rate that can be achieved in the download direction. This is based on measurements made during line probing. This rate includes payload (user data) and any applicable framing overhead.
- **Downstream Attainable Line Rate** – The maximum attainable line rate on the downstream channel.
- **Downstream/Upstream Line Protection** (Slow Path) – The number of additional DMT symbols added to each packet to increase the noise margin.
- **Downstream/Upstream Delay** – The maximum interleave delay. Interleaving causes a delay in the transmission of data. Interleave delay applies only to the interleave (slow) channel and defines the mapping (relative spacing) between subsequent input bytes at the interleaver input and their placement in the bit stream at the interleaver output. Larger numbers provide greater separation between consecutive input bytes in the output bit stream allowing for improved impulse noise immunity at the expense of payload latency.
- **VDSL Estimated Loop Length** – Estimated length of the VDSL connection; used to calculate power backoff.
- **Ghs Estimated Near End Loop Length** – Estimated length of the VDSL connection as viewed from the input receiver on the Gateway; used for handshaking.
- **Ghs Estimated Far End Loop Length** – Estimated length of the VDSL connection as viewed from the central office; used for handshaking.
- **Current Framing Mode** – Indicates one of the packet framing modes (0: HDLC, 1: EFM, 2: By Pass).
- **Band Plan Type –**

Table 5-49 VDSL2 Band Plans

Code	Band Plan
0x00	BP1_998_3
0x01	BP2_998_3 BP998_3B_8_5M

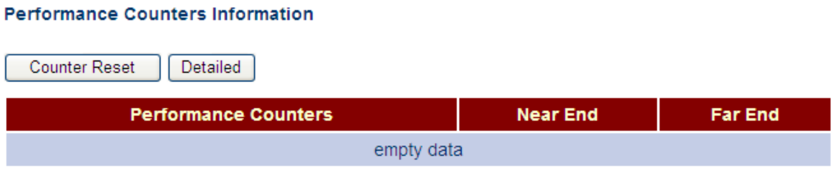
Table 5-49 VDSL2 Band Plans (Continued)

Code	Band Plan
0x02	BP3_998_4 BP998_4B_12M
0x03	BP4_997_3 BP997_3B_7_1M
0x04	BP5_997_3
0x05	BP6_997_4 BP997_4B_7_1M
0x06	BP7_MXU_3 FLEX_3B_8_5M
0x07	BP8_MXU_2
0x08	BP9_998_2
0x09	BP10_998_2 BP998_2B_3_8M
0x0A	BP11_998_2
0x0B	BP12_998_2
0x0C	BP13_MXU_3
0x0D	BP14_MXU_3
0x0E	BP15_MXU_3
0x0F	BP16_997_4B_4P
0x10	BP17_998_138_4400
0x11	BP18_997_138_4400
0x12	BP19_997_32_4400
0x15	BP20_998_138_4400_opBand
0x16	BP21_997_138_4400_opBand BP22_998_138_4400_opBand
0x17	BP23_998_138_16000
0x18	BP24_998_3B_8KHZ
0x19	BP25_998_138_17600
0x1A	BP26_CH1_3
0x1B	BP27_CH1_4

- **No. of Upstream Bands** – This attribute can include both the bands defined by the Band Plan Configuration setting (see “VDSL Configuration” on page 5-95) and the optional Upstream Band (US0).
- **No. of Downstream Bands** – The number of bands defined by the Band Plan Configuration setting (see “VDSL Status and Rate Information” on page 5-95).

Performance Counters

This page is used to display performance information including common error conditions for the VDSL line.



Performance Counters Information

Performance Counters	Near End	Far End
empty data		

Figure 5-50 Performance Counters (Basic)

Field Attributes

Basic Performance Counters

- **LOF** – Loss of Frame. The number of times there was loss of framing error.
- **SES** – Severely Errored Seconds. The number of second intervals containing 18 or more CRC-8 anomalies, one or more Loss of Signal (LOS) defects, one or more Severely Errored Frame (SEF) defects, or one or more Loss of Power (LPR) defects.
- **ESE** – Excessive Severe Errors. The number of times there were excessive severe errors.
- **LOS** – Loss of Signal. The number of times there was a loss of signal error.
- **RDI** – Remote Defect Indication. The number of times a severely errored frame has been detected at the far end.
- **LOM** – Loss of Margin. The number of times there was a loss of noise margin error.
- **PO** – Power Off failure count. (This parameter only applies to the far end.)
- **ES** – Errored Seconds. The number of second intervals during which there was one or more CRC anomalies, or one or more Loss of Signal (LOS) or Loss of Framing (LOF) defects
- **UNAVL_ES** – Unavailable Errored Seconds. The number of seconds during which the VDSL transceiver is powered up but not available.

Field Attributes

Detailed Performance Counters

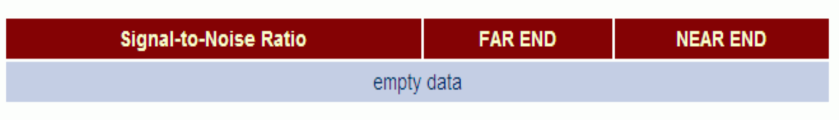
- **TxBlkCnt_S** – Count of superframes transmitted on the slow path.
- **RxBlkCnt_S** – Count of superframes received on the slow path.
- **SES** – Severely Errored Seconds. The number of second intervals containing 18 or more CRC-8 anomalies, one or more Loss of Signal (LOS) defects, one or more Severely Errored Frame (SEF) defects, or one or more Loss of Power (LPR) defects.
- **FEC_F** – Far end Forward Error Correction on the fast path.

- **CRC_F** – Far end CRC errors on the fast path.
- **FEC_S** – Far end Forward Error Correction on the slow path.
- **CRC_S** – Far end CRC errors on the slow path.
- **LOS** – Loss of Signal. The number of times there was a loss of signal error.
- **HEC_F** – Header Error Control (HEC)/EFM framing errors on the fast path.
- **HEC_S** – Header Error Control (HEC)/EFM framing errors on the slow path.
- **ES** – Errored Seconds. The number of second intervals during which there was one or more CRC anomalies, or one or more Loss of Signal (LOS) or Loss of Framing (LOF) defects
- **UNAVL_ES** – Unavailable Errored Seconds. The number of seconds during which the VDSL transceiver is powered up but not available.

SNR Information

This page is used to display counters for sound-to-noise ratio measurements.

Click VDSL, SNR Information.



