NEXPEED NR304G/GH SHDSL Router

User's Manual
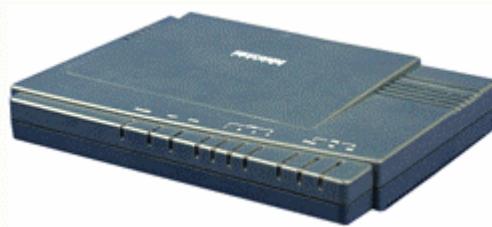
NexComm Systems

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U.S.A.

U.S.FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT
INFORMATION TO THE USER

NOTE : 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 the instructions, may cause harmful
interference to radio communications.
However, there is no guarantee that interference will not occur in a particular
installation.
If this equipment does cause harmful interference to radio or television reception,
which can be determined by turning the equipment off and on, the user is
encouraged to try to correct the interference by one or more of the following
measures:

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

Changes or modification not expressly approved by the party responsible for
compliance could void the user's authority to operate the equipment.
Connecting of peripherals requires the use of grounded shielded signal cables.

Contents

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PART I: *NEXPEED NR304* Introduction

☐ **Overview and Features**
☐ **Specification**
☐ **Product appearance**

Introduction

Introduction to the NEXPEED NR304G/GH router

Overview

The NR304G/GH router with SHDSL is a full-featured, stand-alone, router for connecting diverse local area networks(LANs) to the Internet and other remote networks. You will have a fast SHDSL(Symmetric High-speed Digital Subscriber Line) connection between your LAN and ISP's network of high-speed digital facilities. SHDSL is a technology based on the G.SHDSL(G.991.2) standard. NR304G/GH supports a packet-based network technology that allows high-speed transmission over twisted-pair copper wire between an Internet service provider central office and a customer site or on local loops created within a building.

NR304G/GH provides 1port G.SHDSL and 4ports Ethernet switch.

Features

NR304G/GH provides following possibilities.

■ It supports multiple line rates from 72kbps to 2320kbps without additional equipment investment. Also, it supports rate-adaptive capability.

■ Interoperates with NEXPEED NR104G router and NS300 DSLAM.

■ Support for an Ethernet LANs.

■ LED's on the front side for each interface's monitoring and troubleshooting.

■ Support for TCP/IP routing for internet and intranet connectivity

■ Support for UDP, ICMP, ARP protocol.

■ Support various management tools. (console-base management, Telnet and HTTP server)

■ Support for RIP1, RIP2 for IP routing protocol.

■ Support for HDLC, PPP, Frame-Relay, ETHDLC by WAN protocol.

■ Support for NAT(NAT/PAT).

■ Support for DHCP that assigns an IP address to local network nodes automatically and dynamically .

■ Support for ProxyARP operation.

■ Support various utilities such as PING, Traceroute.

Specification

The NR304GH router supports 1port G.SHDSL, 4ports Ethernet switch and console port.

[Table 1-1] The NR304GH router specification

Hardware Specifications	
Memory	DRAM : 4Mbyte up to 16Mbyte Flash Memory : 512Kbyte up to 2Mbyte
Line Coding Method	TCPAM(G.991.2)
DSL Port (for G.SHDSL)	1port with RJ-11
LAN Port (for Ethernet)	4ports with RJ-45
Console Port	RJ-45
Data Rate	WAN: 72kbps~2320kbps LAN: 10/100Mbps auto
Power	external Adapter 5V 2.0A
Dimension	230mm(W) x 165mm(D) x 35mm(H)
Software Specifications	
LAN	TCP/IP
WAN	HDLC, PPP(PAP/CHAP), Frame-Relay ETHDLC, NTNHDLC
Routing	RIP I, RIP II
Management	SNMPv1(MIB I, MIB II)
Application	TELNET, DHCP, NAT, IP Filter, ProxyARP, TFTP upgrade

The NR304G router supports 1port G.SHDSL, 1port Ethernet and console port.

[Table 1-1] The NR304G router specification

| Hardware Specifications	
Memory	DRAM : 4Mbyte up to 16Mbyte Flash Memory : 512Kbyte up to 2Mbyte
Line Coding Method	TCPAM(G.991.2)
DSL Port (for G.SHDSL)	1port with RJ-11
LAN Port (for Ethernet)	1port with RJ-45
Console Port	RJ-45
Data Rate	WAN: 72kbps~2320kbps LAN: 10/100Mbps auto
Power	external Adapter 5V 2.0A
Dimension	230mm(W) x 165mm(D) x 35mm(H)
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LAN	TCP/IP
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Routing	RIP I, RIP II
Management	SNMPv1(MIB I, MIB II)
Application	TELNET, DHCP, NAT, IP Filter, ProxyARP, TFTP upgrade

Product appearance

The front side for the NR304G/GH Router

The NEXPEED NR304G/GH router has various LEDs in the front panel to provide port status information in real time.

[Figure 1-1] The front side of the NR304G   [Figure 1-2] The front side of the NR304GH
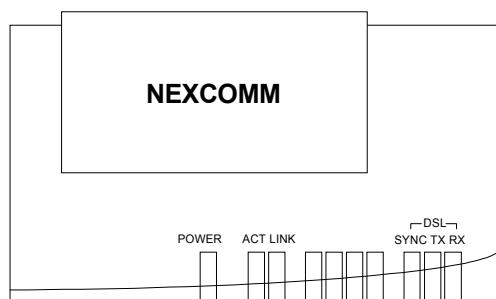
NEXCOMM

POWER   ACT LINK   ┌DSL┐
                                    SYNC TX RX

NEXCOMM

POWER   ACT COL   ┌LINK┐   ┌DSL┐
                  1 2 3 4   SYNC TX RX
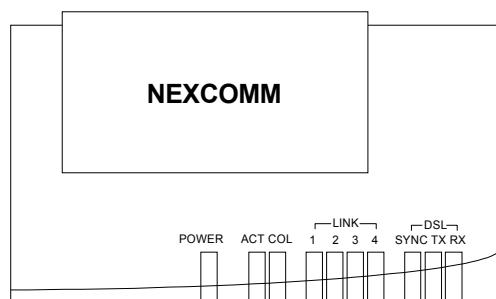
LEDs in the front side of the NR304G/GH router shows router's status at the time.

[Table 1-2] Status of LEDs

| LED	STATUS	DESCRIPTION
POWER	ON/OFF	Power ON/OFF
ACT	Blink	LAN port data receiving status
COL	ON/OFF	LAN port collision status (NR304GH only)
LINK	ON/OFF	LAN port physical cable connection status
SYNC	ON/OFF	DSL port G.SHDSL sync. status
TX	Blink	DSL port data transmitting status
RX	Blink	DSL port data receiving status

The rear side for the NR304G/GH Router

The NR304G/GH router provides power, console, and LAN cables, in addition to the G.SHDSL line connector in the backside.

[Figure 1-3] The rear side of the NR304G router
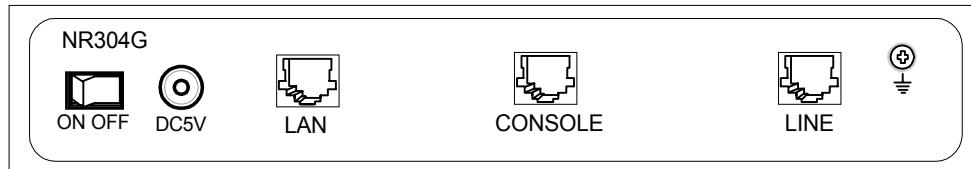
[Figure 1-4] The rear side of the NR304GH router
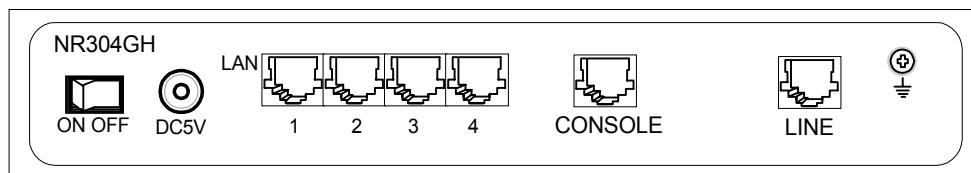
[Table 1-3] The table below explains each port

Port	Explanation
DC5V	Connect to a DC 5V power adapter (an external 5V 2.0A adapter).
CONSOLE (RJ-45 to DB9)	Connect to a console cable for a serial communication with a user's computer.
LAN (RJ-45)	Connect to a UTP cable for communication with network devices such as user's computer, hub, switch, and router.
LINE (RJ-11)	Connect a pair of copper wires for G.SHDSL communication, i.e., connect to the 3rd and 4th pins of the RJ-11 jack (6pin connector).

PART II: Installing the Router

☐ **Before getting Start**
☐ **Checking in the box**
☐ **Connecting cable and connector**

Before getting Start

You check the items below before installing the Router

■ Setting up Internet services

■ Configuring TCP/IP on your network nodes.

Setting up Internet service

The NR304G/GH Router with SHDSL provides its high-speed connection to the Internet through a CLEC(Competitive Local Exchange Carrier).

In determining which Internet Service Provider to establish your account with, you must be sure that your ISP supports connections via a CLEC with a compatible DSLAM.

Information you can get from the ISP

- Local WAN IP address and subnet mask
- Local Area Network(LAN) IP address
- Default gateway IP address
- Primary and secondary domain name server(DNS) IP address
- Multi e-mail address
- Web site hosting

Configuring TCP/IP on your computer

To gain an access to the network through the NEXPEED NR304G/GH router connection, the corresponding computer should satisfy the following requirements.

1) Hardware and OS Requirements

	PC	Macintosh
System Software	DOS, Windows 95, Windows 98	MacOS 7.5 or Higher
Network Software	TCP/IP	MacTCP or Open Transport TCP/IP
Network Hardware	Ethernet card (10BASE-T or Higher)	Built-in Ethernet card or the third party Ethernet card (for 10BASE-Tor Higher)
Note	The router can connect with not only a user's computer but also a repeater, such as a hub or a switching device.	

