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March 2002
LR0060A-R2

DSL LAN Extender 200

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Black Box Corporation

**DSL LAN
Extender 200
User's Guide**

Version: V2.12

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Electrical Safety Statement

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

Safety Precautions

Before attempting to set up or operate your DSL LAN Extender device, please read the following precautions carefully.

1. Immediately upon unpacking the DSL LAN Extender device, inspect for external damage. If the unit has been damaged in any way, do not attempt to operate it and contact Black Box Corporation immediately. Do not connect the supplied power adapter to a power source if the cord or the plug of the adapter is frayed or split.
2. Do not open the case. There are no user serviceable parts within.
3. Do not attempt to use any other similar power adapter other than the one supplied with the package.
4. The supplied power adapter is designed exclusively for operation at 100V~240V, 47~63Hz AC, unless otherwise specified. Before inserting the AC power plug into a wall socket, be certain that your electrical power is within the correct range of values.
5. Do not operate the DSL LAN Extender device beyond the temperature and humidity range specified (see specifications section).
6. Do not place near or over sources of heat such as a heater or radiator. Do not expose this unit to rain or moisture.
7. Do not allow objects or foreign substances to enter the unit. If the unit malfunctions, immediately turn off the power by removing the power plug from the outlet.

Note: Every effort has been made to make this user's guide as complete and accurate as possible, but no warranty or fitness is implied. The information is provided on an "as is" basis. Black Box Corporation shall have neither liability nor responsibility to any person or entity, with respect to any loss or damage arising from the information contained in this user's guide or the use of the product itself.

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INTRODUCTION

Thank you for purchasing these outstanding Black Box communication products. This user's guide describes how to operate your new Multi-rate Symmetric Digital Subscriber Line (MSDSL) devices.

Instructions for installing your DSL LAN Extender devices are described in the Installation section, while the remaining sections review operation of the DSL LAN Extender devices after they are installed, such as self-test, LED indication, and troubleshooting.

PRODUCT DESCRIPTION

The DSL LAN Extender 200 is an Ethernet bridge which utilizes Multi-rate Symmetrical Digital Subscriber Line (MSDSL) technology to achieve a symmetrical transmission rate up to 2.3 Mbps in both directions over a single copper telephone pair out to 5.5 miles/8.8 Km. The speed is dependent on the line conditions and signal quality. Multi-rate SDSL allows users to select a fractional transmission rate to optimize the length and line condition of the telephone pair used for a better Bit Error Rate (BER).

The DSL LAN Extender 200 was designed for remote LAN interconnection and high-speed Internet access. This bridge has a 10Base-T Ethernet port and MSDSL line interface which can achieve high transmission quality comparable to fiber optic BER without repeaters, up to 5.5 miles/8.8 Km. Featuring a compact design for easy installation and combining its high-speed symmetrical rate and longer local loop reach, a DSL LAN Extender 200 is an ideal solution for campus networks, remote LAN interconnection and high-speed Internet access for businesses and consumers.

Features

- Support symmetrical 2.3 Mbps rate up to 2.6 miles (4.2 Km) for 24 gauge wire
- Support fractional transmission rates, which allows a reach up to 5.5 miles (8.8 Km), depending on line condition
- MSDSL line coding for multi-rate selection over a single copper telephone pair
- Concurrent IP routing (RIP-1, RIP-2) and Learning bridge functions
- Support Network Address Translation (NAT) for flexible, secure IP access
- Broadcast and multicast packet filtering
- Support for Dynamic Host Configuration Protocol (DHCP) with DNS and gateway setting
- Support for the Simple Network Management Protocol (SNMP)
- Support for customer side Web, FTP, and E-mail Servers
- User-definable limits for inbound and outbound traffic (bandwidth control)
- Standard 10Base-T Ethernet port for network connections
- System management via console VT-100 emulation, telnet, and SNMP
- Users can telnet or ping to the remote DSL LAN Extender device. (To help facilitate access via telnet, each device is shipped with a pre-assigned IP address)

- Users can configure a DSL LAN Extender either as a CO (Central Office) or CP (Customer Premise) device
- A DSL LAN Extender can detect the line rate used by the other remote DSL LAN Extender and use the lower rate setting of the two devices
- Flash memory for software upgrade via serial console port or Ethernet port via TFTP
- Stand-alone, compact design with rack-mount kit option
- Use industry standard CAP (Carrierless Amplitude & Phase Modulation) line coding for superior performance and low power consumption
- Support for the following protocols: ARP, DHCP, ICMP, IP, NAT, RIP-1, RIP-2, SNMP, TCP, UDP, telnet and TFTP.

Package Contents

The list below shows what is included in your DSL LAN Extender 200 package.

- 1 DSL LAN Extender 200 device
- 1 power supply
- 1 telephone cable
- 1 warranty card
- 1 DSL LAN Extender 200 User's Guide – this booklet

Quick Start

This section provides the basic steps to follow to set up and configure your DSL LAN Extender devices. It is intended for users with network experience who don't need the detailed instructions in this user's guide to set up and configure the DSL LAN Extender 200.

You must perform the steps below for both the DSL LAN Extender CO and CP devices.

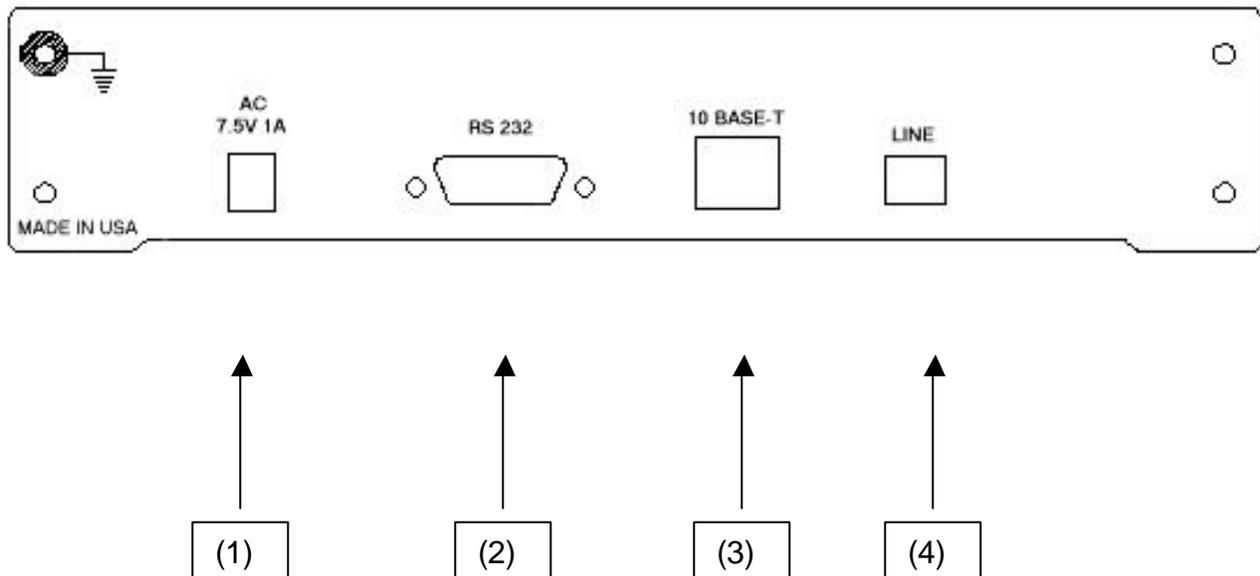
1. Connect the DSL LAN Extender device to your network via its 10Base-T port.
2. Connect the DSL LAN Extender device to the DSL line via its LINE port.
3. Attach a null-modem or straight serial cable to the serial port on a PC; attach the other end to the DSL LAN Extender device's Console (RS-232) port.
4. Connect the power supply to a grounded outlet and insert the power supply connector into the DSL LAN Extender device's power port. The LEDs on the device's front panel should flash while the device performs its startup diagnostic tests.
5. Configure the following settings for a terminal-emulation program (ProComm Plus recommended) on the PC you connected to the DSL LAN Extender device's Console port:
 - Data rate: Specify console data rate up to 38400; the DSL LAN Extender device will automatically adapt to the rate you specify
 - Terminal type: VT 100
 - Data bits: 8
 - Parity bits: None
 - Stop bits: 1
 - Flow Control: None
6. After you connect the PC to the DSL LAN Extender device, the main menu appears by pressing <Enter> a few times. Select the DSL Status/ Configuration option from the Main Menu. When prompted for the password, enter <password>.
7. One of the DSL LAN Extender devices is pre-configured as CO and the other device is pre-configured as a CP. Select the DSL and Status Configuration menu option, and you can change the configuration to either CO or CP.
8. The device is pre-configured with the highest allowed line rate. For the CO device, use the Line Rate selection option to select successively lower line rates until the two devices link up. You do not need to change the line rate defined for the CP device, as it will automatically adapt to the rate selected for the CO device.
9. Select the Network Mode Configuration option from the Main Menu. Define the setting of Bridging Enabled and RIP Enabled functions. If RIP is enabled, then select Device Main IP Address and its Subnet Mask address. It is optional to define the Default Gateway.
10. Set the Bandwidth control for Outbound and Inbound traffic rates in Kbps. (A setting of 0 is equivalent to no bandwidth control.)
11. For CP devices only, the NAT enabled option can be activated. Define the device's IP address for NAT and its subnet mask.
12. Configure the optional IP addresses for E-mail server and HTTP/FTP server.
13. Select DHCP Status/Configuration option from the Main Menu to configure IP address range for DHCP and DNS servers.