Signal-to-Noise Ratio	FAR END	NEAR END
empty data		

Figure 5-51 SNR Information

Field Attributes

- **Far End SNR** – Sound-to-noise ratio at the far end.
- **Avg SNR Margin** – Average signal-to-noise margin above the SNR.
- **Avg SNR** – Average signal-to-noise ratio.
- **SNR Margin (SNRMpb0-4)** – SNR Margin of band 0-4 in 0.1 dBs.
- **Line Attenuation (LATNpb0-4)** – Line Attenuation of band 0-4 in 0.1 dBs.
- **Signal Attenuation (SATNpb0-4)** – Signal Attenuation of band 0-4 in 0.1 dBs.

DELT

Dual-ended loop testing (DELT) is an ITU-standard loop diagnostic tool that enables the measurement of conditions at both ends of a DSL line. DELT can be used after deployment to allow service providers to monitor stability and connection rates for existing customer lines.

Click VDSL, DELT.

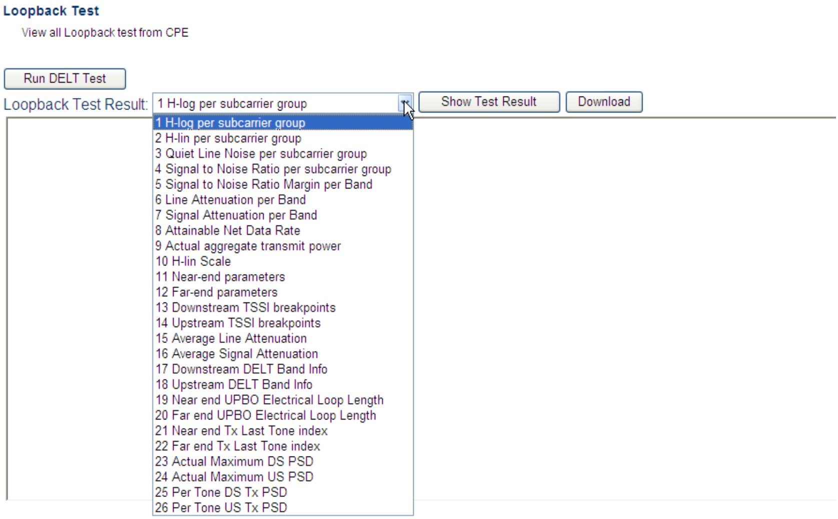

Loopback Test
View all Loopback test from CPE
Run DELT Test
Loopback Test Result:
1 H-log per subcarrier group
Show Test Result
Download
1 H-log per subcarrier group
2 H-lin per subcarrier group
3 Quiet Line Noise per subcarrier group
4 Signal to Noise Ratio per subcarrier group
5 Signal to Noise Ratio Margin per Band
6 Line Attenuation per Band
7 Signal Attenuation per Band
8 Attainable Net Data Rate
9 Actual aggregate transmit power
10 H-lin Scale
11 Near-end parameters
12 Far-end parameters
13 Downstream TSSI breakpoints
14 Upstream TSSI breakpoints
15 Average Line Attenuation
16 Average Signal Attenuation
17 Downstream DELT Band Info
18 Upstream DELT Band Info
19 Near end UPBO Electrical Loop Length
20 Far end UPBO Electrical Loop Length
21 Near end Tx Last Tone index
22 Far end Tx Last Tone index
23 Actual Maximum DS PSD
24 Actual Maximum US PSD
25 Per Tone DS Tx PSD
26 Per Tone US Tx PSD

Figure 5-52 DELT Loopback Test Information

- **Run DELT Test** – Performs the selected DELT test.
- **DELT Option** – The type of signal transmitted from the specified port.
  - 1 – H-log per subcarrier group
  - 2 – H-lin per subcarrier group
  - 3 – Quiet line noise per subcarrier group
  - 4 – Signal-to-noise ratio per subcarrier group
  - 5 – Signal-to-noise ratio margin per band
  - 6 – Line attenuation per band
  - 7 – Signal attenuation per band
  - 8 – Attainable net data rate
  - 9 – Actual aggregate transmit power
  - 10 – H-lin scale
  - 11 – Near-end parameters
  - 12 – Far-end parameters
  - 13 – Downstream TSSI breakpoints

  - 14 – Upstream TSSI breakpoints
  - 15 – Average line attenuation
  - 16 – Average signal attenuation
  - 17 – Downstream DELT band information
  - 18 – Upstream DELT band information
  - 19 – Near end UPBO electrical loop length
  - 20 – Far end UPBO electrical loop length
  - 21 – Near end TX last tone index
  - 22 – Far end TX last tone index
  - 23 – Actual maximum DS PSD
  - 24 – Actual maximum US PSD
  - 25 – Per tone DS Tx PSK
  - 26 – Per tone US Tx PSK
- **Show Test Result** – Displays the DELT test results.
- **Download** – Downloads the DELT test results to a local folder.

IGMP Configuration

This Gateway can use Internet Group Management Protocol (IGMP) to filter multicast traffic.

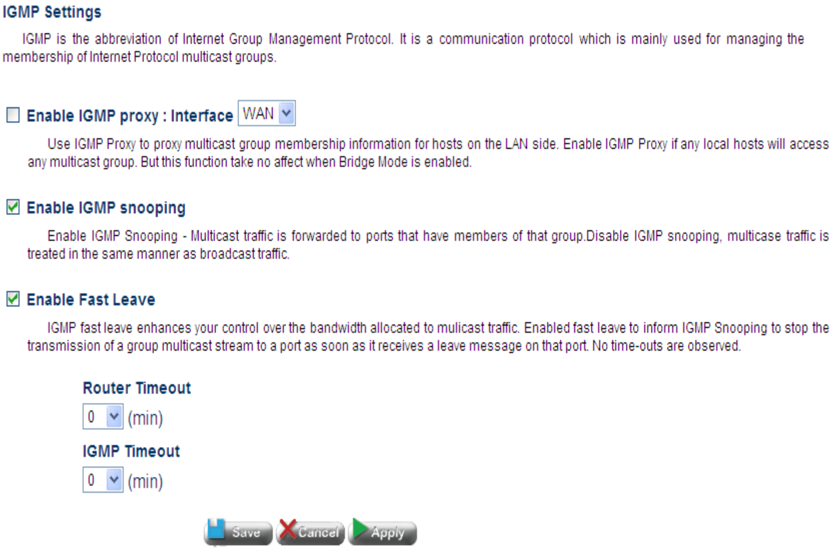
IGMP Snooping can be used to passively monitor or “snoop” on exchanges between attached hosts and an IGMP-enabled device, most commonly a multicast router. In this way, the Gateway can discover the ports that want to join a multicast group, and set its filters accordingly.

Using IGMP Proxy, the Gateway learns multicast requirements from its downstream interfaces, proxies this group membership information to the upstream router, and then forwards multicast packets based upon that information to downstream hosts.

IGMP Settings

This page is used to configure IGMP Proxy, IGMP Snooping, Fast Leave, and several other IGMP timeout attributes.