2) Configuring TCP/IP on Windows 95, 98

To set up TCP/IP to allow for network communications on Windows 95 or 98 environment, the following procedure should be performed.

☞ Check the user's computer hardware.

√ Make sure that the Ethernet card (Network Adapter) is installed.

√ Make sure that the Ethernet card supports the TCP/IP protocol.

☞ Confirm if TCP/IP has already been installed in the computer running on Windows 95 or 98. The confirmation can be done with the following steps: [Start] → [Setup] → [Control Panel] → [Network] → [Network Configuration]. If the item TCP/IP is not found, use Windows 95 or 98 Setup CD and install it.

3) Assigning an IP Address to the Host

If both hardware and software were already installed for the network services set the IP address that was assigned to the host.

① [Start] → [Setup] → [Control Panel] → [Network] → [Network Configuration]
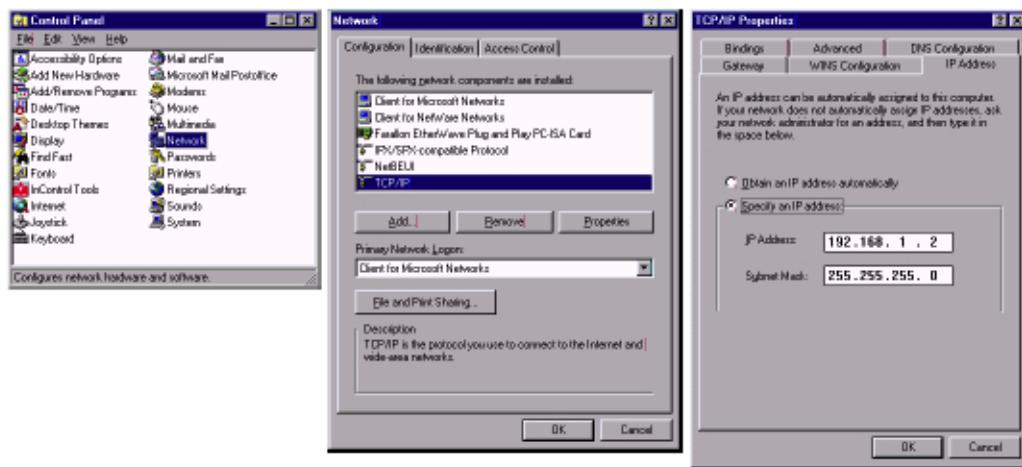
② Select TCP/IP in the list and then select the Registration Information tap. If TCP/IP Registration Information is displayed in the screen, select the IP Address tap.

Click "Use Assigned IP Address" and then enter the assigned IP address and subnet mask.

If the assigned IP address and subnet mask are not known, contact the network manager.

③ Click the Gateway tap. In "New Gateway" field, enter the IP address assigned to the NEXPEED NR304G/GH router.

④ Click the DNS Configuration tap. Click the "Use DNS" button and enter the following information.

1) Host : Enter the name of the current computer.

2) Domain : Enter the user's domain name.

If it is not known, enter the ISP domain name.

3) DNS server address to search for : Enter the IP address of DNS (Domain Name Server) to process the domain, and click "Add". For the SubDNS server, follow the same procedure as above.

4) Domain address to search for : Enter the domain name that you entered in the previous step.
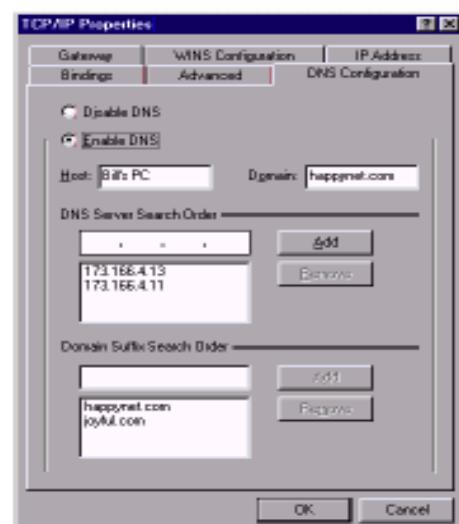
⑤ Click the "Confirm" button in the current window. In the next window, click the "Confirm" button to activate rebooting of the computer.

Checking in the box

Physical Environments

To make the installation as well as use of the NEXPEED NR304G/GH router safe, a constant temperature and humidity are required. The conditions of physical environment are as follows.

- Operating Temperature: 0ºC ~ 50ºC
- Relative Humidity: 5% ~ 95% (non-condensing)
- Caution: No Fire

Checking in the Box

Following items are needed for the set up of NEXPEED NR304G/GH Router.

- Power cable and a AC/DC adapter
- UTP cable with RJ-45 for LAN connection
- Console cable (RJ-45 to DB9 connector)
- Telco cable with RJ-11(use 3rd and 4th pin) for SHDSL connection

The box in which you received the NEXPEED NR304G/GH product should contain the following components. Please be sure to check if the following items are found in the box.

[Table 2-1] In a package of the NEXPEED NR304G/GH router has following items:

Part's Name	Amount	Usage
Main Body	1	The router's main body
Power Cable	1	A cable that supplies power to the router.
Power Adapter	1	A AC/DC adapter (DC 5V)
Console Cable	1	RJ-45 to DB-9 pin cable
UTP Cable	1	For a Local Area Network(LAN) connection
DSL Cable	1	For a SHDSL connection
Documentation	1	This Guide

Connecting cable and connector

This part explains the physical set up for NEXPEED NR304G/GH router. Connect the cable after checking the connector in the rear side of NR304G/GH router.

Connecting Power Cables

1> Connect one end of the power cable to the DC adapter.

2> Plug the other end of the power cable into the power terminal.

3> Plug the other end of the AC/DC power adapter into the port named "DC5V" in the back of the NR304G/GH unit.

4> Confirm if the LED named "POWER" is turned on among the LEDs in the front panel.

Note: If the LED is not on, check if the power cable is properly connected or if the power terminal is being supplied with the normal power.

Connecting LAN Port

1> Confirm if the UTP cable connector is a RJ-45 jack.

2> Connect one end of the UTP cable to the network equipment such as a cable or hub.

3> Connect the other end of the UTP cable to the port named "LAN" in the back of the NR304G/GH unit.

4> Confirm if the LED named "LINK" is turned on among the LEDs in the front panel.

Note1: If the LED is not on, check if the UTP cable is properly connected or if there is a disconnection in the UTP cable or if the RJ-45 jack is properly plugged in.

Note2: You can use a cable both UTP Straight-through cable and UTP Cross-over cable to connect PC(or Hub/Switch) to NR304's LAN port.

Connecting LINE(DSL) port

1> Plug the RJ-11 connector (to be connected to the 3rd and 4th pins, in case of 6pins) into a pair of regular telephone lines preinstalled for the SHDSL connection and, use a tool to achieve a correct assembly.

2> Connect the assembled RJ-11 connector to the port named "LINE" in the back of the NR304G/GH unit.

Note: Among the front panel LEDs, the LED named "SYNC", a branch of "DSL", will be turned on when the router is ready for a normal communication.

Connecting Console Ports

You can change the setting in the console to modify the functionality of the NR304G/GH.

1> Check if there is a console cable in the purchased product box.

2> Connect the RJ-45 connector to the port named "CONSOLE" in the back of the NR304G/GH unit.

3> Connect the DB-9 connector, which is the other end of the cable, to the computer's COM port.

4> Run any communications program that supports vt100 emulation(HyperTerminal or Zterm) to communicate directly with the router through the computer's COM port.

Note: If random or illegible characters appear on your display, you probably have a communications-setting problem. Mask sure that your communications software is configured as follows :

[Table 2-2] Console software parameters

PARAMETER	VALUE
Bits per Second	9600
Data Bits	8
Parity	N
Stop Bit	1
Flow Control	None
Terminal Type	VT100

PART III: Configuring the Router

☐ **Accessing the Console**
☐ **User Mode**
☐ **Establishing LAN interface**
☐ **Establishing WAN interface**
☐ **Configuring the Routing Table**
☐ **Configuring the ARP Table**
☐ **Saving the Configuration**
☐ **Rebooting the system**

Accessing the Console

You can change the setting in the console to modify the functionality of the NR304G/GH unit.

The NEXPEED NR304G/GH provides CLI (Command Line Interface) in the text mode to setup and operate built-in functions, which can be used after the console is connected.

You can access the console through a serial connection or an Ethernet connection.

Serial Connection

For a user of a serial connection, you connect a console cable to your computer and the router's console port. You then use any communication program that supports vt100 emulation(HyperTerminal or Zterm) to communicate directly with the router through the computer's COM port.

Note: If random or illegible characters appear on your display, you probably have a communications-setting problem. Mask sure that your communications software is configured as follows :

[Table 3-1] Console software parameters

PARAMETER	VALUE
Bits per Second	9600
Data Bits	8
Parity	N
Stop Bit	1
Flow Control	None
Terminal Type	VT100

Telnet Connection

Once the NR304G/GH has been configured with an IP address, you can use the IP address to open a Telnet session with the unit from any workstation on the same Ethernet network. The NEXPEED NR304G/GH can be configured using a program that supports Telnet protocol. If the system uses Windows 95 or 98 as an operating system, all you need to do is just to run the Telnet application in the folder or run the Telnet program in the Start menu. Like the Telnet, you can run the execution program in the folder where software packages supporting the Telnet protocol were installed.

User Mode

The NEXPEED NR304G/GH supports two modes: Login Mode and Configuration Mode. The dual mode like this provides a security feature for configuration and operation of the router.

Login Mode

This mode does not allow for a router configuration. In this mode, however, only such commands that are associated with monitoring are executed for the equipment operation.