INSTALLATION

To install your DSL LAN Extender 200 devices, you need to use the following cable connection for each device:

- Supplied power supply
- 10Base-T cable
- DSL telephone cable
- Serial cable – you only need to connect a serial cable if you want to configure the DSL LAN Extender device via a serial port connection. Most of the configuration can be set through the 10BaseT connection, except for changing the Device Main IP address.
- Please see the section below for Port Pin Layout of Console (RS-232), 10Base-T, and DSL LINE ports.

The illustration below shows the ports on the DSL LAN Extender 200's back panel.



Connections

- (1) Power supply terminal. Connect this terminal with the power jack from the supplied power adapter.
- (2) Console Port, RS-232 (DB9 Female Connector): Console serial port for system configuration.
- (3) LAN Network Port: Standard 10Base-T Ethernet interface port (RJ-45 Jack).
- (4) xDSL Line Interface: Standard RJ-11 Jack (using Pins 3 and 4).

Telephone Wire Requirements

The telephone circuits recommended for the DSL LAN Extender 200 are commonly known as Dry Line, Dry Pair, Raw Copper Line, or Alarm Circuit. Now, it is often referred as DSL Line or ADSL Line.

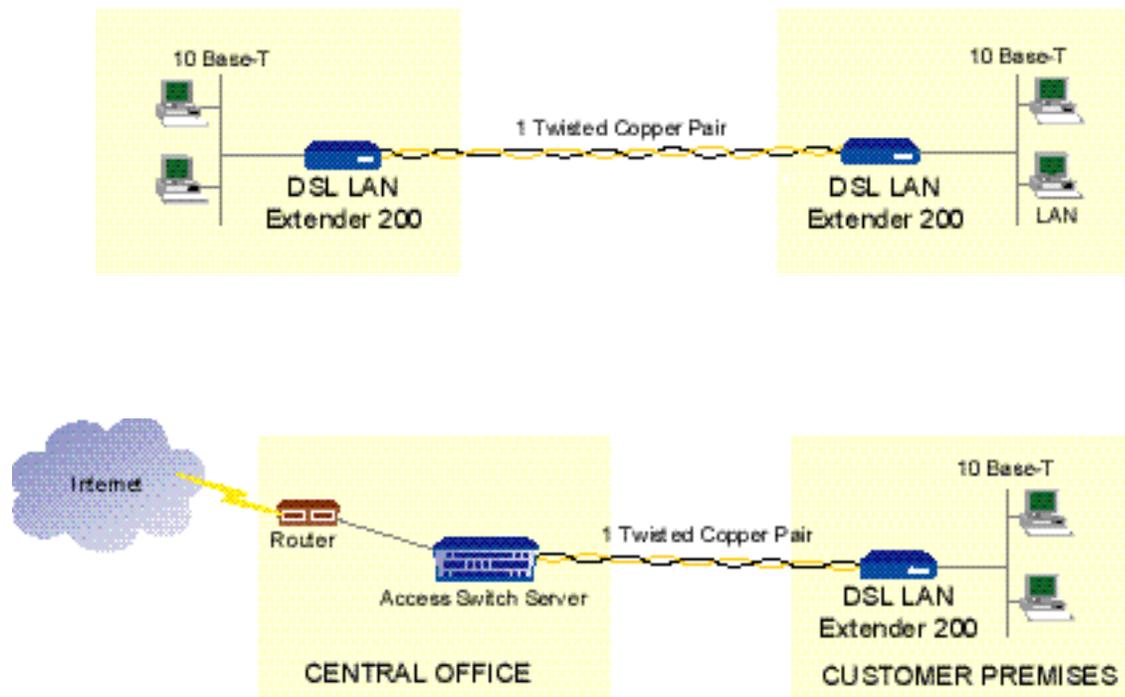
When ordering a DSL line from a Telco, make sure to tell the telephone company that you need a non-loaded line with no bridged taps on it. For example, Pacific Bell's Local Area Data Channels (LADC) use USOC code to specify a 2-wire dry line as "T6E2D".

NOTE:

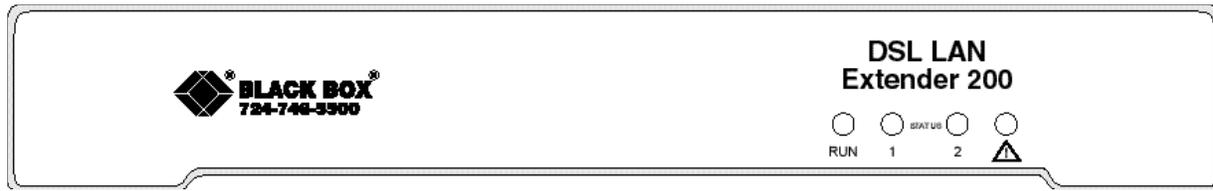
The term "non-loaded" or "non-loaded coils" means no passive lowpass filter for voice spectrum on the line. With a lowpass filter, the loop is used for voice signals only, the high frequency spectrum of signals (above 4Khz) will be filtered out, and the loop cannot be used for xDSL signal transmission.

To have a dry line from a Telco, the **loaded coils** in the Telco's Central Office and **bridge taps** at punch down blocks **MUST BE REMOVED** from the subscribed line.

Installation Diagram



FRONT PANEL INDICATORS



Power On

Check all connections before plugging in the power jack from the supplied power adapter. Then attach the adapter to the wall outlet or other AC source. Be sure the AC voltage is correct for the AC power source of 100V - 240VAC at 47 - 63Hz.

Self-test

When the DSL LAN Extender device is turned on, it performs a self-test, which may take a few seconds. During this period, both YELLOW LEDs are on. After the self-test is complete, one of the YELLOW LEDs blinks, indicating the device is trying to communicate with the other unit at the other end. The GREEN LED starts to blink when the two units link up. The DSL LAN Extender device is then ready to operate.

LED Indication

RUN (green) – Blinks with normal operation (indicates devices have linked up and are ready).

STATUS 1 (yellow) – Blinks when data is being transmitted/received. Steady on when transmission is idle. On when running a self-test. Blinks momentarily before link up, when device is configured as CP.

STATUS 2 (yellow) – Blinks when data is being transmitted /received. Steady on when transmission is idle. On when running a self-test. Blinks momentarily before link up, when device is configured as CO.

FAULT (red) – On/Blink when error/noise occurred/received during transmission.