Click IGMP. Enable the required IGMP function, modify any of the timeout attributes as required, and then click Apply.



IGMP Settings

IGMP is the abbreviation of Internet Group Management Protocol. It is a communication protocol which is mainly used for managing the membership of Internet Protocol multicast groups.

□ **Enable IGMP proxy : Interface** WAN

Use IGMP Proxy to proxy multicast group membership information for hosts on the LAN side. Enable IGMP Proxy if any local hosts will access any multicast group. But this function take no affect when Bridge Mode is enabled.

☑ **Enable IGMP snooping**

Enable IGMP Snooping - Multicast traffic is forwarded to ports that have members of that group.Disable IGMP snooping, multicase traffic is treated in the same manner as broadcast traffic.

☑ **Enable Fast Leave**

IGMP fast leave enhances your control over the bandwidth allocated to mulicast traffic. Enabled fast leave to inform IGMP Snooping to stop the transmission of a group multicast stream to a port as soon as it receives a leave message on that port. No time-outs are observed.

Router Timeout

0 (min)

IGMP Timeout

0 (min)

Figure 5-53 IGMP Settings

Field Attributes

- **Enable IGMP Proxy** (Router Mode) – Collects and sends multicast group membership information onto the upstream interface based on IGMP messages monitored on downstream interfaces, and forwards multicast traffic based on that information. (Default: Disabled)
- **Enable IGMP Snooping** – Passively monitors exchanges between attached hosts and an IGMP-enabled device (most commonly a multicast router) to discover the ports that want to join a multicast group, and sets its filters accordingly. (Default: Enabled)
- **Enable Fast Leave** – Immediately deletes a member port of a multicast service if a leave packet is received at that port. (Default: Enabled)

  If immediate leave is not used, a multicast router (or querier) will send a group-specific query message when an IGMPv2 group leave message is received. The router/querier stops forwarding traffic for that group only if no host replies to the query.

  If immediate leave is enabled, the Gateway assumes that only one host is connected to the interface. Therefore, immediate leave should only be enabled on an interface if it is connected to only one IGMP-enabled device, either a service host or a neighbor running IGMP snooping.

This attribute is only effective if IGMP snooping is enabled, and IGMPv2 snooping is used.

- **Router Timeout** – This function is used to see if IGMP query packets are arriving from the WAN side at regular intervals, and indicates the time the Gateway waits after the querier stops before it considers it to have expired. (Option: 0, 1, 5, 10, 20, 30 minutes; Default: 0 minutes, which means that detection is disabled)

  If no queries have been detected for the specified time, the Gateway stops forwarding multicast traffic to downstream clients.

- **IGMP Timeout** – The function is used to see the IGMP report (join) packets are arriving from the LAN side at regular intervals, and indicates the time the Gateway waits after these messages have stopped before it considers there to be no more downstream clients. (Options: 0, 1, 5, 10, 20, 30 minutes; Default: 0 minutes, which means that detection is disabled)

  If no report message have been detected for the specified time, the Gateway stops forwarding multicast traffic to downstream clients.

  When an IGMPv2 or v3 multicast host leaves a group, it sends an IGMP leave message. When the leave message is received by the Gateway, it checks to see if this host is the last to leave the group by sending out an IGMP group-specific or group-and-source-specific query message, and starts a timer. If no reports are received before the timer expires, the group record is deleted, and a report is sent to the upstream multicast router.

  Since IGMPv1 clients do not send leave packets, both Router Timeout and IGMP Timeout are required to maintain multicast flows to IGMPv1 clients.

  This attribute will take effect only if Fast Leave is enabled.

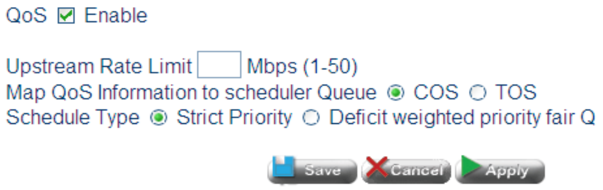
QoS Configuration

Quality of Service (QoS) specifies which data packets have greater precedence when traffic is buffered in the Gateway due to congestion. The Gateway supports QoS with eight priority queues for each port. Data packets in a port's high-priority queue will be transmitted before those in the lower-priority queues.

QoS Settings

This page is used to enable or disable QoS, sets the upstream rate limit, and the queuing mode.

Click QoS, QoS Settings. Enable QoS, specify the maximum upstream data rate, select the queueing method, and then click Apply.



QoS ☑ Enable

Upstream Rate Limit □ Mbps (1-50)

Map QoS Information to scheduler Queue ● COS ○ TOS

Schedule Type ● Strict Priority ○ Deficit weighted priority fair Q

Figure 5-54 QoS Settings

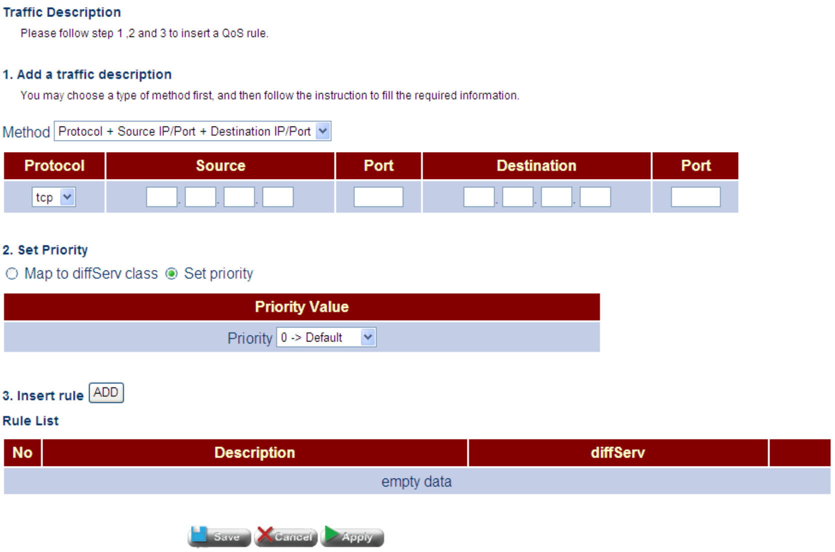
Field Attributes

- **QoS Enable** – Enables or disables QoS settings.
- **Upstream Rate Limit** – Sets the maximum rate for traffic transmitted onto the upstream interface. Traffic that falls within the rate limit is transmitted, while packets that exceed the acceptable amount of traffic are dropped.

Traffic Classification

This page is used to configure diffServ priorities based on protocol type, source and destination addresses, and TCP/UDP port.