Activating the Login Mode :

1> Enter the password and press Enter to accept it. The default is "password" :

Password : password

If you enter the correct password, the command-line prompt appears as follows :

NR304>

2> To close this mode, enter the Exit command at the prompt.

NR304> exit

*Note***:** The default password must be typed in a lower case. If the properly typed default password does not work, check whether the Caps Lock key is pressed or not.

Configuration Mode

This mode makes all command available to configuring system and monitoring administrative information.

Activating the Configuration Mode.

1> Type the following command in Login Mode :

NR304> enable

Enter the password and press Enter to accept it. The default is "password" :

Password : password

If you enter the correct password, the command-line prompt appears as follows :

NR304(conf)#

2> To close this mode, enter the Exit command at the prompt.

NR304(conf)# exit

*Note***:** The default password must be typed in a lower case. If the properly typed default password does not work, check whether the Caps Lock key is pressed or not.

Changing a Password

Password security to protect the unit from unauthorized access. Changing a password is a integral part of setup and operation of the router and it is strongly recommended to consult with the manager on the matter. The password may be changed only in Configuration Mode.

Changing a password for Login Mode.

COMMAND	(conf)# passwd
Usage Examples	NR304(conf)# passwd Enter login password:xxxx New password:yyyy Re-enter new password:yyyy

Changing a password for Configuration Mode.

COMMAND	(conf)# passwd config
Usage Examples	NR304(conf)# passwd config Enter config password:xxxx New password:yyyy Re-enter new password:yyyy

And then you must save the changes in Flash memory.

COMMAND	(conf)# write config

Note: If you lost your password, please contact Nexcomm Systems Co., Ltd.

Tel: +82-31-781-1862

E-mail: sales@nexcomm.co.kr / support@nexcomm.co.kr

Establishing LAN Interface

Assigning an IP Address to the LAN interface

To enable the router-connected user's local network (LAN) to communicate with the outside, the IP address should be set in the LAN interface of the NEXPEED NR304G/GH router. If the IP address is assigned to the LAN interface without an additional activation command, the interface can be automatically enabled, making the communication possible.

The pre-allocated IP address and subnet mask should be set in the LAN interface.

If the IP address to be set is not known, please contact the network manager.

COMMAND	(conf)# interface <ifname> ip <address> <mask> [secondary]
Parameters	<ifname> : interface name <address> : IP address <mask> : subnet mask [secondary] : Input is required if multiple IP addresses are assigned to the interface.

Usage Examples:

```
(conf)# interface lan ip 168.126.188.130 255.255.255.0

(conf)# interface lan ip 192.168.3.2 255.255.255.224 secondary
```

Viewing the current configuration settings for the LAN interface

Lists information about the LAN interface including the status of routing and bridging and IP address and subnet mask.

COMMAND	(conf)# show interface [-v|-c] [<ifname>]
Parameters	-v option provides various visual statistics regarding the interface. -c option initializes the statistics. <ifname> : interface name

Usage Examples:

```
(conf)# show interface lan

(conf)# show interface -v lan

(conf)# show interface –c lan
```

Note: If you omit the interface name, all interface are listed.

Configuration example 1

(conf)# interface lan ip 168.126.188.130 255.255.255.0

☞ sets up the "168.126.188.130" IP address to the LAN interface, subnet mask value is "255.255.255.0".

Displays the LAN interface information as follows :

(conf)# show interface lan

Interface: lan, status <UP>, mtu 1500

    ip address 168.126.188.130 255.255.255.0

    Routing-only mode

    ether 00:d0:84:01:08:b2, speed 100 Mbps full-duplex

(conf)#

Viewing the statistics for the LAN interface

(conf)# show interface -v lan

Interface: lan, status <UP>, mtu 1500

----

    ip address 168.126.188.130 255.255.255.0

    Routing-only mode

    ether 00:d0:84:01:08:b2, speed 100 Mbps full-duplex

    descriptor   rhead:0x921e0   thead:0x91db8   ttail:0x91db8

    statistics:

        10 RxOK, 0 RxNoBufs, 0 RxMiss

        0 RxCRCErr, 0 RxAlignErr, 0 RxDribbles

        5 TxOK, 0 TxNotReady, 0 TxTooBig

        0 TxLossCRS, 0 TxLateCols, 0 TxCollisions

(conf)#

Configuration example 2 : Setting up the multiple IP address to the LAN interface

```
(conf)# int lan ip 172.16.10.1 255.255.255.0 secondary
```

☞ sets up the "172.16.10.1" IP address to the LAN interface as the secondary IP address, subnet mask value is "255.255.255.0".

Note: Don't forget adding the string "secondary". Otherwise, it replaces your primary IP address with new IP address.

(conf)# show interface lan

Interface: lan, status <UP>, mtu 1500

    ip address 168.126.188.130 255.255.255.0

    ip address 172.16.10.1 255.255.255.0 **secondary**

    Routing-only mode

    ether 00:d0:84:01:08:b2, speed 100 Mbps full-duplex

(conf)#

Deleting the secondary IP address

(conf)# int lan delete secondary 172.16.10.1

☞ deletes the "172.16.10.1" IP address as the secondary IP address.

(conf)# sh int lan

Interface: lan, status <UP>, mtu 1500

    ip address 168.126.188.130 255.255.255.0

    Routing-only mode

    ether 00:d0:84:01:08:b2, 100 Mbps full-duplex

(conf)#

Establishing WAN(SHDSL) Interface

The NR304G/GH unit support 1port with SHDSL connection. The LINE port is called WAN interface.

Configuring Annex Type(Annex A/ Annex B)

The G.991.2 Annexes are specific to SHDSL. The G.SHDSL is organized into a bass document with two regional annexes. Annex A refers to North American specific requirements. Annex B refers to European specific requirements.

The default Annex type is Annex A.

COMMAND	(conf)# device <ifname> annex a|b

Usage Examples: `(conf)# device wan annex b`

☞ Configure SHDSL annex type B.

Verifying your change

COMMAND	(conf)# show device

Setting the WAN(SHDSL) device

The WAN interface supports multiple data rate and rate-adaptive capability. Also it can act as both a COE and a CPE. The SHDSL port supports multiple line rates ranging from 72 kbps to 2320 kbps. In rate adaptive mode line rate is negotiated the highest achievable data rate given the loop conditions and then locked when the line trains. To control the SHDSL physical port, use the following commands:

COMMAND	(conf)# device <ifname> gshdsl co [auto] <kbps> (conf)# device <ifname> gshdsl rt

Parameters	<ifname> : interface name
	co|rt : unit type (COE or CPE), The default is CPE.
	[auto] : adaptive rate mode, If you type this option, the mode is
	        changed into adaptive mode.
	<kbps>: sets a line rate in kbps from 72 kbps to 2320 kbps
	        ; 64 x N + 8 + 8 x I , N=1~36 / I=0,1

Note : The CPE unit can set 'adaptive mode' only, then you can't set the specific line rate.

Usage Examples:

```
(conf)# device wan gshdsl co 2320

(conf)# device wan gshdsl rt

(conf)# device wan gshdsl co auto 2320
```

Viewing the device configuration

To verify whether the unit type and a line rate are correct for your application, use the following command:

COMMAND	(conf)# show device

```
(conf)# sh dev
name    type              side   speed
-------------------------------------------
lan     10base-t            *    10 Mbps
wan     gshdsl  (ANNEX-A)   RT   auto
(conf)#
```

Usage example:

(conf)# dev wan gshdsl co 2320

☞ The wan interface functions as COE and operates at a line rate of 2320Kbps in Fixed Mode.

(conf)# dev wan gshdsl rt

☞ The wan interface functions as CPE.

(conf)# dev wan gshdsl co auto 2056

☞ The wan interface functions as COE and operates at a line rate of 2056Kbps(maximum bit rate) in Adaptive Mode.

Monitoring the SHDSL port

Use the "gshdsl" command to display the status of a G.SHDSL physical port on the router.

COMMAND	(conf)# gs

(conf)# gs

==

G.SHDSL R2.0(A.233.1.21) Device Driver, (14:25 05/15/2002)   ☞ chipset information

==========================

Line #   0

==========================

Side	RT	☞ Equipment Type
Mode	ADAPTIVE	☞ Rate Mode
OP state	[Data]	☞ Operating Status
SYNC status	sync	☞ SYNC Status (none/ sync)
rate(kbps)	2320	☞ Actual bit rate
Tx Power	13	☞ Transmit Power
LoopAtten(dB)	-1	☞ Loop Attenuation
SNR(dB)	35	☞ Received signal-to-noise ratio(SNR)
SMargin (dB)	2	☞ Start-up margin value

(conf)#

Note1: Operating Status

Handshake, when local transceiver tries to reach the far-end transceiver.

Training, indicates the startup training is in progress.

Data, if successfully trained.

Note2: Loop Attenuation

The difference in decibels (dB) between the power received at the near-end and the power transmitted from the far-end.

You can verify values related the data rate using the following command :

COMMAND	(conf)# gs status

If you type the following command, it displays "gshdslset help" commands.

COMMAND	(conf)# gs help

```
(conf)# gs help
Usage:gshdslset margin [0 .. 15]
      gshdslset backoff [enable|disable]
      gshdslset status
      gshdslset psdtest [enable|disable]
      gshdslset mode [0 .. 7]
(conf)#
```

Changing the Start-up Margin value

To configure shdsl Start-up margin values, use the following command :

The default Start-up margin is 2dB. NexComm suggests using the default settings.

COMMAND	(conf)# gs margin <dB value[0..15]>

Note: Changing the Start-up margin on a live port results in a retrain of the line.

Usage example: (conf)# gs margin 3

        Start-up margin is changed into 3 dB.

        (conf)#

Enabling/Disabling the Power back-off

To enable or disable power backoff, use the following command: The NR304G/GH enables power backoff by default.