When the device is working properly, the LEDs appear as follows:

GREEN (Run)	Yellow (Status 1)	Yellow (Status 2)	Red (Fault)	Condition
Flashing	On	On	Off	DSL link OK. No Ethernet traffic
Flashing	Flashing	On	Off	Ethernet traffic going from local LAN to DSL line
Flashing	On	Flashing	Off	Ethernet traffic going from DSL line to local LAN

Configuring and Monitoring a DSL LAN Extender

Accessing System

Access to the System Management Main Menu can be done either through a Console Port or LAN Port (telnet):

- **CONSOLE PORT** – The console port is located at the rear panel of Black Box's DSL LAN Extender. Console connection is through an RS-232 DB9 cable to the terminal/computer's serial COM 1 or 2 port. Users may choose to use any terminal emulation software (PROCOMM Plus is recommended). **Note:** Hardware flow control should be disabled and S/W download via HyperTerminal is not supported.
- **TELNET** – Once the IP Address is assigned to the DSL LAN Extender device, users can "telnet" to the DSL LAN Extender device for system configuration. An appropriate IP address must be configured to the DSL LAN Extender device by a console terminal before the telnet command can be used. The default IP address assigned is 192.168.100.1.

Default Password

The password is required to access any of the Main Menu's sub-menus. You will need to re-enter the password each time the device is restarted or reset. The default password is set to <password>. You may change the password in the main menu.

```
Please Enter Password :*****
Press Esc to return to the main menu
```

Main Menu

After entering the correct password, the following message is displayed. Select the desired function by entering the corresponding number.

```
Copyright (C) 2001, Black Box Corporation, Inc.
Main Menu
  1. System Information
  2. Traffic Statistics
  3. DSL Status/Configuration
  4. Network Mode Configuration
  5. DHCP Status/Configuration
  6. SNMP Status/Configuration
  7. Bridge Filtering
  8. Password Change
  9. Software Upgrade
  A. Reset
  0. Exit
Make A Choice :
Tab           : Move to next changeable field
Up/down Arrow : Move cursor by one line
Left/right Arrow: Move cursor by one character
Space/enter   : Next choice when in selection field
Ctrl-S       : Save all changes of current screen
Esc          : Leave current table or screen
```

System Information

- The first line allows the user to give the unit a name.
- The second line allows the user to set the security to high or low by pressing <Enter>. If set to "high" the Main Menu cannot be accessed without the correct password.
- The third line allows the user to enable or disable upgrades through the TFTP program.
- The fourth line of the System Information sub-menu shows if the unit is configured as a CO (Central Unit or Local Unit) or a CP (Customer Premise or Remote Unit) device.
- The next four lines display the currently assigned Ethernet Address, the IP Address, serial number and hardware version number, respectively.
- The ninth line displays the Firmware Version. You should check the Black Box Web site (www.blackbox.com) to see if this is the latest version. If not, you should upgrade your firmware.
- The tenth line is the Firmware Checksum. You should record this checksum and compare it with the displayed one every time the unit is reset or power-cycled. This checksum should be the same; if it changes, the unit's firmware has been corrupted. In this case you have to reload the firmware. Remember each new firmware version has a different checksum.

EXAMPLE OF SUB-MENU #1: SYSTEM INFORMATION

```

===== System Information =====

. System Name           :          S002
. Security Level        :          Low
. Allow TFTP Download   :          N
. The Device Configured as :        CP
. Ethernet Address      :          00 E0 F3 00 05 14
. Device Main IP Address :          194. 1. 2. 1
. Controller Serial No. :          00C09C84D30E
. Controller HW Version :           1
. Firmware Version      :          Ag200 2.19
. Firmware Checksum     :          7B5C

Ctrl-s Save all
Press Esc to return to the main menu

```

Traffic Statistics

The Statistics sub-menu 2 provides traffic statistics from/to the Ethernet port and from/to the DSL port.

- Ethernet Packets Received: Number of Ethernet packets that have been received from the LAN
- Ethernet Packets Sent: Number of Ethernet packets that have been sent to the LAN
- Ethernet Tx + Rx Error: Number of Ethernet packets received or transmitted on the Ethernet port that have errors
- DSL Line Packets Received: Number of packets from the remote LAN that have been received from the DSL line
- DSL Line Packets Sent: Number of packets from the directly connected LAN that have been sent onto the DSL line
- DSL Line RX Packets Errors: Number of packets received from the DSL line that have errors
- Current Error displays any error that the system may have

Example of Sub-Menu # 2: Traffic Statistics

```

===== Traffic Statistics =====
. Ethernet Packets Received :      375
. Ethernet Packets Sent    :      375
. Ethernet Tx+Rx Errors   :         0
. DSL Line Packets Received :      375
. DSL Line Packets Sent    :      375
. DSL Line Rx Packet Errors :         0

. Current Error: (no error)

Press '0' to reset the traffic statistics.
Press Esc to return to the main menu

```

DSL Status/Configuration

You use the DSL Status/Configuration screen to configure a DSL LAN Extender device as either the CO or CP device. This screen also allows you to define the DSL line rate and displays information about the status of the DSL connection, including the operation mode of CO or CP, whether the link is up or down, line rate selected, actual line rate and the signal to noise ratio (SNR) of the DSL line.

- The Device can be changed to either CO or CP by pressing <Enter> and toggling between the two.
 - NOTE:** The devices work only in pairs, with one configured as CO and the other as CP. This is already factory defaulted and this function should only be used for replacement devices that are not configured appropriately.
- Using the arrow keys to get to the Line Rate Selection line, you can change the Line Rate. Press the <Enter> or <Space> key to select the appropriate speed. There are 9 available line rates settings: 2320, 2064, 1552, 1040, 784, 528, 400, 272 and 144 Kbps.
- The Actual Line Rate shows the actual line rate in effect on the DSL line. When you connect the CO device to a CP device, they will synchronize on the lower line rate of the two devices.
- Link status is shown as UP or DOWN when CO and CP devices are linked up or not linked up.
- DSL Line SNR (dB) shows the signal-to-noise ratio (in Decibels) for the received signal on the DSL line. The normal values for 24 AWG and 26 AWG wire pairs are shown in the Appendix E.
- Note: You must press <Ctrl-s> to save all changes.

```

===== DSL Status/Configuration =====
. The Device Configured as : CP           Link Status : Down
. Line Rate Selection(Kbps) : 2320
. Actual Line Rate(Kbps)   : 0
  (Determined by lower rate of both sides)
. DSL Line SNR(dB)        : 0.0

Ctrl-s           Save all
Press Esc to return to the main menu

```

Network Mode Configuration

The Network Mode Configuration screen allows the user to change a variety of functions.

- The user can enable either or both Bridging and RIP functions.
- The user can change the devices main IP Address, Subnet Mask and Default Gateway.
- A Bandwidth Limit can also be set for inbound and outbound traffic (a setting of 0 means that the traffic control is not activated and it will allow whatever traffic the network can support).
- For the Remote CP device, NAT can be enabled, with optional setting for e-mail and http/ftp servers. The appropriate IP addresses must be entered.

Network Mode Configuration - Local (CO) Side

```

===== Network Mode Configuration =====

. Device Serves at Side           : CO

. Bridging Enabled                : N
. RIP Enabled                     : N

. Device Main IP Address          : 194. 1. 1. 2
. Device Main IP Subnet Mask     : 255.255.255. 0
. Ethernet Side Default Gateway  : 194. 1. 1. 1

. Bandwidth Limit, Outbound(Kbit/s): 256
. Bandwidth Limit, Inbound(Kbit/s) : 256

Ctrl-s          Save all
Press Esc to return to the main menu

```

Network Mode Configuration – Remote (CP) Side

```

===== Network Mode Configuration =====

. Device Serves at Side           : Remote

. Bridging Enabled                : Y
. RIP Enabled                     : N

. Device Main IP Address          : 194. 1. 2. 1
. Device Main IP Subnet Mask     : 255.255.255. 0
. Ethernet Side Default Gateway  : 0. 0. 0. 0

. Bandwidth Limit, Outbound(Kbit/s): 256
. Bandwidth Limit, Inbound(Kbit/s) : 256

. NAT Enabled                    : Y
(Item below has no effect unless NAT is enabled)
. Device NAT IP Address          : 192.168. 1. 1
. NAT Subnet Mask                : 255.255.255. 0
. E-mail Server Enabled          : Y
. E-mail Server's IP Address     : 192.168. 1. 10
. HTTP/FTP Server's IP Address  : 0. 0. 0. 0

Ctrl-s          Save all
Press Esc to return to the main menu

```

By default, the DSL LAN Extender CO and CP devices are pre-assigned the same IP address at the factory: 192.168.100.1. You should assign the DSL LAN Extender device a valid host IP address in the same subnet as the Ethernet to which it is directly connected.