Click QoS, Traffic Classification. Select the classification method from the drop-down list and fill in the required parameters, set the priority, click ADD to insert the rule in the table, and then click Apply.



Traffic Description

Please follow step 1 ,2 and 3 to insert a QoS rule.

1. Add a traffic description

You may choose a type of method first, and then follow the instruction to fill the required information.

Method: Protocol + Source IP/Port + Destination IP/Port

Protocol	Source	Port	Destination	Port
tcp	. . .		. . .	

2. Set Priority

○ Map to diffServ class ● Set priority

Priority Value
Priority: 0 -> Default

3. Insert rule ADD

Rule List

No	Description	diffServ	
empty data			

Figure 5-55 Traffic Classification

Field Attributes

- **Method**
  - **Protocol** – Specifies the protocol type to match as TCP or UDP.
  - **Source Port** – Source port number[1] (that is, protocol socket number) for the specified protocol type.
  - **Source IP/Port** – Source IP address, and port number[1] for the specified protocol type.
  - **Destination Port** – Destination port number[1] for the specified protocol type.
  - **Source IP/Port** – Destination IP address, and port number[1] for the specified protocol type.
  - **Protocol + Source IP/Port + Destination IP/Port** – Source/destination IP address, and port number[1] for the specified protocol type.

[1] The TCP/UDP port range is 0-65535.

- **Priority**
  - **CS Class** – Class of Service (CoS) priority.
    (Range: 0 - 7, where 7 is the highest priority: Default: 0)

    This Gateway processes Class of Service (CoS) priority tagged traffic by using eight priority queues for each port. Up to eight separate traffic priorities are defined in IEEE 802.1p. The default priority levels are assigned according to recommendations in the IEEE 802.1p standard as shown in the following table.

Table 5-56 Mapping CoS Values to Egress Queues

Priority	0	1	2	3	4	5	6	7
Queue	2	0	1	3	4	5	6	7

The priority levels recommended in the IEEE 802.1p standard for various network applications are shown in the following table. However, you can map the priority levels to the Gateway's output queues in any way that benefits application traffic for your own network.

Table 5-57 CoS Priority Levels

Priority Level	Traffic Type
1	Background
2	(Spare)
0 (default)	Best Effort
3	Excellent Effort
4	Controlled Load
5	Video, less than 100 milliseconds latency and jitter
6	Voice, less than 10 milliseconds latency and jitter
7	Network Control

  - **PHB** – Per-Hop Behavior includes the following DiffServ queueing options:
    - Best-Effort uses the lowest priority. BE (DSCP, Q=0)
    - Assured Forwarding provides four priority classes. AF1X(DSCP,Q=1), AF2X (DSCP, Q=2), AF3X (DSCP, Q=3), AF4X (DSCP, Q=4)
    - Expedited Forwarding provides highest priority. EF (DSCP, Q=5)
  - **PHB Priority** – Per-hop behavior, or the priority used for this router hop.
    (Range: 0-7, where 7 is the highest priority)

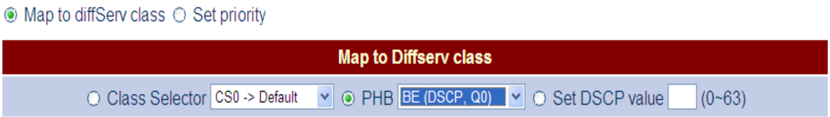
DSCP to 802.1p Mapping

Use the DSCP to 802.1p page to assign Class of Service (CoS) values to the priority queues (i.e., hardware output queues 0 - 3) on the CPE.

Most CPEs currently support Class of Service by using four priority queues, with Weighted Round Robin queuing for each port. Eight separate traffic classes are defined in IEEE 802.1p. The default priority levels are assigned as shown below.

Table 5-1 Default CoS Priority Levels

Priority	0	1	2	3	4	5	6	7
Queue	0	0	1	1	2	2	3	3

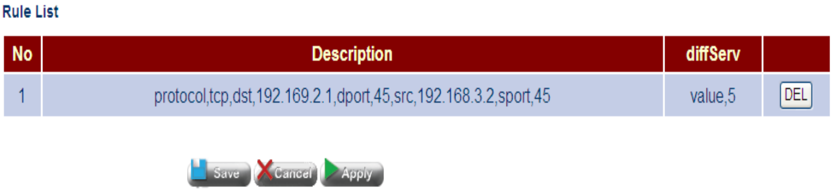


● Map to diffServ class ○ Set priority

Map to Diffserv class

○ Class Selector CS0 -> Default ● PHB BE (DSCP, Q0) ○ Set DSCP value (0~63)

Figure 5-58 DSCP to 802.1p Mapping



Rule List

No	Description	diffServ	
1	protocol,tcp,dst,192.169.2.1,dport,45,src,192.168.3.2,sport,45	value,5	DEL

Figure 5-59 DSCP to 802.1p Default Mapping

Field Attributes

- **Enable** – Enables DSCP to 802.1p mapping.
- **DSCP start** – Specifies the DSCP start priority.
- **DSCP end** – Specifies the DSCP end priority.
- **802.1p** – Specifies the 802.1p CoS priority.

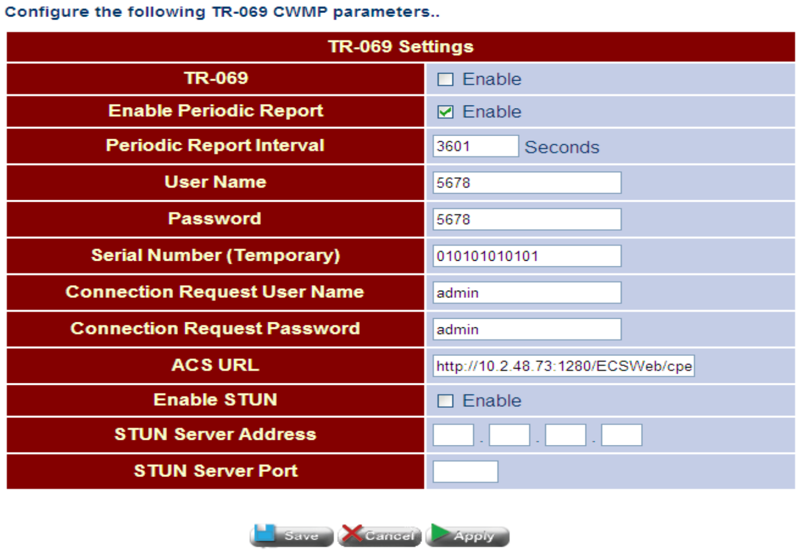
ACS Configuration

Configures parameters for auto-configuration servers (ACS) based on TR-069 (CPE WAN Management Protocol) and TR-098 (Internet Gateway Device Data Model for TR-069 Configuration).