COMMAND	(conf)# gs backoff enable
COMMAND	(conf)# gs backoff disable

Power back-off   Once the initial SYNC has occurred, the COE(DSLAM) and the CPE can work together to reduce the amount of power used on the wire. If the data rate is set to a speed lower than the full capability of the loop being used, there is no need to push maximum power on the loop. Instead, the COE(DSLAM) can reduce the power level, maintaining speed while using the minimum amount of power to support the signal.

Assigning the IP Address to the WAN interface

The IP address and subnet mask, both of which are supposed to be pre-allocated to the SHDSL segment in advance, should be set in the WAN interface. The NR304G/GH unit provides an "unnumbered" parameter option to make a communication possible through a physical connection without setting an additional IP address in the SHDSL segment.

COMMAND	(conf)# interface <ifname> ip unnumbered
	(conf)# interface <ifname> ip <address> <mask> [secondary]
Parameters	unnumbered : Required if the IP address was not allocated.
	<ifname> : interface name
	<address> : IP address
	<mask> : subnet mask
	[secondary] : Multiple IP addresses can be allocated to the interface when there is an additional input.

Usage Examples:

```
(conf)# interface wan ip 192.168.3.2 255.255.255.224 secondary
(conf)# interface wan ip unnumbered
```

Defining an encapsulation method

The NR304G/GH and the remote device must agree upon the type of link encapsulation used. The NR304G/GH unit must encapsulate all outbound packets before sending them across the WAN, and the remote device must decapsulate them before forwarding the packets to the local network.

The NR304G/GH supports various encapsulation methods such as HDLC, PPP, Frame-Relay, ETHDLC and NTNHDLC(a protocol for communicating with NettoNet technologies products. It supports interoperability for both base-level layers 1 and 2 and NettoNet technologies's innovative feature sets.).

By default, WAN(SHDSL) interface use the High-Level Data Link Control (HDLC) serial encapsulation method, which provides the synchronous framing and error detection functions of HDLC without windowing or retransmission.

You can define the encapsulation method by using the following command:

COMMAND	(conf)# interface <ifname> encap hdlc|ppp|frelay|ethdlc|ntnhdlc
Parameters	<ifname> : interface name hdlc : HDLC protocol ppp : PPP protocol frelay: Frame-Relay protocol ethdlc : ETHDLC protocol, it is used to connect a modem ntnhdlc: NTNHDCL protocol, it is used to connect a NettoNet technologies's product

Usage Examples:

```
(conf)# interface wan encap ethdlc
```

Viewing the current configuration settings for the WAN interface

Lists information about the WAN interface including the status of routing and bridging, encapsulation, IP address and subnet mask and a line rate.

COMMAND	(conf)# show interface [-v|-c] [<ifname>]
Parameters	-v option provides various visual statistics regarding the interface. -c option initializes the statistics. <ifname> : interface name

Usage Examples:

```
(conf)# show interface wan
(conf)# show interface -v wan
```

Note: If you omit the interface name, all interface are listed.

Configuring the Routing Table

Setting up Static Route

A static route is a path from one network to another, which specifies the destination network and the router to use get to that network. For routes that must be reliable, the administrator often configures more than one path (adds a secondary route), in which case the NR304G/GH chooses the primary route on the basis of an assigned metric.

Note: If no routes exist for the destination address of a packet, the NR304G/GH forwards the packet to the default route. If there is no default route, the NR304G/GH drops packets for which it has no route.

1> Adding the static route :

COMMAND	(conf)# ip route add default <ifname> [<gw>] [<metric>]
	(conf)# ip route add <net> <mask> <ifname> [<gw>] [<metric>]
Parameters	default : adds the default route <net> <mask> : adds the destination network <ifname> : Name of the interface through which a packet addressed to this destination will be sent. <gw> : the address of the gateway to use for that destination network. If the interface has been configured with "unnumbered", you should not enter this option. <metric> : a metric value for this route

Usage Examples:

```
(conf)# ip route add default wan
```

☞ adds the default gateway to forwards the packet to the WAN interface.

```
(conf)# ip route add 210.10.10.0 255.255.255.0 lan 168.126.188.5
```

☞ adds the path to "210.10.10.0/255.255.255.0" network is through the gateway at 168.126.188.5 on the local LAN.

Note: The "ip route add" command can add multiple path of the same network. To overwrite a static route to that network, you first remove route (or routes) existing for the same network.

2> Deleting the static route :

COMMAND	(conf)# ip route del default|all
	(conf)# ip route del <net> <mask> [<ifname>] [<gw>]

Usage Examples:

```
(conf)# ip route del all
```

☞ removes all static route and RIP entries from the routing table.

```
(conf)# ip route del 210.10.10.0 255.255.255.0
```

☞ deletes the path to "210.10.10.0/255.255.255.0" network

```
(conf)# ip route del default
```

☞ deletes all default routes.

Viewing the Routing Table

To display information for the routing table, use the following command. Displays only routes is current available

COMMAND	(conf)# show ip route [-a]
Parameters	-a options is displayed all routes in the routing table.

Displays only available routes on the routing table :

(conf)# show ip route

destination	netmask	gateway	met	ifname	type
default	*	0.0.0.0	1	wan	static
210.10.11.0	255.255.255.0	168.126.188.100	1	lan	static
168.126.188.0	255.255.255.0	168.126.188.130	0	lan	connected

☞ NR304G/GH dynamically adds a directly connected route. The type column value is "connected".

Displays all routes on the routing table :

(conf)# show ip route -a

destination	netmask	gateway	met	ifname	type
default	*	0.0.0.0	1	wan	static
127.0.0.1	255.255.255.255	127.0.0.1	0	local	local
210.10.11.0	255.255.255.0	168.126.188.100	1	lan	static

224.0.0.9	255.255.255.255	127.0.0.1	0	local	local
168.126.255.255	255.255.255.255	127.0.0.1	0	local	local
168.126.188.255	255.255.255.255	168.126.188.130	0	local	local
168.126.188.130	255.255.255.255	168.126.188.130	0	local	local
168.126.188.0	255.255.255.0	168.126.188.130	0	lan	connected
255.255.255.255	255.255.255.255	127.0.0.1	0	local	local

(conf)#

☞ Routes pointing to local machines are labeled local, with a single route for each local IP address.

RIP(Routing Information Protocol)

A dynamic route is a path to another network that is "learned" dynamically. A router that uses RIP broadcasts its entire routing table every 30 seconds, updating other routers about which routes are usable. Dynamic routes age and if no updates are received, they eventually expire.

NR304G/GH unit supports RIP1 and RIP2 to configuring the dynamic route. RIP (Routing Information Protocol) is one of the most popular protocols currently in use.

RIP1(version I) does not support the subnet mask information, whereas RIP2 (version II) supports CIDR (Classless Inter-domain Route) block address, VLSM (Variable Length Subnet Masking), route summarization, and security.

RIP is saved as a form of routing table in the internal cache. These routing information are periodically broadcast to the neighboring routers by means of UDP protocol. To update its routing table to enhance its reliability, the host can receive information that was already broadcast and it can compare its own information with the received information to generate optimum routing information. RIP use distance vector metric, so the metric is interpreted as a hop count.

Configuring RIP

You can configure the router to send and receive RIP packet information, respectively, to and from the remote router. The default is to not send or receive IP RIP packets. If RIP packets are not allowed to flow on the LAN or WAN link, you must use the "ip route add" command to configure static routes for this link.

To set or clear RIP options on an interface, use the following command:

COMMAND	(conf)# rip enable|disable <ifname> rxrip1|txrip1|rxrip2|txrip2
COMMAND	(conf)# rip enable|disable <ifname> rxdefault|txdefault
Parameters	<ifname> : interface name rxrip1: Receive and process RIP-1 packets only txrip1: Send RIP-1 packets only rxrip2: Receive and process RIP-2 packets only txrip2: Send RIP-2 packets only rxdefault: Receive the default route address. This option is useful if you do not want to configure your router with a default route. txdefault: Send the local site's default route

Usage Examples:

```
(conf)# rip enable wan rxrip2 txrip2
```

☞ The router sends and receives RIP-2 packets.

```
(conf)# rip enable wan rxdefault txdefault
```

☞ The router sends the local site's default route to the remote destination.

Note: The default route specifies a static route to another IP router, which is often a local router. In that case, although the rxdefault is set to enable, RIP updates do not configuring the default route in the routing table.

Sending RIP packets manually to the specified interface

COMMAND	(conf)# rip send <ifname> v1|v2

Usage Examples:

```
(conf)# rip send wan v2
```

☞ immediately transmits RIP-2 updates over the WAN interface.

Viewing the RIP configuration

Displays the interface setting up RIP

COMMAND	(conf)# show rip

Usage Examples:

> (conf)# sh rip
>
> wan: txrip2 rxrip2
>
> lan: disabled
>
> (conf)#

Viewing the RIP updates :

(conf)# sh ip route

destination	netmask	gateway	met	ifname	type
210.10.10.0	255.255.255.0	210.10.10.1	1	wan	rip(175)
168.126.188.0	255.255.255.0	168.126.188.130	0	lan	connected

(conf)#

Configuring the ARP Table

ARP (Address Resolution Protocol) is a protocol designed for an acquisition of information for mapping between the IP address and physical MAC address.

Currently, the most prevalent IP address is the address used by the network layers. And when the data transmission takes place through the physical media connected with the actual router, the address the communication uses is not the IP address but the MAC address.

The internal cache of the router contains the ARP table for mapping between the IP address and MAC address. The ARP table is dynamically configured and updated with the broadcast packets. The "arp" command is available to set up a fixed mapping information for the IP and MAC addresses.