To configure the DSL LAN Extender without using a serial port, please see Appendix D.

Note: The above tables show the configuration of Case F in Appendix C. (The DSL LAN Extender CP is NAT enabled, with some using private IP and some using public IP).

Defining the Device IP Address and Subnet Mask

This option lets you define the IP address for the DSL LAN Extender CP device's connection to your local LAN. Assign the DSL LAN Extender CP device a valid host IP address that is consistent with the Ethernet to which it is directly connected. Also, make sure the DSL LAN Extender CP device belongs to the same subnet as the Ethernet to which it is directly connected. See the illustration at the end of this section for an example showing IP addresses correctly assigned on a network.

You use this option to specify how many bits in an IP address are considered to be part of the network portion of the address. For example, the default Ethernet Side Subnet Mask, 255.255.255.0, indicates that 24 bits are used for the network portion, leaving 8 bits, or a maximum of 254 node addresses, for this subnet to use. If you do not expect your organization to require more than 254 nodes in the future, you should leave the default value for this option.

Defining the Ethernet Side Default Gateway

You use this option to specify the default gateway address of the Internet access router or other router connected to the DSL LAN Extender's Ethernet port. Please see Appendix C for examples of setting the IP parameters for different network environments.

Bandwidth Control

The bandwidth control feature allows you to control the bandwidth allocated for information going out to the remote side and coming into the local LAN side. Users who mostly download information (from the Web, for example), would probably want to increase the amount of inbound traffic. On the other hand, if some users were running their own Web sites, most traffic would flow out from their computers, so they would probably want to increase the amount of outbound traffic. The inbound and outbound settings function independently.

Bandwidth control allows ISPs to charge their customers based on the customers' bandwidth needs. It also allows ISPs to increase users' bandwidth allocation quickly and easily, without requiring additional hardware. In addition, bandwidth control allows users to reconfigure the bandwidth without reconfiguring the line rate.

To define the desired amount of bandwidth for outbound traffic (that is, traffic flowing from the local LAN to the remote side), enter the desired bandwidth in the Bandwidth Limit, Outbound field. The number you enter represents the number of kilobits per second (Kbps). The valid range for this field is 1 to x, where x is the highest data rate supported by the DSL LAN Extender device in its current configuration.

To define the desired amount of bandwidth for inbound traffic (that is, traffic flowing from the remote side to the local LAN), enter the desired bandwidth (in Kbps) into the Bandwidth Limit, Inbound field. The valid range for this field is 1 to x, where x is the highest line rate supported by the DSL LAN Extender device in its current configuration.

NOTE: To turn off bandwidth control in both directions, specify 0 for both the Bandwidth Limit, Outbound and Inbound fields. To turn off bandwidth control in either the outbound or inbound direction, specify 0 for the Outbound or Inbound field, depending on the direction you want.

Type <Ctrl-s> to save the new setting.

NOTE: When using bandwidth control, configure the DSL LAN Extender device for the highest data rate supported by the length and condition of the DSL cable.

Benefits of Using a DSL LAN Extender as an Internet Access Gateway

You can configure a DSL LAN Extender CP with Bridging disabled and RIP either enabled or disabled. In this mode, the DSL LAN Extender will act as an Internet access gateway, which treats the local LAN side as one community. A good example of how this works is in a high-rise apartment building. You could connect the residents on each floor to a DSL LAN Extender CP device. Each DSL LAN Extender device, in turn, would connect to a DSL LAN Extender CO.

Network Address Translation (NAT)

This option allows a group of computers connected to a DSL LAN Extender CP device to share a single IP address, while still allowing the machines to use different private, internal IP addresses. This feature is useful in situations where users are restricted by a limited (and usually small) number of public IP addresses assigned by their Internet Service Provider (ISP). For example, by setting the Ethernet Side Subnet Mask to 255.255.255.0, users have the flexibility of using 254 private, internal IP addresses for their machines. Yet with NAT turned on, the outside world only sees one, public IP address (the DSL side IP address) for all the machines.

The NAT option also enhances the security of your network because only a single IP address is presented to the world, not every computer's IP address. This makes it harder for hackers to access the computers on your network.

To turn on the NAT feature, select Y for the NAT Enabled option and enter the NAT IP address (such as 192.168.10.10) and its Net Mask (such as 255.255.255.0).

The CP routing configuration allows public IP addresses to co-exist with the subnet that uses private IP addresses. When the ISP has assigned more than one public IP address, you can use them for the E-mail server and/or the HTTP/FTP server. Please see Appendix C for more detailed examples.

Adding Support for Your E-Mail Server and HTTP/FTP Server

The DSL LAN Extender CP device supports the Simple Mail Transfer Protocol (SMTP) and Post Office Protocol 3 (POP3). If you have an e-mail server on your local LAN to handle your organization's e-mail, you can configure the DSL LAN Extender CP device to support this server. The advantages of setting up your own e-mail server are as follows:

- Reduce Internet traffic across the DSL connection. E-mail messages directed to PCs on the local LAN aren't sent across to the remote side. Also, when people on the local LAN side check their e-mail, their queries are sent to the local e-mail server, instead of over the DSL connection.
- Provide flexibility in managing e-mail accounts. You can quickly and easily add, delete, or modify e-mail accounts by yourself.
- Provide greater security for internal e-mail.

To use an E-mail server, select Y for the E-Mail Server Enabled option. Enter the E-mail server's IP address. If you have an HTTP/FTP server, you can also enter its IP address in the next field.

NOTE:The DHCP server feature is most commonly used when the DSL LAN Extender CP device is configured as an Internet access gateway, although you can use it when the DSL LAN Extender CP is configured for another mode.

DHCP Enabled

To turn the DHCP feature on and off, use the arrow keys to position the cursor beside the DHCP Enabled field. Press the <Enter> key to toggle between the Y and N settings. Select Y to turn the DHCP feature on; select N to turn the feature off.

DHCP Range

Specify the range of IP addresses you want the DSL LAN Extender CP device (functioning as the DHCP server) to assign the DHCP clients on your local LAN. Each machine you configure as a DHCP client will be assigned an IP address in this range. The maximum number of DHCP clients supported by the DSL LAN Extender CP is displayed in the DHCP Status/Configuration screen. Make sure the range of IP addresses you specify are valid host IP addresses on the same subnet as the subnet connected to the DSL LAN Extender CP device's Ethernet side.

NOTE:When you define the DHCP range, you should set aside a few IP addresses for your servers (such as your Web and e-mail servers). For example, suppose the available IP addresses on your local LAN include the addresses from 1.2.3.1 to 1.2.3.30. To reserve three IP addresses for your servers, you could define the following DHCP range: 1.2.3.4 to 1.2.3.30.

To specify the DHCP IP address range:

1. Use the arrow keys to position the cursor beside the first DHCP Range field. Press the <Enter> key. The field is highlighted.
2. Type the starting IP address for the range. Press the <Enter> key when you are finished typing the first address.
3. Press the <Right> arrow key to move the cursor to the next DHCP Range field. Press the <Enter> key. The field is highlighted.
4. Type the last IP address in the range. Press the <Enter> key when you are finished typing the last address. Type <Ctrl-s> to save the new settings.