TR Settings

This page is used to configure parameters for establishing a connection between the Gateway and an auto-configuration server.

Click TR. Configure the required parameters, and click Apply.



Configure the following TR-069 CWMP parameters..

TR-069 Settings	
TR-069	□ Enable
Enable Periodic Report	☑ Enable
Periodic Report Interval	3601 Seconds
User Name	5678
Password	5678
Serial Number (Temporary)	010101010101
Connection Request User Name	admin
Connection Request Password	admin
ACS URL	http://10.2.48.73:1280/ECSWeb/cpe
Enable STUN	□ Enable
STUN Server Address	. . .
STUN Server Port	

Figure 5-60 TR Settings

Field Attributes

- **TR** – Enables or disables connection with an auto-configuration server upon initial bootup and at the specified periodic report interval or when events occur that must be reported to the ACS (such as when the broadband IP address of the Gateway changes). When this parameter is enabled, the ACS can also issue a Connection Request to the Gateway at any time, instructing it to establish a communication session with the ACS.
- **Enable Periodic Report** – Enables periodic reporting of status and performance information, as well as information used to diagnose connectivity and service issues.
- **Periodic Report Interval** – The interval at which the Gateway must initiate a connection session with the ACS.

- **User Name** – A string used to identify the Gateway during authentication with the ACS. This string should be globally unique among all CPE manufacturers. Specifically it should be a multi-part string comprising a manufacturer identifier and a serial number unique within that manufacturer. The recommended format for this string is OUI-SERIAL, where OUI is a six-digit hexadecimal value using all upper-case letters and including any leading zeros. (Range: 1-6 characters)
- **Password** – A user name used to authenticate the Gateway when it attempts to make a connection with the ACS as defined in the CPE WAN Management Protocol. (Range: 1-256 characters)

  This user name is used only for HTTP-based authentication of the Gateway.

  Note that on a factory reset of the Gateway, this parameter is reset to its factory value. If an ACS modifies the value of this parameter, it should take into account the fact that the original value will be restored as the result of a factory reset.
- **Serial Number (Temporary)** – A temporary serial number to uniquely identify the unit's TR connection.
- **Connection Request User Name** – A user name used to authenticate an ACS when requesting the Gateway to establish a connection with it. (Range: 1-256 characters)
- **Connection Request Password** – A password used to authenticate an ACS when requesting the Gateway to establish a connection with it. (Range: 1-256 characters)
- **ACS URL** – HTTP or HTTPS URL that uniquely identifies the ACS.
- **Enable STUN** – Simple Traversal of UDP through NATs.
  Enables the use of STUN by the Gateway. This applies only to the use of STUN in association with the ACS to allow UDP Connection Requests. Some applications have difficulty connecting through a firewall to remote servers. If you experience this kind of problem connecting to the ACS, the use of a STUN server may be required to determine the IP address allocated to this application by the NAT.
- **STUN Server Address** – Host name or IP address of the STUN server to which the Gateway sends binding requests when STUN is enabled. If this field is empty and STUN is enabled, the Gateway must use the address of the ACS extracted from the host portion of the ACS URL.
- **STUN Server Port** – Port number of the STUN server to which the Gateway sends binding requests if STUN is enabled.
- **Root CA File** – The root file used in certificate-based authentication. This file is used by the Gateway to identify the ACS. Note that because this authentication process uses SSL/TLS, the ACS URL attribute on this page must be specified as an HTTPS URL.
- **Client Certificate File** – Filename of the client's digital certificate. This file is used by the ACS to identify the Gateway.
- **Client Private Key File** – A digital file used for message decryption, and to form digital signatures.

Appendix A: Troubleshooting

Diagnosing Gateway Indicators

Gateway operation is easily monitored via the LED indicators to identify problems. The table below describes common problems you may encounter and possible solutions. If the solutions in the table fail to resolve the problem, contact technical support for advice.

Table A-1 Troubleshooting Chart

Symptom	Cause	Solution
PWR indicator does not light up after power on.	Power outlet, power cord, or external power adapter may be defective.	• Check the power outlet by plugging in another device that is functioning properly. • Check the power adapter with another Gateway.
LAN link indicator does not light up after making a connection.	Network interface (e.g., a network adapter card in the attached computer), network cable, or Gateway LAN port may be defective.	• Verify that the Gateway and computer are powered on. • Be sure the cable is plugged into both the Gateway and the computer. • Verify that the proper cable type is used and its length does not exceed specified limits. • Check the network adapter in the computer and cable connections for possible defects. Replace the defective adapter or cable if necessary.
VDSL LINK indicator is off or does not stop flashing (i.e., synchronizing) after making a connection.	VDSL switch, cabling, or Gateway VDSL port may be defective.	• Verify that the Gateway and attached VDSL switch are powered on. • Be sure the cable is plugged into both the Gateway and an RJ-11 telephone jack. • Verify that the cable length does not exceed specified limits. (Check with your service provider for this information.) • Check the cable connections on the Gateway, wall jack, punch-down block/patch panel, and the VDSL switch for possible defects. Replace the defective cable if necessary.
ALARM indicator is on.	VDSL link failure	Restart the Gateway. If condition is not resolved, contact your service provider.

If You Cannot Connect to the Internet

- Check that your computer is properly configured for TCP/IP. See "Configuring the TCP/IP Protocols" on page 27.
- Make sure the correct network adapter driver is installed for your PC operating system. If necessary, try reinstalling the driver.
- Check that the network adapter's speed or duplex mode has not been configured manually. We recommend setting the adapter to auto-negotiation when installing the network driver.

Problems Accessing the Management Interface

Table A-1 Troubleshooting Chart

Symptom	Action
Cannot connect using Telnet, web browser, or SNMP software	• Be sure the Gateway is powered up. • Check the network cabling between the management station and the Gateway. • Check that you have a valid network connection to the Gateway and that the port you are using has not been disabled. • Be sure you have configured the VLAN interface through which the management station is connected with a valid IP address, subnet mask and default gateway. • Be sure the management station has an IP address in the same subnet as the Gateway's IP interface to which it is connected. • If you cannot connect using Telnet*, you may have exceeded the maximum number of concurrent Telnet/SSH sessions permitted. Try connecting again at a later time.
Cannot connect using Secure Shell	• If you cannot connect using SSH*, you may have exceeded the maximum number of concurrent Telnet/SSH sessions permitted. Try connecting again at a later time. • Be sure the control parameters for the SSH server are properly configured on the Gateway, and that the SSH client software is properly configured on the management station.
Forgot or lost the password	• Contact your local distributor.

* Telnet and SSH are not implemented for the current firmware, but will be made available for future releases.