Adding the ARP entry

COMMAND	(conf)# arp add <net address> <mac address> <ifname>
Parameters	<net address> : host IP address <mac address> : mac address (for example, 00:D0:84:00:00:01) <ifname> : interface name

Usage Examples:

```
(conf)# arp add 168.126.188.133 00:d0:84:12:23:5a lan
```

Deleting the ARP entry

COMMAND	(conf)# arp del <net address>
Parameters	<net address> : Network address (IP address)

Usage Examples:

```
(conf)# arp del 168.126.188.133
```

Viewing the ARP table

COMMAND	(conf)# show arp

Saving the Configuration

The system configuration values currently in effect are saved in Flash memory. The configuration values currently being used by the system are lost when the system is rebooted. To prevent the system configuration values from being lost, the non-volatile memory called Flash memory is employed. If the current system configuration values are saved in Flash memory, the previous operating environment can be retained at the system rebooting.

Saving Router Configuration Changes

The following command saves the current running configuration to flash memory.

COMMAN	(conf)# write config

Displaying the configuration information

You can also display the configuration stored in flash memory using the "show config" command. This command prints out the contents of Flash memory, which happens to be the configuration of the router at the time the user does a "write config".

COMMAN	(conf)# show config

The "show config running" command displays the configuration information currently running on the router.

COMMAN	(conf)# show config running

Resetting to the Default Configuration

Step1: The following command resets all configuration settings to factory defaults, including passwords and the IP address. The "write config –default" command changes the contents of Flash memory only.

COMMAN	(conf)# write config –default

Step2: Rebooting the system. After reboots, your change will take effect on the system.

COMMAN	(conf)# reboot flash

The default configuration is as follows:

```
NR304(conf)# sh config
#
# System Configuration:
# boot status: system configuration checksum OK.
mac-address 00:d0:84:01:08:b2
console-baudrate 9600
hostname NR304
#
device local none
device lan 10base-t
device wan gshdsl(annex-a) RT auto
#
interface local ip 127.0.0.1 255.0.0.0
encapsulation NULL
interface lan ip 192.168.1.1 255.255.255.0
   encapsulation ETHERNET
#
#
#
#
#
NR304(conf)#
```

Rebooting the system

Unplugging and subsequent plugging of the power source adapter for NR304G/GH triggers a reboot of the system hardware. The following command is available to perform a software-wise reboot of the system.

COMMAN	(conf)# reboot flash

Note: Before rebooting the system, you must save current configuration to Flash memory. Otherwise, the system can lose the running configuration when rebooting the system. Because NR304 router configures the system based on the configuration values in Flash memory.

PART IV: Configuring advanced Functions

☐ **Configuring Bridge Function**
☐ **Configuring DHCP Function**
☐ **Configuring NAT Function**
☐ **Configuring IP Filter**

Configuring Bridge Function

Bridging is useful primarily in providing connectivity for protocols other than IP although it can be used to join segments of an IP network. Because a bridging connection forwards packets at the hardware-address level(link layer), it does not distinguish between protocol types, and it requires no protocol-specific network configuration.

Bridging is commonly used to:

> Provide non routed protocol connectivity with another site
>
> Link two sites so that their nodes appear to be on the same LAN
>
> Support protocols that depend on broadcasts to function

NR304G/GH provides the following features :

Routing-Only Mode

> This mode supports only those IP routing functions that are supported by the existing router. In general, when the IP (including "unnumbered") is set in the interface, this mode is automatically set as a default mode.

Routing and Bridging Mode(Brouter)

> In this mode, only IP packets are routed, and all other packets (IPX, NetBEUI, etc.) are handled with bridging. This mode sets the bridge function to "enable" only if the routing function is "enable".

Bridging-Only Mode

> This mode is a mode to configure the NR304G/GH as a bridge.
>
> When setting up this mode, <u>the routing function defined as default must be turned to "disable"</u>. If not, the IP packets are not going to be bridged.
>
> *Note:* To control the router remotely in this mode, the IP should be set in the LAN interface. Also, the remote control of the router via the Internet requires that a default gateway be set.

Be aware that bridges examine all packets on the LAN, so they incur greater processor and memory overhead than do routers. On heavily loaded networks, the increased overhead can result in slower performance.

From a practical point of view, you should always route if possible, as routing is more efficient. Bridging is necessary when you cannot subnet your IP network, and when you need to use non-routable protocols.

Setting up Routing-Only Mode

This mode becomes set as a default mode when setting the IP address (including "unnumbered") in the interface. This is a mode that provides the routing services for the IP packets.

Usage Examples:

```
(conf)# int wan ip unnumbered
(conf)# sh int wan
Interface: wan, status <UP>, mtu 1500
    ip address unnumbered
    Routing-only mode
    encapsulation HDLC
    idle-char FLAG, CO speed 2320/2320 Kbps
(conf)#
```

The following command is for manually setting or deleting the routing mode.

COMMAND	(conf)# ip routing enable <ifname>
	(conf)# ip routing disable <ifname>
Parameters	<ifname> - Interface name

Setting up Routing and Bridging Mode

The following command is available for setting or deleting the bridge mode in the specified interface. Setting the bridge mode without deleting the routing mode will trigger a setup of "Routing and Bridging Mode".

COMMAND	(conf)# interface <ifname> bridge enable
	(conf)# interface <ifname> bridge disable
Parameters	<ifname> - Interface name enable – enabling the bridge mode disable – disabling the bridge mode
Confirmation of Setup	(conf)# sh int : Confirm "Routing and Bridging Mode".

Usage Examples:

```
(conf)# int wan ip unnumbered

(conf)# int wan bridge enable

(conf)# sh int wan

Interface: wan, status <UP>, mtu 1500

    ip address unnumbered

    Routing and Bridging mode

    encapsulation HDLC

    idle-char FLAG, CO speed 2320/2320 Kbps

(conf)#
```

Setting up Bridging-Only Mode

As described above, setting the bridge mode without deleting the routing mode from the interface will trigger a setup of "Routing and Bridging Mode". To set a mode to "Bridging-Only Mode", the routing mode must be deleted.

COMMAND	(conf)# interface <ifname> bridge enable
	(conf)# ip routing disable <ifname>
Confirmation of Setup	(conf)# sh int
	: Confirm "Bridging-Only Mode".

Usage Examples:

```
(conf)# int wan ip unnumbered

(conf)# int wan bridge enable

(conf)# ip routing disable wan

(conf)# sh int wan

Interface: wan, status <UP>, mtu 1500

   ip address unnumbered

   Bridging-only mode

   encapsulation HDLC

   idle-char FLAG, CO speed 2320/2320 Kbps

(conf)#
```

Note: To operates as a bridge, you must configure "Bridging-Only Mode" to all interfaces(LAN and WAN).

Managing the bridge table

As to forward bridged packets to the right network destination, the NR304G/GH uses a bridge table that associates end nodes with particular connections. It builds this table dynamically, in a process called transparent bridging.

COMMAND	(conf)# show bridge map

Configuring DHCP Function

The DHCP (Dynamic Host Configuration Protocol) protocol enables a DHCP client who has not set the IP address to set the IP address automatically.

NEXPEED NR304G/GH supports the following two functions: a DHCP relay function that delivers the IP address request packet received from the DHCP client to the specified DHCP server, and a DHCP server function that allocates the IP address upon the receipt of the IP address request packet. With these functions, the DHCP client can access to the IP network without setting the IP address.

Setting DHCP relay service

To set up dhcp relay, you have to set the following command :

COMMAND	(conf)# dhcp relay to \<server\> (conf)# dhcp relay off
Parameters	\<server \> – IP address of DHCP server

Usage Examples:

```
(conf)# dhcp relay to 168.126.63.1
```

To delete dhcp relay, you have to set the following command:

COMMAND	(conf)# dhcp relay off

Setting up a DHCP Server

Step1: Setting the IP address pool :

To assign IP addresses dynamically, set the IP address pool. Possible to set up multiple pools, but the overlapping of the range of IP for each pool is not allowed.

COMMAND	(conf)# dhcp add \<poolname\> \<startip\> \<endip\> \<mask\>
Parameters	\<poolname\> – name of the IP address pool \<startip\> – start address of the IP address pool \<endip\> – last address of the IP address pool \<mask\> – subnet mask of the IP address pool

Step2: Setting gateway, dns, and wins for the IP address pool :

COMMAND	(conf)# dhcp <poolname> gw|dns|wins <ipaddr> [secondary]
Parameters	<poolname> – name of the IP address pool gw|dns|wins – gateway or dns or wins <ipaddr> - IP address of gateway or dns or wins [secondary] – sets the secondary IP address of gateway or dns or wins

Step3: Setting lease time for the IP address pool :

Lease time specifies how long a DHCP IP address lives before it needs to be renewed. If the host. Renews the address before it expires, the NR304G/GH provides the same address. You must set up this option to using a DHCP server.

COMMAND	(conf)# dhcp <poolname> lease <seconds>
Parameters	<poolname> – name of the IP address pool <seconds> - lease time, set in the unit of second

Step4: Setting domain name for the IP address Pool

COMMAND	(conf)# dhcp <poolname> domain <string>
Parameters	<poolname> – name of the IP address pool <string> - set a domain in a character string

Step5: Activating the IP address pool :

The DHCP-sever feature for the IP address pool is enabled and works.