DNS Addresses

If your network includes DNS servers, you can configure the DSL LAN Extender CP device to automatically pass the addresses of the DNS servers to DHCP clients. To set this up, you need to define the IP addresses of the DNS servers (up to 3 allowed). Make sure you specify the correct host IP addresses for each DNS server (if you do not know the IP addresses of the DNS servers on your network, contact your system administrator or ISP for this information).

To define the DNS server information:

1. Use the <Up/Down> arrow keys to position the cursor beside the first field beside the DNS Servers option. Press the <Enter> key. The field is highlighted.
2. Type the IP address for the first DNS server. Press the <Enter> key when you are finished typing the address. Press the <Right> arrow key to move the cursor to the next DNS Server's field.
3. Follow the above step to specify the IP addresses of up to two more (for a total of 3) DNS servers. Type <Ctrl-s> to save this information.

DHCP Lease Time

Specify the amount of time you want the IP information assigned by the DSL LAN Extender CP device to remain in effect for the DHCP clients. This feature lets you build in an automatic termination date for DHCP-assigned IP information. This helps prevent system administrators from worrying about a limited number of IP addresses being allocated to DHCP clients that no longer need them (for example, PCs that are no longer in service). If the DHCP client fails to renew the lease within the specified time, the lease expires and the DSL LAN Extender CP device can reassign the IP address to another client.

In most cases, 30 days (720 hours) is a good starting DHCP Lease value (you can always increase or decrease this value later).

To specify the duration of the DHCP lease:

1. Use the <Up/Down> arrow keys to position the cursor beside the Days field next to the DHCP Lease Time option. Press the <Enter> key. The field is highlighted.
2. Type the number of days (up to 999) you want the IP information to stay in effect. Press the <Enter> key when you are finished typing the desired number of days.
3. If you want to define the number of hours you want for the lease time, in addition to the specified number of days, press the <Right> arrow key to move the cursor to the Hours field. (For example, to specify a DHCP lease time of 1-½ days, specify 1 for the days and 12 for the hours.) Press the <Enter> key. The field is highlighted.
4. Type the desired number of hours (up to 99). Press the <Enter> key when you are finished. Type <Ctrl-s> to save the new settings.

You can display status information about the DHCP clients, and also delete them.

Configuring DHCP Clients

To allow machines on your local LAN to receive their IP information from the DSL LAN Extender CP device, you must configure each machine as a DHCP client. The following section describes how to configure a PC running Windows 98 as a DHCP client. (Perform these steps for each machine on your local LAN you want to be a DHCP client.)

1. From the Windows 98 desktop, open the Start menu and choose the Settings/Control Panel command. The Control Panel window appears.
2. Double-click the Network icon. The Network dialog box appears.
3. Click the TCP/IP -> (Adapter Name) item in the list at the top of the dialog box. (Adapter Name = the name of the network interface card installed in the machine.) Click the Properties button. The TCP/IP Properties dialog box appears.
4. Click the IP Addresses tab. The IP Addresses options appear.
5. Select the Obtain an IP address automatically option. Click OK in all the open dialog boxes. Follow the instructions that appear on screen (for example, you must restart the machine to implement the changes you made).

Implementing New DHCP Settings

If you change the DHCP settings you defined using the DSL LAN Extender software, for each DHCP client, follow the instructions below to update the client with the new settings.

1. Display the MS-DOS Prompt window.
2. Type winipcfg, then press the <Enter> key. The IP Configuration dialog box appears.

3. Click the Release button.
4. Click the Renew button. Click OK. Exit from the MS-DOS Prompt window.

Viewing DHCP Lease Status Information and Deleting Clients

You can check the status of the DHCP clients that receive their IP information from the DSL LAN Extender CP device. The bottom of the DHCP Status/Configuration screen displays the following information about the status of DHCP clients:

- Index – a sequential number assigned to help you keep track of DHCP clients
- User Name – the host name of the DHCP client
- HW Address – the MAC address of the network interface card installed in the client's machine
- IP Address – the IP address assigned to the client
- Hours Left – the number of hours remaining on the client's DHCP lease

Scrolling Through the List of DHCP Clients

If the DHCP Lease Status list contains more clients than can be displayed in the DHCP Lease Status field, you can scroll through the list.

To scroll through the list of clients:

1. Press the <Down> arrow key to move the cursor to the DHCP Lease Status line.
2. Press the <Enter> key. The cursor moves into the DHCP Lease Status Table.
3. Press the <Up/Down> arrow keys to scroll up and down the list.
4. Press the <Esc> key to move the cursor out of the DHCP Lease Status field.

Deleting DHCP Clients

In general, if you want to release a client's IP address, you should release them using the operating system's network software (see the "Implementing New DHCP Settings" for information on how to release clients). However, if you cannot do this for some reason (for example, if the machine assigned the IP address is no longer available), you can delete clients from the DHCP Lease Status list. If you delete a client from the DHCP Lease Status list, the client's IP address will be released and the IP address will be added to the range of IP addresses available for other clients. (The client you delete from the list will no longer be able to access the TCP/IP network, unless you configure it again as a DHCP client.)

To delete a DHCP client:

1. Press the <Down> arrow key to move the cursor to the DHCP Lease Status line.
2. Press the <Enter> key. The cursor moves into the DHCP Lease Status Table.
3. If necessary, press the <Up/Down> arrow keys to scroll through the list to position the cursor beside the client you want to delete.
4. Type <Ctrl-d>. A prompt appears to confirm you want to proceed. Press the <Enter> key to delete the client; press the <Esc> key to cancel the deletion. If you press <Enter>, the selected client is deleted from the list.
5. Type <Ctrl-s> to save your changes. Follow the on-screen prompts to either cancel or implement the changes.

SNMP Support

The DSL LAN Extender devices support the industry-standard Simple Network Management Protocol (SNMP). This protocol allows users running popular network management software (such as HP's OpenView and Castle Rock's SNMPc) to manage and monitor the DSL LAN Extender devices. The section below describes how to configure your DSL LAN Extender devices to support SNMP.

NOTE: This document assumes you know how to use SNMP network management software and how to configure hosts and set up communities under SNMP. For information about SNMP, you can consult some reference information about this subject. Below is information about a few good reference books about SNMP:

SNMP, SNMPv2, and RMON, written by Williams Stallings, published by Addison Wesley

Understanding SNMP MIBs, written by David Perkins and Evan McGinnis, published by Prentice Hall

Managing Internetworks with SNMP, written by Mark A. Miller, published by M&T books

Installing the DSL LAN Extender Software MIB Files

To use your SNMP management software to access a DSL LAN Extender device, you must first install the two Management Information Bases (MIB) files that come with the DSL LAN Extender: `blackbox.mib` and `extender.mib`. The steps for installing MIB files depend on the SNMP management program you are using, so you should check the documentation that came with your SNMP management software for instructions on how to install MIBs. Below is some information describing how you can get the latest MIB files and how to install them:

- In an effort to continually improve our products, Black Box will update the DSL LAN Extender MIB files and post the updated MIB files on the Black Box Web site (www.blackbox.com). Check the Web site to see if any new MIBs are available. (Use a text editor to open the MIB files and check the release history information in each MIB file's header to see if you have the latest MIB files.) If new MIBs are available, you should download them from the Black Box Web site and install the new MIBs in your SNMP management software.
- After you install the MIB files in your SNMP management software, make sure you re-compile the MIB files using your SNMP management software. Make sure you compile the `wailan.mib` first, then the `agate.mib`.

SNMP Configuration

Before you can use SNMP management software to monitor and manage a DSL LAN Extender device, you must first use the DSL LAN Extender 2.x software console user interface to configure certain SNMP information.

NOTE: You must configure SNMP support separately for the DSL LAN Extender CO and CP devices because they are independently managed SNMP devices.