Appendix B: Cables

Twisted-Pair Cable and Pin Assignments

For 10BASE-T and 100BASE-TX connections, the twisted-pair cable must have two pairs of wires. Each wire pair is identified by two different colors. For example, one wire might be green and the other, green with white stripes. Also, an RJ-45 connector must be attached to both ends of the cable.

Caution: DO NOT plug a phone jack connector into any RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform with FCC standards.

Caution: Each wire pair must be attached to the RJ-45 connectors in a specific orientation. (See “10BASE-T/100BASE-TX Pin Assignments” on page 113 for an explanation.)

The figure below illustrates how the pins on the RJ-45 connector are numbered. Be sure to hold the connectors in the same orientation when attaching the wires to the pins.

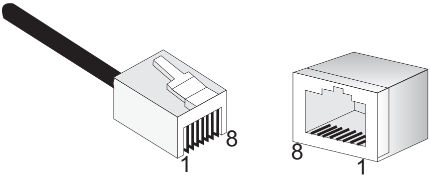


Figure B-1 RJ-45 Connector Pin Numbers

10BASE-T/100BASE-TX Pin Assignments

Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3, 4 or 5 cable for 10 Mbps connections, or 100-ohm Category 5 cable for 100 Mbps connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

The RJ-45 ports on the Gateway support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs or gateways. In straight-through cable, pins 1, 2, 3, and 6, at one end of the cable, are connected straight through to pins 1, 2, 3, and 6 at the other end of the cable. When using the RJ-45 port on this Gateway, you can use either straight-through or crossover cable.

Table B-1 10BASE-T/100BASE-TX MDI and MDI-X Port Pinouts

Pin	MDI Signal Name	MDI-X Signal Name
1	Transmit Data plus (TD+)	Receive Data plus (RD+)
2	Transmit Data minus (TD-)	Receive Data minus (RD-)
3	Receive Data plus (RD+)	Transmit Data plus (TD+)
6	Receive Data minus (RD-)	Transmit Data minus (TD-)
4,5,7,8	Not used	Not used

Note: The "+" and "-" signs represent the polarity of the wires that make up each wire pair.

Straight-Through Wiring

If twisted-pair cable is to join two ports and only one of the ports has an internal crossover (MDI-X), the two pairs of wires must be straight-through. (When auto-negotiation is enabled for the RJ-45 port on the Gateway, you can use either straight-through or crossover cable to connect to any device type.)

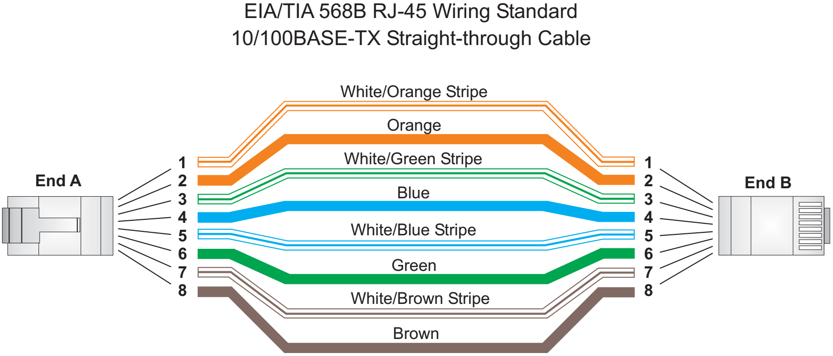


Figure B-2 Straight-through Wiring

Crossover Wiring

If the twisted-pair cable is to join two ports and either both ports are labeled with an "X" (MDI-X) or neither port is labeled with an "X" (MDI), a crossover must be implemented in the wiring. (When auto-negotiation is enabled for the RJ-45 port on the Gateway, you can use either straight-through or crossover cable to connect to any device type.)

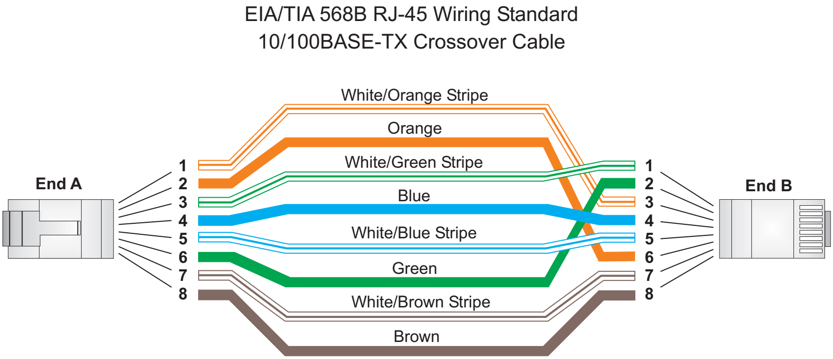


Figure B-3 Crossover Wiring

Cable Testing for Existing Category 5 Cable

Installed Category 5 cabling must pass tests for Attenuation, Near-End Crosstalk (NEXT), and Far-End Crosstalk (FEXT). This cable testing information is specified in the ANSI/TIA/EIA-TSB-67 standard. Additionally, cables must also pass test parameters for Return Loss and Equal-Level Far-End Crosstalk (ELFEXT). These tests are specified in the ANSI/TIA/EIA-TSB-95 Bulletin, "The Additional Transmission Performance Guidelines for 100 Ohm 4-Pair Category 5 Cabling."

Note that when testing your cable installation, be sure to include all patch cables between switches and end devices.

RJ-11 Ports

Standard telephone RJ-11 connectors and cabling can be found in several common wiring patterns. These six-pin connectors can accommodate up to three wire-pairs (three telephone lines), but usually only one or two pairs of conductor pins and wires are implemented.

The RJ-11 ports on the side of the Gateway contain two wire-pairs, an inner pair (pins 3 and 4) and outer pair (pins 2 and 5). On the LINE port, the inner wire-pair carries both voice and digital data. On the PHONE port, the inner wire-pair carries voice only.

The outer wire-pair is only connected if there is a second telephone line, and carries voice only.