COMMAND	(conf)# dhcp <poolname> start
Parameters	<poolname> – name of the IP address pool start – starts the dhcp-server feature for the IP address pool

Deleting the IP address Pool

1> stop the dhcp-sever feature for the IP address pool

COMMAND	(conf)# dhcp <poolname> stop

2> delete the IP address pool

COMMAND	(conf)# dhcp <poolname> del

Management the assigned IP address

Checking the DHCP allocation table :

COMMAND	(conf)# show dhcp

Deleting an entry from the table :

COMMAND	(conf)# dhcp clear all|ip [<ipaddr>]
Parameters	all – deleted all entries of the dhcp table. ip <ipaddr> – delete the specified IP address entry.

configuration example :

```
(conf)# dhcp add ip-210 210.123.251.45 210.123.251.56 255.255.255.192
```

☞ creates the "ip-210" IP address pool, The rang of the pool is from 210.123.251.45 to 210.123.251.56 and subnet mask value is 255.255.255.192.

```
(conf)# dhcp ip-210 gw 210.123.251.62
```

☞ setting up the gateway of the "ip-210" pool.

```
(conf)# dhcp ip-210 dns 168.126.63.1
```

☞ setting up the dns server of the "ip-210" pool.

```
(conf)# dhcp ip-210 domain nexcomm.co.kr
```

☞ setting up the domain name of the "ip-210" pool.

```
(conf)# dhcp ip-210 lease 3600
```

☞ setting up the lease time of the "ip-210" pool. You must set up this option to activate the DHCP-server feature.

```
(conf)# dhcp ip-210 start
```

☞ starting the DHCP-server feature based the "ip-210" IP address pool. You must set up this option to activate the DHCP-server feature.

Configuring NAT Function

To connect to the Internet or any other TCP/IP network, a host must have an IP address that is unique within that network. The Internet and other large TCP/IP networks guarantee the uniqueness of addresses by creating central authorities that assign official IP addresses. However, many local networks use private IP addresses that are unique only on the local network. To allow a host with a private address to communicate with the Internet or another networks that requires an official IP address, NR304G/GH can perform a service known as Network Address Translation(NAT).

NAT works as follows: When the local host sends packets to the remote network, NR304G/GH automatically translates the host's private address on the local network to an official address on the remote network. When the local host receives packets from the remote network, NR304G/GH automatically translates the official address on the remote network to the host's private address on the local network.

The IP address conversion can be performed in the following three ways:

1> Static Mapping

The NR304G/GH establish a one-to-one mapping between the private IP and public IP. This translation is used when the connection to the internal network is attempted from the outside. It is often used for the server IP address application.

2> Dynamic Mapping

Usually, this method takes a dynamic n:n translation. The translations between the local network and the Internet or remote network are dynamic.

3> Port Mapping

Usually, this method takes a dynamic n:n translation and not only the IP address but also port number translation is performed. For outgoing calls, the NR304G/GH performs NAT for multiple hosts on the local network after getting a single IP address from the remote network. For incoming calls, the NR304G/GH can perform NAT for multiple hosts on the local network by using the single IP address.

NAT can be implemented to use a single address or multiple address.

Note: Turns RIP off, so the address of the NR304G/GH is not propagated to the Internet or remote networks.

Setting up Static Mapping

COMMAND	(conf)# nat static <local-ip> <global-ip>
Parameters	<local-ip> – IP address before conversion <global-ip> - IP address after conversion (Possible to omit for deletion)

Usage Examples:

(conf)# nat static 192.168.1.1 168.126.188.100

☞ establish a one-to-one mapping between the local network address of 192.168.1.1 and the public address of 168.126.188.100.

Setting up dynamic/port Mapping

Step1: Creating a global IP address pool :

you can to set up multiple pools, but the overlapping of the range of IP address for each pool is not allowed.

COMMAND	(conf)# nat pool <poolname> <global-startip> <global-endip>
Parameters	<poolname> : name of IP pool <global-startip> <global-endip> : range of global IP addresses, start IP address and last IP address

Step2: Mapping between local IP addresses and the global IP address pool

COMMAND	(conf)# nat map|portmap <local-startip> <local-endip> <poolname>
Parameters	map : set up a dynamic mapping portmap : set up a port mapping <local-startip> <local-endip> : range of local IP address, start IP address and last IP address <poolname> : Name of IP pool to be mapped

Step3:   Activating translation to the specified interface :

sets an outside interface. The interface will be subject to translation.

COMMAND	(conf)# nat outside \<ifname\>
Parameters	\<ifname\> : Interface name

Configuration example

(conf)# nat pool test 168.126.188.101 168.126.188.110

☞ creates a global IP address pool called test. The range of the pool is from 168.126.188.101 to 168.126.188.110.

(conf)# nat pool test2 168.126.188.111 168.126.188.111

☞ creates a global IP address pool called test2. The range of the pool is from 168.126.188.111 to 168.126.188.111.

(conf)# nat map 192.168.1.1 192.168.1.254 test

☞ establishes dynamic mapping between local network addresses and the global address pool called test.

(conf)# nat portmap 192.168.1.1 192.168.1.254 test2

☞ establishes port mapping between local network addresses and the global address pool called test2.

(conf)# nat outside wan

☞ The packet sending and receiving through the WAN interface will be translate.

Management translation table

Translation timeout :

NAT has an internal translation table. A translation table entry represents one TCP, UDP, ICMP connection.(***Note:*** a port mapping can generate many TCP and UDP connections.) A translation table entry is reused as long as traffic includes packets that match an entry. All the entries for a connection are freed(expire) when the connection disconnects.

The NR304G/GH unit removes entries from the translation table entries on the basis of the following timeouts:

> TCP translations time out after 240 seconds

> UDP translations time out after 120 seconds

> ICMP translations time out after 10 seconds

you can manually change timeouts using the following command :

COMMAND	(conf)# nat timeout tcp|udp|icmp <seconds>
Parameters	tcp|udp|icmp : TCP or UDP or ICMP translations <seconds> : timeout value, set in the unit of second

Deleting translation-table entry :

All entries or a particular entry of the NAT table can be deleted.

COMMAND	(conf)# nat clear {all | <global-ip> [<port>]}
Parameters	all : delete all entries <global-ip> : delete an entry corresponding to a particular IP address (after-conversion address). <global-ip> <port> : delete an entry corresponding to a particular port of a particular IP address (after-conversion address).

Confirming the NAT configuration:

1> Verify the NAT configuration :

COMMAND	(conf)# sh nat map

2> Viewing the translation-table entries :

COMMAND	(conf)# sh nat entry [-v]
Parameters	-v : displays detail information for the entry

Configuring IP Filter

Filters inspect packets to determine whether or not to prevent them from entering or leaving your network. When a filter is in use, NR304G/GH examines every packet in the packet stream and takes action if the defined filter conditions are present. The action of the NR304G/GH depends on both the conditions specified within the filter and how the filter is applied. The default action when no filter is used is forwarding all packets.

You can define conditions in filters as the following rules:

1> determine the interface to apply the filters

2> whether to apply the filter to inbound packets, outbound packets.

3> whether to drop(reject) all packets except the ones you explicitly allow, or forward(accept) all packets except the ones you explicitly drop.

Defining IP filter conditions

You can define an IP filter and this filter examines source addresses, destination addresses, and IP protocol types (TCP/UDP/ICMP) and ports, in any combination.

The IP filter can be defined individually for the inbound packets and outbound packets, respectively, and the IP filters examines packets in the filter's number.(proceeding from a smaller number to a larger number.)

COMMAND	(conf)# filter in|out <num> block|pass [<proto>] [<expressions>]

Parameters	in|out - Set for 'in packet' or 'out packet'
	 <num> - Filter number
	 block|pass – Determine whether packet is to be blocked or passed.
	 [<proto>] - Specify protocol (TCP, UDP, ICMP) (Possible to omit)
	 [<expressions>]
	 [src <address>] - Specify a source IP address (Possible to omit)
	 [dst <address>] - Specify a destination IP address (Possible to omit)
	    <address> = A.B.C.D/M[:<lport>[-<hport>]]
	      A.B.C.D: IP address
	     M: Subnet mask value (the number of '1' bits)
	       [<lport>[-<hport>]]: low num – [high num]
	       - Port number (TCP) or ID number (ICMP)

Attention: If the block filter is chosen to setup, all other packets that have no relation with the block filter will pass through. If the pass filter is setup, however, all other packets that have no relation with the pass filter will be blocked. Therefore, the pass filter requires an additional filter that can take care of those packets that are not under the control of the pass filter.

Viewing the filters

To display the filters, type the following command:

COMMAND	(conf)# show filter

Applying a filter to a interface

To control which packets will be allowed to cross the interface, you specify the interface as follows:

COMMAND	(conf)# filter port <ifname>
Parameters	<ifname> - Interface name

A filter applied to the interface takes effect immediately. Also, if you change any of the filter conditions, new or changed conditions are applied immediately.

Usage Examples:

(conf)# filter port wan

To stop applying a filter to the interface, type the following command:

COMMAND	(conf)# filter port none

Deleting a filter

To delete a filter condition, use the following command:

COMMAND	(conf)# filter in|out <num> delete
Parameters	<num> - defined filter's number

Configuration example

☞ filter forwards the packet satisfied by the following conditions:

```
(conf)# filter in 10 pass tcp src 210.123.2.1/32 dst 168.126.10.1/32:23
```

==>Admit the packet of telnet access(port no.: 23) of source IP address 210.123.2.1 and destination IP address 168.126.10.1.

```
(conf)# filter in 20 pass tcp src 210.123.2.1/32 dst 168.126.11.1/32:23
```

==> Admit the packet of telnet access(port no.: 23) of source IP address 210.123.2.1 and destination IP address 168.126.11.1

```
(conf)# filter in 30 block tcp dst 168.126.188.10.1/32:23
```

==> Block the packet of telnet access(port no.: 23) of source IP address 168.126.10.1

```
(conf)# filter in 40 block tcp dst 168.126.188.11.1/32:23
```

==> Block the packet of telnet access(port no.: 23) of IP address 168.126.10.1168.126.11.1

```
(conf)# filter in 50 pass src 0.0.0.0/0 dst 0.0.0.0/0
```

==> Admit all packets unsatisfied by the above conditions of the filter. Unless these settings are made all packets which don't satisfy the above conditions will be blocked.

☞ applying the filters to the interface :

```
(conf)# filter port wan
```

==> Apply the filter function to the packet to the WAN interface.