To access the screen used to configure SNMP information, select the SNMP Status/Configuration option from the Main Menu. If prompted, enter your password. The SNMP Configuration screen appears.

```

===== SNMP Configuration =====
. Limit Access to SNMP Hosts:      N
. Communities (16 bytes max.)
|---No.-----Communities-----Read-----Write-----|
|   1   | public                |         Y         |         N         |
|   2   |                          |                   |                   |
|   3   |                          |                   |                   |
|---Total:1-----|
. SNMP Management Hosts
|---No.-----Host Name-----Community-----IP-----|
|   1   | sysadmin                | secured           | 201.100.100. 1   |
|   2   |                          |                   |                   |
|   3   |                          |                   |                   |
|---Total:0-----|
. Trap Destinations
|---No.-----Host Name-----Community-----IP-----|
|   1   |                          |                   |                   |
|   2   |                          |                   |                   |
|   3   |                          |                   |                   |
|---Total:0-----|
Ctrl-s  Save all      Escape  Return to the main menu

```

SNMP Status/Configuration screen

The SNMP Status/Configuration screen consists of one option and three tables:

- Limit Access to SNMP Hosts option
- Communities table
- SNMP Management Hosts table
- Trap Destinations table

These items are described below.

Selecting Settings for SNMP Options

You can enter and edit text in the following fields in the SNMP Status/Configuration screen:

- Communities
- Host Name
- Community
- IP

For all the other fields (including the Limit Access to SNMP Hosts field), you simply need to move the cursor beside the desired option, and then press the <Enter> key to display the desired setting (Y = option turned on; N = option turned off).

Follow the steps below to change a setting in one of the tables:

1. If the cursor appears inside one of the tables, press the <Esc> key. The cursor moves outside the table.

2. Press the <Up/Down> arrow keys to move the cursor beside the table you want to change. For example, if you want to modify information in the Communities table, move the cursor beside the Communities title.
3. Press the <Enter> key. The cursor moves to the first field in the current table. Press the <Up/Down> arrow keys to move the cursor up or down a row; press the <Left/Right> arrow keys to move the cursor to the column to the left or right field (note that you cannot change the Read setting, so the cursor always skips the Read fields).
4. If you are in a field that requires you to enter or edit information (see the above list of fields in which you can enter/edit information), press the <Enter> key. The field is highlighted. Press the <Left/Right> arrow keys to move the cursor to the left and right in the current field. Press the <Backspace> key to delete characters in the field. Type the information (IP addresses for the IP fields, text for the other fields). Press the <Enter> key when you are finished editing the field.
5. Press the arrow keys to move the cursor up, down, left, or right to the next field you want to edit.
6. Press the <Esc> key when you are finished editing information in the current table.

Deleting a Row

To delete a row of information:

1. Position the cursor in the row you want to delete.
2. Type <Ctrl-d>. A prompt appears to confirm you want to proceed. Press the <Enter> key to delete the current row; press the <Esc> key to cancel the deletion.

Adding a Row

You can add up to four rows of entries to the Communities, SNMP Management Hosts, and Trap Destinations tables.

To add a row for a new entry:

1. Position the cursor in the table where you want the new row to appear.
2. Type <Ctrl-a>. A new row is added to the table. Follow the editing instructions in the "Selecting Settings for SNMP Options" to modify the information in the new row.

Saving Changes

After you make any changes to the contents of the SNMP Status/Configuration screen, you need to save your changes. If you don't save your changes and exit from the DSL LAN Extender 2.xx software, your changes will be discarded.

To save changes, type <Ctrl-s>. A prompt appears to confirm you want to proceed. Press the <Enter> key to save the changes; press the <Esc> key to cancel the save.

Limit Access to SNMP Hosts Option

This option controls whether or not your DSL LAN Extender device only allows the hosts defined in the SNMP Management Hosts table to access the device. When this option is turned off (N), the DSL LAN Extender device allows all the members of the communities defined in the Communities table to access the device. When this option is turned on (Y), only the hosts defined in the SNMP Management Hosts table are allowed to access the device.

Defining Communities Information

You need to define the communities to which the DSL LAN Extender device belongs. You can assign the device to up to four communities. The community information determines which hosts on the network are allowed to do the following:

- Read the device's configuration information
- Modify (write) the configuration
- Receive traps from the device (traps are essentially alarms the device sends out to alert certain users when certain events occur, such as when the device is powered or reset).

NOTE: Be careful when you define community information. You must enter the community names exactly as they are defined in your SNMP management software or your management software will not be able to recognize the device. Community names are case-sensitive.

After you assign the device to the communities you want, assign the permissions you want for members of each community. You assign permission by selecting Yes (Y) or No (N) for each permission.

Y = allow members of the community to do this

N = don't allow members of the community to do this

There are two access options:

Read = allow (Y)/disallow (N) members of the community to read the device's configuration. (The Read option is automatically turned on for all the communities to which you assign the device. You cannot change this setting. However, if the Limit Access to SNMP Hosts option is turned on, only hosts you designate in the SNMP Management Hosts table will be allowed to read the device's configuration -- see the "Specifying Who Can Access the Device" section below for information.)

Write = allow (Y)/disallow (N) members of the community to modify the device's configuration.

You designate the members of the community you want to be able to access the device in the SNMP Management Hosts table.

Specifying Who Can Access the Device

You can specify the hosts on the network who will be allowed to access the device. You use the SNMP Management Hosts table to do this. This feature adds an additional level of security to the device.

NOTE: If the Limit Access to SNMP Hosts option is turned on, only the hosts you specify will be allowed to access the DSL LAN Extender device. (If the Limit Access to SNMP Hosts option is turned off, all members of the communities you assigned to the DSL LAN Extender device will be allowed to access the device, contingent on the permissions you assigned to each community.)

The hosts you specify must belong to the communities in the Communities table. Also, the permissions you defined in the Communities table apply to the hosts you specify. For example, suppose you assign the DSL LAN Extender device to a community named "public" and a community named "netman". You assign write permission to members of the public community but not to the netman community. Also, suppose you set up the following two hosts in the SNMP Management Hosts table: Jupiter and Saturn. Jupiter belongs to the public community and Saturn belongs to the netman community. Jupiter, as a member of the public community, which has write permission, will be able to modify the device's configuration. Saturn, as a member of the netman community, which doesn't have write permission, will only be able to read the device's configuration, but not modify (write) it.

You can designate up to four hosts in the SNMP Management Hosts table. You must define the following correct information about each host you want to access the DSL LAN Extender device:

- Host name
- Community name (the community to which the host belongs)
- IP address

Specifying Trap Destinations

Similar to defining hosts you want to allow to access the device, you can also specify the hosts (up to four) you want to receive trap information. You specify these hosts in the Trap Destinations table.

You need to define the following correct information about the hosts you want to receive trap information:

- Host name
- Community name (the community to which the host belongs)
- IP address

This feature provides an added level of security to the device. In order for a host to receive trap information, the following conditions must be true:

- The host must belong to a community defined in the Communities table.
- The community must be configured to receive trap information (that is, Trap = Y).
- The host must be correctly defined in the Trap Destinations table .

SNMP Features Supported

The main features of the DSL LAN Extender devices' SNMP support are as follows:

- Supports standard MIB-II MIBs, as defined in RFC 1213.
- Supports two Black Box private MIBs: blackbox.mib and extender.mib. These features are described below.

Standard MIB Support

The MIB-II groups the DSL LAN Extender devices support are summarized below.

SYSTEM

Provides overall information about the system.

INTERFACE

Provides information about the interfaces the device offers (see the "Interfaces Supported by DSL LAN Extender Models" section below for a list of the interfaces offered by the various DSL LAN Extender models).

IP

Provides information regarding the device's implementation and execution of the Internet Protocol (IP).

ICMP

Provides information about the device's implementation and execution of the Internet Control Message Protocol (ICMP).

TCP

Provides information about the device's implementation and execution of the Transmission Control Protocol (TCP).

UDP

Provides information about the device's implementation and execution of the User Datagram Protocol (UDP).

SNMP

Provides information about the device's implementation and execution of SNMP.

Interfaces Supported by DSL LAN Extender Models

The table below shows the number of interfaces available on the various DSL LAN Extender models.