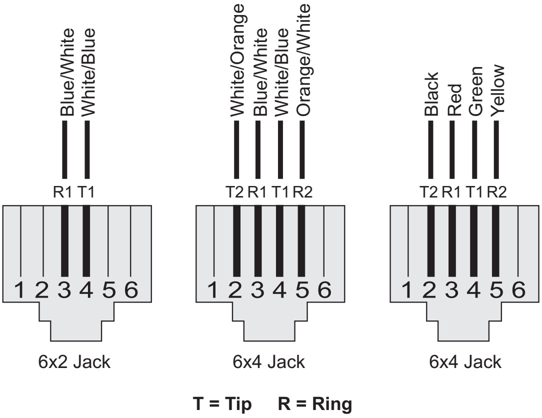


Figure B-4 RJ-11 Wiring

Table B-2 RJ-11 Port Pinouts

Pin	Signal Name	Wire Color
1	Not used	
2	Line 2 Tip	Black or White/Orange
3	Line 1 Ring	Red or Blue/White
4	Line 1 Tip	Green or White/Blue
5	Line 2 Ring	Yellow or Orange/White
6	Not used	

Appendix C: Specifications

VDSL Functional Criteria

VDSL2 profile 30A (100 Mbps upstream / 100 Mbps downstream)
Band Plan: 8D, 12A, 12B and 17A
Signal Bandwidth: 25 kHz to 17.664 MHz
Multi-Carrier-Modulation (MCM) - DMT modulation
Interleaving: general convolution
Upstream Power Back-off (UPBO)
Remote firmware upgrade

Physical Characteristics

Ports

1 RJ-11 VDSL line (to phone jack in the wall)
1 RJ-11 phone line (POTS connection to telephone, with built-in splitter)
1 RJ-45 10/100BASE-TX (Ethernet connection to PC)

Ethernet Interface

4 RJ-45 connectors, auto MDI/X pinout detection
10BASE-T: 100-ohm, UTP cable; Category 3 or better
100BASE-TX: 100-ohm, UTP cable; Category 5 or better

*Maximum Cable Length - 100 m (328 ft)

VDSL2 Interface

RJ-11 connector, using standard phone cable (26 AWG)

Power Consumption

15 Watts maximum

Input Power

12 VDC (via AC power adapter), 1.25 A maximum

Size

20.95 x 16.05 x 3.62 cm (8.25 x 6.32 x 1.43 in.)

Weight

385 g (13.5 oz)

Temperature

Operating: 0 °C to 40 °C (32 °F to 104 °F)
Storage: -25 °C to 70 °C (-13 °F to 158 °F)

Humidity

Operating: 20% to 90% (non-condensing)

LED Indicators

PWR, ALARM, VDSL LINK, VDSL TX/RX, LAN 1-4

Standards

Ethernet Standards

IEEE 802.3-2005 Ethernet Access
- Ethernet, Fast Ethernet
- Full-duplex flow control (ISO/IEC 8802-3)
- IEEE 802.1D Spanning Tree Protocol

IEEE 802.1p priority tags
IEEE 802.3ac VLAN tagging

VDSL Standards

ANSI T1.424-2004 (T1E1 T1.424 - 2004)
ETSI TS 101 270-1 and TS 101 270-2
ITU-T G.992.2 (ADSL2+, ADSL2, ADSL)
ITU-T G.993.1-2004 - VDSL (including Annex F)
ITU-T G.993.2 - VDSL2
ITU-T G.993.2 Annex A - Band Plan for North America
ITU-T G.993.2 Annex K - Packet Transfer Mode-Transmission Convergence
ITU-T G.993.2 - Recommendation for Trellis Coding,
- Impulse Noise Protection (INP), Upstream Power Backoff (UPBO),
- Recommendation for latency path correction including scrambling,
  - Reed-Solomon forward error correction, and interleaving,
- On-line Reconfiguration (OLR) Bit Swapping and Seamless Rate Adaptation

ITU-T G.993.2 Annex A - Power Spectral Density (PSD) Mask
ITU-T G.994.1 Handshake procedures for DSL transceivers
ITU-T 997 and 998 Band Plans
VDSL2 Profiles - Up to 17A
Rate Adaptation Mode - ITU G.993.2/G997.1 (Manual, Rate Adaptive AT INIT)
Other evolving ETSI, ANSI, ITU standards

Compliances

Emissions

FCC Class B
FCC Part 68
IEC 61000-4-2 ESD (level 2)
CE

Environmental

RoHS compliant

Wireless Characteristics

Wireless Transmit Power (Maximum)

802.11b : 20.36 dBm
802.11g : 22.84 dBm

Wireless Receive Sensitivity (Maximum)

802.11b/g:
802.11b: -85 dBm @ 1 Mbps; -80 dBm @ 11 Mbps
802.11g: -83 dBm @ 6 Mbps; -66 dBm @ 54 Mbps

Operating Frequency

802.11g:
2.4 ~ 2.4835 GHz (US, Canada)
2.4 ~ 2.4835 GHz (ETSI, Japan)
802.11b:
2.4 ~ 2.4835 GHz (US, Canada)
2.4 ~ 2.4835 GHz (ETSI)
2.4 ~ 2.497 GHz (Japan)

Data Rate

802.11b: 1, 2, 5.5, 11 Mbps per channel
802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps per channel

Operating Channels

802.11g:
11 channels in base mode (US, Canada)
13 channels (ETSI, Japan)
802.11b:
11 channels in base mode (US, Canada)

13 channels (ETSI)
14 channels (Japan)

Modulation Type

802.11g: CCK, BPSK, QPSK, OFDM
802.11b: CCK, BPSK, QPSK

Glossary

10BASE-T

IEEE 802.3 specification for 10 Mbps Ethernet over two pairs of Category 3, 4, or 5 UTP cable.

100BASE-TX

IEEE 802.3u specification for 100 Mbps Fast Ethernet over two pairs of Category 5 or better UTP cable.

Auto-Negotiation

Signalling method allowing each node to select its optimum operational mode (e.g., speed and duplex mode) based on the capabilities of the node to which it is connected.

Bandwidth

The difference between the highest and lowest frequencies available for network signals. Also synonymous with wire speed, the actual speed of the data transmission along the cable.

Bridging

A device that connects two LANs, or two segments of the same LAN. Unlike routers, bridges are protocol-independent. They simply forward packets without analyzing and re-routing messages. Consequently, they're faster than routers, but less versatile.

Challenge-Handshake Authentication Protocol (CHAP)

A type of authentication in which the authentication agent (that is, the router) sends the client a key to use to encrypt the user name and password. This enables the user name and password to be transmitted in an encrypted form to protect them against eavesdroppers.

Domain Name Service (DNS)

A system used for translating host names for network nodes into IP addresses.

Dynamic Host Control Protocol (DHCP)

Provides a framework for passing configuration information to hosts on a TCP/IP network. DHCP is based on the Bootstrap Protocol (BOOTP), adding the capability of automatic allocation of reusable network addresses and additional configuration options.

Dynamic Routing

Dynamic routing uses a routing protocol to exchange routing information with neighboring routers on the network. It calculates routing tables based on a given metric, such as lest number of hops or shortest path. It can respond to changes in the status or traffic on the network, re-routing traffic as required.

End Station

A workstation, server, or other device that does not forward traffic.

Ethernet

A network communication system developed and standardized by DEC, Intel, and Xerox, using baseband transmission, CSMA/CD access, logical bus topology, and coaxial cable. The successor IEEE 802.3 standard provides for integration into the OSI model and extends the physical layer and media with repeaters and implementations that operate on fiber, thin coax and twisted-pair cable.