☞ viewing the filters :

```
(conf)# show filter
fid    flag    source address block            destination address block
----------------------------------------------------------------------
I-10   tcp =O  210.123.2.1    /32              168.126.10.1   /32:   23

I-20   tcp =O  210.123.2.1    /32              168.126.11.1   /32:   23

I-30   tcp =X                                  168.126.10.1   /32:   23

I-40   tcp =X                                  168.126.11.1   /32:   23

I-50       =O

(conf)#
```

PART V: System maintenance

☐ **Accessing Telnet**
☐ **Configuring SNMP Function**
☐ **Upgrading the System Software**

Accessing Telnet

You can make use of a console cable to perform a serial communication between the NEXPEED NR304G/GH unit and the user's PC in order to configure the router. Also, the network-connected users can configure the router by means of the Telnet application provided from the user's PC through the network.

Once the NR304G/GH unit has been configured with an IP address, you can use the IP address to open a Telnet session with the unit from any computer on the same Ethernet network. If the unit is connected to just one computer, the Ethernet network comprises the computer and the NR304G/GH unit.

The NR304G/GH supports both telnet client and telnet server. Your computer can connect to the NR304GH unit and the NR304G/GH unit can connect to the workstation or router on the same Ethernet network.

How to access to the NR304G/GH that still retains the state of factory initialization

1> Use a 10BASE-T straight-through cable to connect the NIC card in the user's PC with the "LAN" port of the NR304G/GH router.

2> Configure the IP address of the router to 192.168.1.1/24. If you use the Bridging-only mode, you must type the following command :

　　　(conf)# ip routing disable lan

3> Change the IP address of the user's PC to 192.168.1.2, and the subnet mask to 255.255.255.0.

4> Run MS-DOS after the user's PC is done with rebooting (Windows95/98).

5> Enter "ping 192.168.1.1" in the MS-DOS prompt field.

6> If there is a response, enter "telnet 192.168.1.1" in the prompt field. If no response, check if the cable is in place.

Note: All the commands used for the Telnet access are as same as those used for the console access.

Configuring SNMP Function

As one of the most popular protocols for the network trouble management, the SNMP (Simple Network Management Protocol) provides users with various kinds of information regarding the network equipment and their failures with help of communication between the SNMP manager and agent.

The NEXPEED NR304G/GH provides a SNMP agent function, and for that purpose, it supports MIB1 and MIB2. Only those SNMP managers that were registered with the NR304G/GH are able to perform SNMP Query. The "Community", "Authority", "Trap Transmission or not" can be set differently for each manager.

Also, if "Authentication Trap" is set, and then, whenever any unregistered manager attempts SNMP Query, the "Authentication Trap" is sent to all of the registered SNMP managers.

[Figure 5-1] Schematic Diagram for SNMP Communication
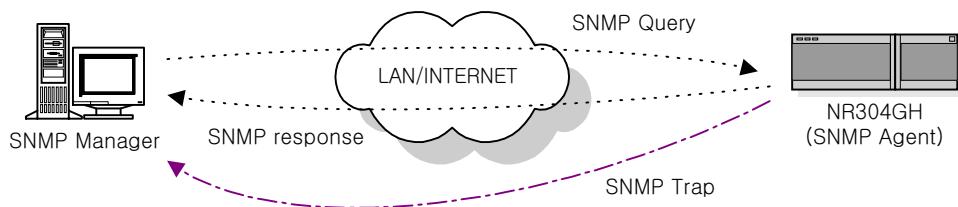
Registering SNMP Manager

COMMAND	(conf)# snmp add <address> <community> read|rdwr [trapon|trapoff]
Parameters	<address> : IP address of SNMP manager <communtiry> : communication name read|rdwr : set authority, Allow read-only	Allow read and write trapon|trapoff : whether or not the "trap" is to be transmitted to the manager that is currently being registered.

Setting the SNMP Trap IP address

Sets the trap IP address. This address is a source address of the trap transmitted to the manager. And you set whether the unit transmits "authentication trap" to the manager.

COMMAND	(conf)# snmp authtrap on|off <address>
Parameters	<address> : Among the IP addresses defined in each interface, select the IP address that was registered with SNMP manager and enter it.

Viewing the SNMP configuration

Display the SNMP setting status.

COMMAND	(conf)# show snmp

Sending cold start Trap to the Manager manually

COMMAND	(conf)# snmp start

Deleting the SNMP Manager

COMMAND	(conf)# snmp del <address>
Parameters	<address> : Delete SNMP manager corresponding to the specified IP address

Configuration example

Step1:   registering the "211.10.10.1" as a SNMP manager using "public" community name. This manager can read-only for the MIB and receive the trap when the event generate to the unit such as link down, system down and so on.

```
(conf)# snmp add 211.10.10.1 public read trapon
```

Step2:   setting the "168.126.188.130" IP address for the trap's source address.

```
(conf)# snmp authtrap on 168.126.188.130
```

Note: The address is already used to your Ethernet or SHDSL interface. And your SNMP manager creates the entry using this address.

Step3:   And then test the SNMP agent feature.

```
(conf)# snmp start
```

Attention: For SNMP manager, the community names for "read", "read/write", and "trap" is needed to set individually. But the unit sets up only one community name of the specified manager. Thus when you configuring entry to the manager, you set the same community name of all community names.

Upgrading the System Software

The NR304G/GH unit can upgrade using TFTP (Trivial File Transfer Protocol). If a newer version of the software for your NR304G/GH unit is available, you be sure to perform any required preparatory tasks.

Preparing to upgrade

Before upgrading system firmware, be sure to confirm the following items.

1> For the file downloading, the program that supports TFTP server function should be installed in the user's PC in advance.

2> And the binary (BIN) file to be downloaded should be saved in the user's PC.

This file is supported in the form of a binary file such as nr304.<version>.bin.

3> The TCP/IP communication should be possible between the user's PC and the NR304G/GH router.

Note1: If you upgrade with the wrong file, the unit will not function and you will have to return it for replacement.

Note2: If you don't have a firmware file(BIN file), you can download a file from NexComm Homepage(http://www.nexcomm.co.kr) or contact NexComm sales or technical support department.

Upgrading the system

STEP1> Make sure the TFTP server is running.

1-1> Place the Firmware file in your TFTP server's root directory.

STEP2> To download the new binary image into the router, use the following command :

COMMAND	(conf)# tftp <host> <file>
Parameters	<host> : TFTP server's IP address <file> : Firmware file name

Note: If the Firmware file is not root directory, you must type full path to access the file.

STEP3> Reboot your router to verify whether the downloaded firmware is correct. And verifying firmware version after reboots.

First, you save current configuration to Flash memory using following command :

COMMAND	(conf)# write config

2> Reboot your router to load new firmware to memory.

COMMAND	(conf)# reboot tftp

When the download process is competed, reset your unit. If downloading was not successfully completed or a wrong file was downloaded, the system reboot will not complete successfully. In such a case, turn the router power switch off and then turn it on, and retry the downloading

3> Verify the version of the new firmware using following command :

COMMAND	(conf)# show version ~ System Software Release: 3.7.13 [Mon Jan 28 10:16:20 2002] running ☞ new version 3.7.12 [Mon Dec 17 16:19:42 2001] saved ☞ old version

STEP4> Saving new version to Flash memory

1> Save the downloaded new firmware to Flash memory. When a confirmation message appears in the screen, press "y". The file not saved in Flash memory will be lost or damaged when the system is rebooted.

COMMAND	(conf)# write tftp

2> Verify new version using following command :

COMMAND	(conf)# show version ~ System Software Release: 3.7.13 [Mon Jan 28 10:16:20 2002] running ☞ new version 3.7.13 [Mon Jan 28 10:16:20 2002] saved ☞ new version

Note: If the connection to TFTP is not successful even after the TFTP command was entered, check if the Ethernet communication is live between the PC and router or if the TFTP server program is running.

Configuration example
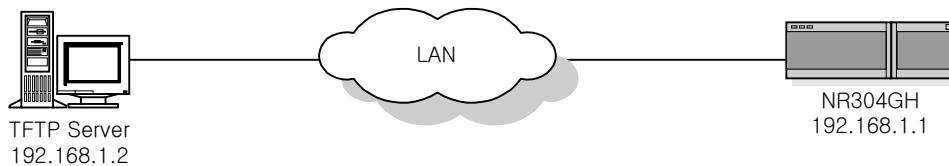
1> Connect LAN port on the NR304GH router to your PC(TFTP Server) using UTP straight-through cable.

2> Configure "192.168.1.1/255.255.255.0" IP address on your router.

3> Configure "192.168.1.2/255.255.255.0" IP address on your PC.

4> Make sure the MS-DOS window is running on your PC and execute ping command.

C:\> ping 192.168.1.1

☞ Verify whether it receives a response.

5> Make sure the TFTP server is running and place the Firmware file in your TFTP server's root directory.

6> Enter the following command to the NR304GH router :

(conf)# tftp 192.168.1.2 nr304.bin

☞ downloads nr304.bin into the router from a TFTP server's IP address of 192.168.1.2

(conf)# write config

☞ save the current configuration to Flash memory.

(conf)# reboot tftp

☞ reboots your router to load downloaded new firmware.

(conf)# write tftp

☞ saves the downloaded new firmware to Flash memory.

image checksum OK

WARNING !!!   this may crash your system, check again:

boot image information:

  - image start : 0x380000

  - image end   : 0x3cf995

  - image size   : 326037(0x4f995) bytes

Confirm ? (y/n)   ☜ "y"

writing boot image ...

verify OK

(conf)#

☞ The following command displays both the version of the firmware currently stored in

Flash memory and the version of the firmware currently running in memory(DRAM).

(conf)# show version

System Software Release:

    3.7.13 [Mon Jan 28 10:16:20 2002] running   ☞ new version

    3.7.13 [Mon Jan 28 10:16:20 2002] saved   ☞ new version

PART VI: Configuration Examples

☐ **Example 1: Routing Configuration Example**
☐ **Example 2: Bridging Configuration Example**

Example1. Routing Configuration

This example explains how to connect the NR304GH and the NR304GH with the method of routing configuration.