Interfaces Model	XDSL Line	Ethernet 10Base-T	T1/E1 RJ-45	G.703 Coax	HS RS-422	LS RS-422	V.35 M-34
DSL LAN Extender 200	1 MSDSL	Yes	No	No	No	No	0
DSL LAN Extender 800/850	2 RADSL	Yes	No/Yes	No	Yes	Yes	0

Interfaces supported

HS RS-422: High Speed Serial Interface (DB-9 for DSL LAN Extender 800/850)

LS RS-422: Low Speed Serial Interface (DB-25)

M-34: Manchester 34-pin V.35 interface

Black Box Private MIBs

Black Box provides two private MIBs for the DSL LAN Extender devices: a Black Box system MIB (blackbox.mib) and a Black Box DSL LAN Extender MIB (extender.mib).

You can find the most current information about the MIBs in the MIB files themselves. Just use a text editor to open them and then read the information about the MIBs. Below is some information about the main groups of information the MIBs support.

Products

This group defines the Black Box product IDs.

SystemConfigGroup

This group provides information about product-specific configuration settings. Users can modify most variable settings (you can also use the DSL LAN Extender 2.x software to modify these settings).

SystemStatusGroup

This group provides system-level information. This information supplements the system information available in the system group in the standard MIB.

Slots

This group contains two tables: a slot table and a slot items table.

The slot table contains one entry for each physical board installed in the device. Each entry defines the board's name, the number of communication ports on the board, and the ports' interface indices. The DSL LAN Extender 800 and 850 models have two boards each, whereas the DSL LAN Extender 200 model has only one board per device.

The slot items table, on the other hand, contains one entry for each communication port on the device. This table includes fields that indicate which slot the interface is on, as well as which standard MIB-II interface the interface is associated with. The slot items table is similar to the standard MIB-II interface table. However, the slot items table contains more detailed information about the interfaces.

The slot table and the slot items table are designed to allow you to clearly see how many boards are in the system (either 1 or 2 in the case of DSL LAN Extender devices), as well as how many communication interfaces are present in the system and the boards on which they are located.

XDSLLogicalIfGroup

This group provides information associating the logical DSL interfaces to the physical interfaces. For the DSL LAN Extender 200 model, there is a one-to-one mapping between the logical and physical interfaces. On the other hand, for the DSL LAN Extender 800 model, one logical interface (namely WaiDSL) is mapped to two physical interfaces (RADSL). This table clearly shows the relationship between the logical and physical interfaces.

XDSLRateSetGroup

This group is a read-only table that essentially serves as an on-line menu that describes the various rate settings available for the device.

DSL LAN Extender DHCP ServPars

This group provides information about the parameters related to the DHCP server feature.

The following information is included in this group:

- Starting and ending IP addresses for the specified range of available IP addresses
- DHCP lease time (in days and hours)
- DNS addresses (up to 3) specified as part of the DHCP configuration

DSL LAN Extender DHCP LeaseTable

This group includes information about the DHCP lease capacity, the total number of DHCP clients, and a table showing information about the DHCP clients. The table contains the following information about the DHCP clients:

- User names
- Hardware (MAC) addresses of the network interface cards installed in the clients' computers
- IP addresses
- Number of hours remaining on the clients' DHCP leases

Bridge Filtering

Bridge Filter provides user access control through the DSL LAN Extender. User needs to manually generate a table of MAC Addresses. These MAC Addresses are from the machine at the end user. Once the MAC Addresses table is generated, it can be used for blocking or forwarding function. If it is configured for blocking, all the devices that have the MAC Addresses included in the MAC Addresses table are restricted from accessing or passing traffic through DSL LAN Extender. On the other hand, if it is configured for forwarding, only the devices, that have the MAC Addresses included in the MAC Addresses table, are allowed to access or pass traffic through DSL LAN Extender.

```

==== MAC Address Table ====
Filter Enabled           : Y
Add A MAC Address       :
Delete A MAC Address    :           (Row, Column)
Total MAC Addresses     : 2           (Max 40)
Configure table for    : Forwarding

      1           2           3           4           5
1  ABCABCABCABC  1234567890AB

Ctrl-s      Save all
Press Esc to return to the main menu

```

Password Change

The Change Password sub-menu allows you to change the password. The new password can be 16 characters or less. System must be rebooted after entering the new password to be valid.

```

===== Password Change =====
Enter New Password      :
Note: Password cannot be longer than 15 characters!
Press Esc to return to the main menu

```

Software Download

• Console Port Download Via RS-232

Press 7 from the main menu to access the Software Download sub-menu. Have your new firmware file ready before selecting this function. Enter "Y" to continue, or press "Esc" to go back to the main menu.

```

Software Download
Are you sure(y/n)? :n
Press 'Esc' to return

```

Instructions are displayed as shown below. Follow these instructions to set up your terminal emulation software and download the latest software to the DSL LAN Extender device. The unit waits about 3 minutes to give you enough time to set the file transfer protocol and select the download file. The displayed "cc....." indicates the time remaining.

```

===== Software Upgrade =====

-----
|                               |
|      WARNING!!!              |
|      No cancellation permitted |
|      once the download begins |
|                               |
|-----|
INSTRUCTIONS:
  .Set file transfer protocol to YMODEM
  .Disable hardware handshaking
  .Select download/send file
Keep pressing 'Esc' 10 seconds to exit
CCC.....

```

- 1) Connect a proper serial cable from the PC to the box.
- 2) Start your VT100 emulator program.
Review the portions of this user's guide for serial port settings and how to get connected.
- 3) Enter the console management session.
The Main Menu displayed.
- 4) Now setup the program to use YModem file transfer protocol.
- 5) In the Main menu, type "6" (without the quotes) to enter Software Download mode.
- 6) Now you will see "C..." on the screen, indicating the box is waiting for file download.
- 7) Now select the command to download the file and execute it.
The process can take as long as 10 minutes. The terminal emulator program indicates the progress and error if any.
- 8) Refer to step 4 of the section "Download via Ethernet/TFTP" for error handling if there is any problem in the download process.

- **Download via Ethernet/TFTP (DOS Version)**

Have the new software ready and know the file location. Make sure you have the TFTP command file on your system.

- 1) Make sure your PC has an Ethernet connection to the box.
- 2) Start a DOS session from Windows 95 or Windows NT.
- 3) Assuming the box's IP address is 10.0.0.1 and the file you want to download is wcs10002.1, type:
tftp -i 10.0.0.1 put wcs10002.1
- 4) Now check the progress and see if the download is successful. Soon after you entered the TFTP command, the green and two yellow LEDs will be lighting cyclically, indicating that it has accepted the downloading job and is processing it. Typically, it takes 50 to 60 seconds to finish the job, and the box will reset itself and link to the other side and start operation immediately afterwards.

The success of the download can also be seen from the result of the TFTP command, showing the command executed successfully and actual time it took. If, on the other hand, the TFTP was finished with a "timeout occurred" message, and you need to find out why.

If the LEDs on the unit display a normal pattern (green flashing regularly, yellows flashing as packets are forwarded), then either the PC doesn't have a good Ethernet connection to the box or the IP address you entered is incorrect.

If the green-yellow-yellow LEDs keep circulating, then the download has failed in the middle. You have to reset the box (by powering off and on the box) and see the status of last download. If the problem happened pretty early and the flash ROM has not been touched at all, then the box will boot as usual; otherwise, both red and green LEDs will be on steadily, indicating it can't perform a normal boot and is only waiting for a download. Now, go to step 3 and try again.

TROUBLESHOOTING

If your DSL LAN Extender device fails to operate properly, follow the troubleshooting procedure listed in Table 1. If the DSL LAN Extender device is still not working, turn off the power and contact Technical Support (see the section entitled *Technical Support Information*).