Fast Ethernet

A 100 Mbps network communication system based on Ethernet and the CSMA/CD access method.

Firewall

A firewall is designed to prevent unauthorized access to or from a private network

Full Duplex

Transmission method that allows two network devices to transmit and receive concurrently, effectively doubling the bandwidth of that link.

Hosting Server

A network device that may provide a limited number of services for external IP clients, but is also used to transparently redirect specific service requests (such as web or FTP) to other dedicated local servers.

Internet Group Management Protocol (IGMP)

A protocol through which hosts can register with their local router for multicast services. If there is more than one multicast switch/router on a given subnetwork, one of the devices is made the “querier” and assumes responsibility for keeping track of group membership.

Internet Service Provider (ISP)

A company that provides access to the Internet. This may be your local telephone company, or a dedicated Internet service company.

ITU

International Telecommunication Union

ITU-T

Telecommunication Standardization Section of ITU

LAN Segment

Separate LAN or collision domain.

Layer 2

Data Link layer in the ISO 7-Layer Data Communications Protocol. This is related directly to the hardware interface for network devices and passes on traffic based on MAC addresses.

LED

Light emitting diode used for monitoring a device or network condition.

Local Area Network (LAN)

A group of interconnected computer and support devices.

Media Access Control (MAC)

A portion of the networking protocol that governs access to the transmission medium, facilitating the exchange of data between network nodes.

Management Information Base (MIB)

An acronym for Management Information Base. It is a set of database objects that contains information about a specific device.

Maximum Transfer Unit (MTU)

The maximum transfer unit for traffic crossing this device. MTU should be set to a value that minimizes unnecessary fragmentation and maximizes the transfer of large sequential data streams.

Media Dependent Interface (MDI)

The IEEE standard for the UTP interface to twisted-pair Ethernet. MDI defines a straight-through pin assignment that allows you to connect the router to any workstation or server that has a properly installed network adapter card using the supplied crossover cable. Pin-out assignments are shown in Appendix B.

Media Dependent Interface - Crossed (MDI-X)

MDI-X port types cross the receive and transmit signals internally, and can be used with straight-through cable to connect the router to a similar networking device (such as a hub or switch). Note that if you use the supplied crossover cable to connect to a similar networking device, then you must connect to an MDI port on the other device. Pin-out assignments are shown in Appendix B.

Network Address Translation (NAT)

A standard that enables a local-area network (LAN) to use one set of IP addresses for external traffic and a second set of addresses for internal traffic.

Network Time Protocol (NTP)

NTP provides the mechanisms to synchronize time across the network. The time servers operate in a hierarchical-master-slave configuration in order to synchronize local clocks within the subnet and to national time standards via wire or radio.

Password Authentication Protocol (PAP)

A basic form of authentication, in which a user's name and password are transmitted over a network and compared to a table of name-password pairs.

Ping

A utility used to determine whether a specific IP address is accessible. It works by sending a packet to the specified address and waiting for a reply.

Plain Old Telephone Service (POTS)

One of the services using voice band. Sometimes used as a descriptor for all voice band services.

Point-to-Point Protocol (PPP)

A protocol for connecting remote hosts to the Internet using TCP/IP.

PPP over Ethernet (PPPoE)

A protocol for connecting remote hosts to the Internet over an always-on connection by simulating a dial-up connection.

PSTN

Public Switched Telephone Network.

Private Branch Exchange (PBX)

A telephone exchange local to a particular organization who use, rather than provide, telephone services.

Quality of Service (QoS)

A network protocol used to specify a guaranteed throughput level. This protocol is often used by Internet service providers to guarantee their customers a minimum end-to-end latency.

Rate Adaptive

A VDSL service that automatically adjusts the transmission rate depending on line quality and loading to ensure data quality (such as, keeping within a maximum error rate).

Router

A device used to interconnect networks over local or wide areas and provide traffic control and filtering functions.

Routing

Routing forwards incoming IP packets using statically defined routes or a dynamic routing protocol such as RIP (or RIP 2).

Routing Information Protocol (RIP)

A protocol that specifies how routers exchange routing table information.

RJ-45 Connector

A connector for twisted-pair wiring.

Secure Shell (SSH)

A secure replacement for remote access functions, including Telnet. SSH can authenticate users with a cryptographic key, and encrypt data connections between management clients and the switch.

Session Initiation Protocol (SIP)

A control protocol used to create sessions with one or more participants for applications including Internet telephony and multimedia conferences.

Splitter

A filter to separate VDSL signals from POTS signals to prevent mutual interference. (Note that an external splitter is not required for this Gateway.)

Static Route

Static routes are manually configured entries in the routing table that indicate the next hop (router) that must be used when sending data to a specific subnet or host.

Telnet

Defines a remote communication facility for interfacing to a terminal device over TCP/IP.

Trivial File Transfer Protocol

A simple file transfer method that uses the User Datagram Protocol (UDP), and therefore provides no error recovery.

TIA

Telecommunications Industry Association

Transmission Control Protocol/Internet Protocol (TCP/IP)

Protocol suite that includes TCP as the primary transport protocol, and IP as the network layer protocol.

Universal Plug-and-Play (UPnP)

A set of protocols that allows devices to connect seamlessly and simplifies the deployment of home and office networks, using auto-discovery of other network devices, acquiring information about device capabilities, and requests for services.

UTP

Unshielded twisted-pair cable.

User Datagram Protocol (UDP)

UDP provides a datagram mode for packet-switched communications. It uses IP as the underlying transport mechanism to provide access to IP-like services. UDP packets are delivered just like IP packets – connection-less datagrams that may be discarded before reaching their targets. UDP is useful when TCP would be too complex, too slow, or just unnecessary.

Very high data rate Digital Subscriber Line (VDSL)

A family of digital telecommunications protocols designed to allow high speed data communication at data rates from below 1 Mbps to 52.8 Mbps with corresponding maximum reach ranging from 4500 feet to 1000 feet using 24 gauge twisted pair cable over the existing copper telephone lines between end-users and service providers.

Very high data rate Digital Subscriber Line 2 (VDSL2)

VDSL2 as defined in ITU-T Recommendation G.993.2 is an enhancement to the first VDSL standard (G.993.1). It supports transmission at a bi-directional net data rate (the sum of upstream and downstream rates) of up to 200 Mbps on twisted pair cables using a bandwidth of up to 30 MHz.

Virtual Private Network (VPN)

A secure tunnel used to protect data passing from one network to another over the Internet.

Wide Area Network (WAN)

A computer network that spans a relatively large geographical area. Typically, a WAN consists of two or more local-area networks (LANs).

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