A company has received a C class , 256 IP addresses from 203.247.170.0 to 203.247.170.255 and will configure local area network(LAN) with this addresses. But a company has two offices and it is a far cry from one office to the other office about 2km.

To configure routed network with two NEXPEED NR304GH routers, you divide the network in two and use subnet mask of 255.255.255.128 to do this.

Configuration figure :
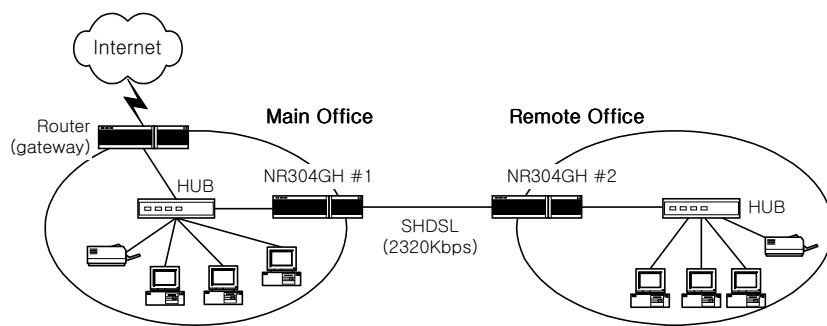
The SHDSL data rate is 2320kbps, refer to the following IP address:

1> The gateway(router) address and subnet mask : 203.247.170.126/255.255.255.128

2> The NR304GH #1's LAN IP address and subnet mask : 203.247.170.125/255.255.255.128

  Note: The NR304GH #1's local area network : 203.127.170.0/255.255.255.128

3> The NR304GH #2's LAN IP address and subnet mask : 203.247.170.254/255.255.255.128

  Note: The NR304GH #2's local area network : 203.127.170.128/255.255.255.128

4> Use IP unnumbered on WAN(SHDSL) interface.

Configuring the NR304GH #1 router as COE :

① Access the NR304GH using serial communication(console) and type a password. The default password is the word "password".

② Change the mode as Configuration Mode. Type the following command and a password. The default value is "password".

      NR304> enable

③ Set up a device type, side and a line rate.

      NR304(conf)# device wan gshdsl co 2320

④ Set up the LAN IP address and subnet mask.

      NR304(conf)# interface lan ip 203.247.170.125 255.255.255.128

⑤ Set up the WAN IP address and subent mask.

      NR304(conf)# interface wan ip unnumbered

⑥ Set up the default gateway address to communicate with a remote host.

      NR304(conf)# ip route add default lan 203.247.170.126

⑦ Add the path to forward a packet to NR304GH#2 router's network.

      NR304(conf)# ip route add 203.247.170.128 255.255.255.128 wan

⑧ Save current configuration to Flash memory.

      NR304(conf)# write config

Note: Additionally, you must add the path for the following network to the gateway(router).

>> Network: 203.247.170.128/255.255.255.128   Gateway: 203.247.170.125

Configuring the NR304GH #2 router as CPE :

① Access the NR304GH using serial communication(console) and type a password. The default password is the word "password".

② Change the mode as Configuration Mode. Type the following command and a password. The default value is "password".

       NR304> enable

③ Set up a device type, side and a line rate.

       NR304(conf)# device wan gshdsl rt

④ Set up the LAN IP address and subnet mask.

       NR304(conf)# interface lan ip 203.247.170.254 255.255.255.128

⑤ Set up the WAN IP address and subent mask.

       NR304(conf)# interface wan ip unnumbered

⑥ Set up the default gateway address to communicate with a remote host.

       NR304(conf)# ip route add default wan

⑦ Save current configuration to Flash memory.

       NR304(conf)# write config

Example2. Bridging Configuration

This example explains how to connect the NR304GH and the NR304GH with the method of bridging configuration.

A company has received a C class , 256 IP addresses from 203.247.170.0 to 203.247.170.255 and will configure local area network(LAN) with this addresses. But a company has two offices and it is a far cry from one office to the other office about 2km.
If you don't want to divide the network, you can configure the NR304GH as bridge unit.

Configuration figure :
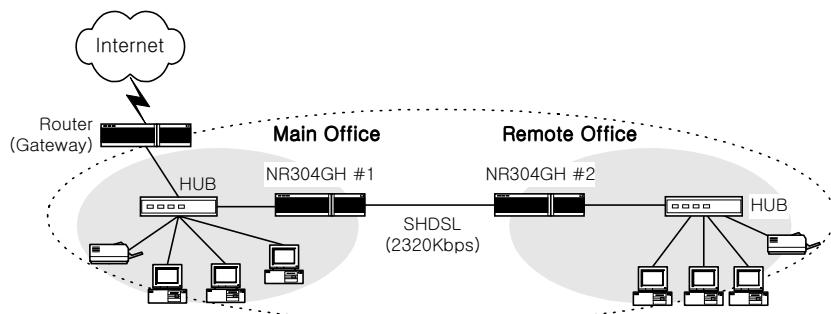
The SHDSL data rate is 2320kbps, refer to the following IP address:

1> The gateway(router) address and subnet mask : 203.247.170.254/255.255.255.0

2> The NR304GH #1's LAN IP address and subnet mask : 203.247.170.253/255.255.255.0

3> The NR304GH #2's LAN IP address and subnet mask : 203.247.170.252/255.255.255.0

4> Use IP unnumbered on WAN(SHDSL) interface.

Configuring the NR304GH #1 router as COE :

① Access the NR304GH using serial communication(console) and type a password. The default password is the word "password".

② Change the mode as Configuration Mode. Type the following command and a password. The default value is "password".

        NR304> enable

③ Set up a device type, side and a line rate.

        NR304(conf)# device wan gshdsl co 2320

④ Set up the LAN IP address and subnet mask.

        NR304(conf)# interface lan ip 203.247.170.253 255.255.255.0

⑤ Set up the WAN IP address and subent mask.

        NR304(conf)# interface wan ip unnumbered

⑥ Configure Bridging-only mode to all interfaces.

        NR304(conf)# interface lan bridge enable

        NR304(conf)# interface wan bridge enable

        NR304(conf)# ip routing disable lan

        NR304(conf)# ip routing disable wan

⑦ Set up the default gateway address to communicate with a remote host.

        NR304(conf)# ip route add default lan 203.247.170.254

⑧ Save current configuration to Flash memory.

        NR304(conf)# write config

Configuring the NR304GH #2 router as CPE :

① Access the NR304GH using serial communication(console) and type a password. The default password is the word "password".

② Change the mode as Configuration Mode. Type the following command and a password. The default value is "password".

        NR304> enable

③ Set up a device type, side and a line rate.

        NR304(conf)# device wan gshdsl rt

④ Set up the LAN IP address and subnet mask.

        NR304(conf)# interface lan ip 203.247.170.252 255.255.255.0

⑤ Set up the WAN IP address and subent mask.

        NR304(conf)# interface wan ip unnumbered

⑥ Configure Bridging-only mode to all interfaces.

        NR304(conf)# interface lan bridge enable

        NR304(conf)# interface wan bridge enable

        NR304(conf)# ip routing disable lan

        NR304(conf)# ip routing disable wan

⑦ Set up the default gateway address to communicate with a remote host.

        NR304(conf)# ip route add default lan 203.247.170.254

⑧ Save current configuration to Flash memory.

   NR304(conf)# write config

Appendix

□ **Connector Pin-outs**

Connector Pin-outs

A.1 LAN Port

The LAN port uses an Ethernet port and supports 10/100Mbps(auto) speed on the UTP cable at a distance of up to 100 meters or less. The Ethernet connector is a RJ-45. Table A-1 lists the pin-outs for the Ethernet connector (labeled "LAN"). The NR304G/GH router supports MDI/MDIX feature.

Table A-1 : LAN port(RJ-45) Pin-outs
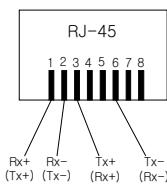
PIN #	Signal	Direction
1	RXD+ / TXD+	Input / Output
2	RXD- / TXD-	Input / Output
3	TXD+ / RXD+	Input / Output
6	TXD- / RXD-	Input / Output

A.2 Console Port

The console port is a management port. The connector is a RJ-45. Use the RJ-45-to-DB-9 female adapter to connect the console port to a PC running terminal emulation software.

Table A-2-1 lists the pin-outs for the serial console port and table A-2-2 shows the cabling using a DB-9 Adapter.

Table A-2-1 : Console Port(RJ-45) Pin-outs
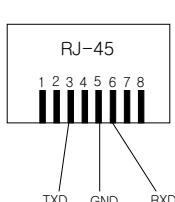
PIN #	Signal	Direction	Description
3	TXD	Output	Transmit data
5	GND	-	Signal ground
6	RXD	Input	Receive data

Table A-2-2 : Console Cable(RJ-45 to DB-9) Pin-outs

Console Port Signal	RJ-45 #		DB-9 #	Console Device Signal
TXD	3	< --- >	2	RXD
GND	5	< --- >	5	GND
RXD	6	< --- >	3	TXD

A.3 SHDSL(LINE) Port

The symmetric high-speed digital subscriber line (SHDSL) port uses a RJ-11 connector. Table A-3 shows the connector pin-outs for the SHDSL connector (labeled "LINE").
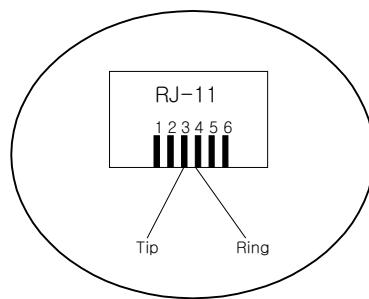

Table A-3 : LINE Port(RJ-11) Pin-outs

PIN #	Signal	Description
3	Tip	Transmit data and Receive data
4	Ring	Transmit data and Receive data