Table 1: Troubleshooting Procedure

SYMPTOM	PROBLEM	SOLUTION
No LED display	AC cord unplugged	Check connections
Red light ON after power up	Bad connection	Check phone jack/cable
Green light/all LED steady ON	System Down	Try Reset by unplugging/ plugging the power jack
Both yellow lights OFF after power-up/reset	Bad internal connection	Call technical support for help
No Response from LAN port	Possibly wrong 10Base-T cable being used	-Use straight 10Base-T cable to hub or switch -Use crossed 10Base-T cable to PC or Router
Both green and red LEDs are on	Download failed	Re-download the software
Can't telnet to the DSL LAN Extender	Possibly an IP address not assigned to the DSL LAN Extender yet	Use system Main Menu to assign an IP address

Appendix A: TECHNICAL SPECIFICATIONS:

Table 2: Technical Specifications

Items	Specifications
Line Code	MSDSL (CAP 8 - CAP 256)
Serial Payload (Full-duplex)	128 Kbps to 2.304 Mbps
Baud Rate	72 to 386.6 Kbps
Symbol Rate	2-6 Bits/Baud
Line Rate (Full-duplex)	144 Kbps to 2.320 Mbps
DSL Line Output	7.4 to 13.0 dBm
xDSL Interface	2 wire, RJ11 MSDSL
Console Port	RS-232, DB9
Network Interface	Standard Ethernet 10Base-T RJ-45 Jack
Power Requirements	7.5 VAC, 1Amp
Environmental Humidity Operating Temp Storage Temp	Up to 95% 32° to 122°F -4° to 158°F
Physical Dimensions	H = 1 ³ / ₄ " x W = 12" x D = 7 ³ / ₄ "

Table 3: Line Rate at Different Cable Lengths

NOTE: The reach distance can change significantly due to line quality and noise conditions.

	Symmetrical Line Rate (Kbps)	26 AWG (Kft./km.)	24 AWG (Kft./km.)
Configuration No. 1	2320	10.3 / 3.14	13.7 / 4.17
Configuration No. 2	2064	11.0 / 3.35	14.7 / 4.48
Configuration No. 3	1552	12.5 / 3.81	16.9 / 5.15
Configuration No. 4	1040	14.1 / 4.30	19.3 / 5.88
Configuration No. 5	784	15.0 / 4.57	20.5 / 6.25
Configuration No. 6	528	17.7 / 5.39	24.8 / 7.56
Configuration No. 7	400	18.8 / 5.73	26.0 / 7.92
Configuration No. 8	272	20.6 / 6.28	27.9 / 8.50
Configuration No. 9	144	21.3 / 6.49	29.0 / 8.84

Appendix B: Port Pin Layouts

Console (RS-232) Port Pin Layout

DB-9 PIN	Direction	PIN Assignment
1	N/A	N/A
2	OUTPUT	TXD
3	INPUT	RXD
4	N/A	N/A
5	↔	Signal /Common Ground
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A
9	N/A	N/A

10Base-T (RJ-45) Port Pin Layout

RJ-45 PIN	Direction	PIN Assignment
1	OUTPUT	TXD+
2	OUTPUT	TXD-
3	INPUT	RXD+
4	N/A	N/A
5	N/A	N/A
6	INPUT	RXD-
7	N/A	N/A
8	N/A	N/A

Note: You must use straight 10Base-T cable to connect to a Hub, Switch, etc. To connect to a PC, Router, etc., you must use a crossed 10Base-T cable.

xDSL Line (RJ-11) Port Pin Layout

PIN	Direction	PIN Assignment
1	N/A	N/A
2	N/A	N/A
3	↔	Tx/Rx Data
4	↔	Tx/Rx Data
5	N/A	N/A
6	N/A	N/A

Note: The middle two pins of RJ-11 are used.

Appendix C: DSL LAN Extender Routing Models

Before configuring the DSL LAN Extender device, you should take time to understand the DSL LAN Extender routing model. This will make planning your network and configuring the DSL LAN Extenders much easier.

This chapter provides information on the DSL LAN Extender's routing and bridging capabilities, and shows some typical application environments. It also will cover the routing related features unique to the CP side. All example applications will have key parameters shown to make overall picture clear.

Summary of DSL LAN Extender Routing and Bridging Capabilities

A minimum system consists of a DSL LAN Extender pair; one side is configured as a CO (central office side) device and the other as a CP (customer side) device. Each side is then connected to an Ethernet network, and traffic can be bridged/routed between the two sides.

The CO device and CP device are connected by a regular telephone line running xDSL signals, which carries packets between these two devices with bit rates up to 2.3Mbps (DSL LAN Extender 200) or 7.1Mbps (DSL LAN Extender 800/850). Even though the distance can be as long as 4 or 5 miles, this link is a dedicated link between two routers (DSL LAN Extender CO and DSL LAN Extender CP in this case). There are not many parameters users need to control and they don't influence the system level functionality of routing or bridging. So, a way of looking at the pair of DSL LAN Extenders is to treat it as a single bridge/router having two Ethernet ports. Each of the ports is capable of doing link level bridging as well as routing for IP protocol.

Routing and Bridging Features

- Both CO and CP support bridging on Ethernet port
- Both CO and CP support RIP/RIP2 protocol for IP packet routing
- Bridging and RIP routing can be enabled at the same time

Customer Side Features

- CP side supports Network Address Translation (NAT)
- CP side can serve as a Dynamic Host Configuration Protocol (DHCP) server
- CO and CP work together to control the bandwidth of the CP side

Bridging, RIP, and NAT

There are three parameters in the device that users will need to configure to have the device properly handle packets. They are:

- Bridging Enabled
- RIP Enabled
- NAT Enabled

These parameters result in 8 possible configurations; each of them is a valid setting. The device also supports the co-existence of a private IP subnetwork and a public IP subnetwork on the same Ethernet network, which is not directly controlled by any parameters. Another factor users might need to consider is the relationship between CO and CP.

It may seem complicated by just looking at these many combinations. But actually, it's not. Understanding the basic description of those parameters will make the selection easy.

Default Behavior

Since all the three parameters are optional, when all of them are turned off, the device is a simple IP router that works in the following way:

- Configured as CP, it serves as the default gateway for all local machines connected with Ethernet. All the machines configured this way will send packets with destination address outside the local subnet to this device, which in turn, sends them to the CO device via the DSL link.
- Configured as CO, it forwards packets coming from CP to its default gateway, or to devices on its local subnet. Any unicast IP received from the Ethernet will be forwarded to the CP, which in turn examines its ARP table and forwards the packet to the target end station.

On the CO side, a higher-level router typically learns this route by either static route or by RIP. In the latter case, the CO's RIP should be enabled.

If customer implements this network for Internet access, all the PCs served by the CP device must have public IP addresses (normally assigned by your ISP).

When to Enable Each Option

With the understanding of behavior when all three options are disabled, we can look at each option and easily tell when to enable them.

RIP enabled:

Enable this option if the device's Ethernet interface has one or more IP Routers, including other DSL LAN Extenders.

This parameter should also be enabled on the CO side if it is enabled on the CP side.

This option can also be turned on even if there is no IP router on the local subnet.

NAT Enabled:

Enable this option if you will use the device's Network Address Translation (NAT) feature. This feature allows a number of machines to use private IP addresses, and to share a single public IP address when talking to the outside world.

When NAT is enabled, users actually assign two IP subnets to the CP device's Ethernet port. CP will route packets among these two subnets and the outside world (via CO).

The NAT option is not allowed on the CO side.

Bridging Enabled:

There are generally two cases where bridging will be enabled. **NOTE:** The bridging option should be enabled for both sides if it is enabled on either side.

One is to allow other protocols (like NetWare, NetBEUI, or AppleTalk) to pass through (be bridged) when IP protocol is routed. In this case, RIP should be enabled even though there is no IP router on the local Ethernet network. Otherwise, the device can't decide whether to route or bridge IP packets.

The other is to let all protocols pass through, which makes the two networks connected by the CO-CP pair a "flat" network. This may sometimes be an easy choice if the remote side (CP side) is a small group (with a dozen or so or even less machines).

In bridge mode, packets between local machines will be filtered out, but broadcast and multicast packets are always forwarded to the other side.

Example of Applications

Case (A) Branch Office Connection, no route to outside world

Network Structure:

Three subnetworks connected using two DSL LAN Extender pairs.
 (CO_X denotes a DSL LAN Extender configured as CO, CP_X as CP.)

Routing Capabilities:

Every machine in the chart can talk to any other machine.

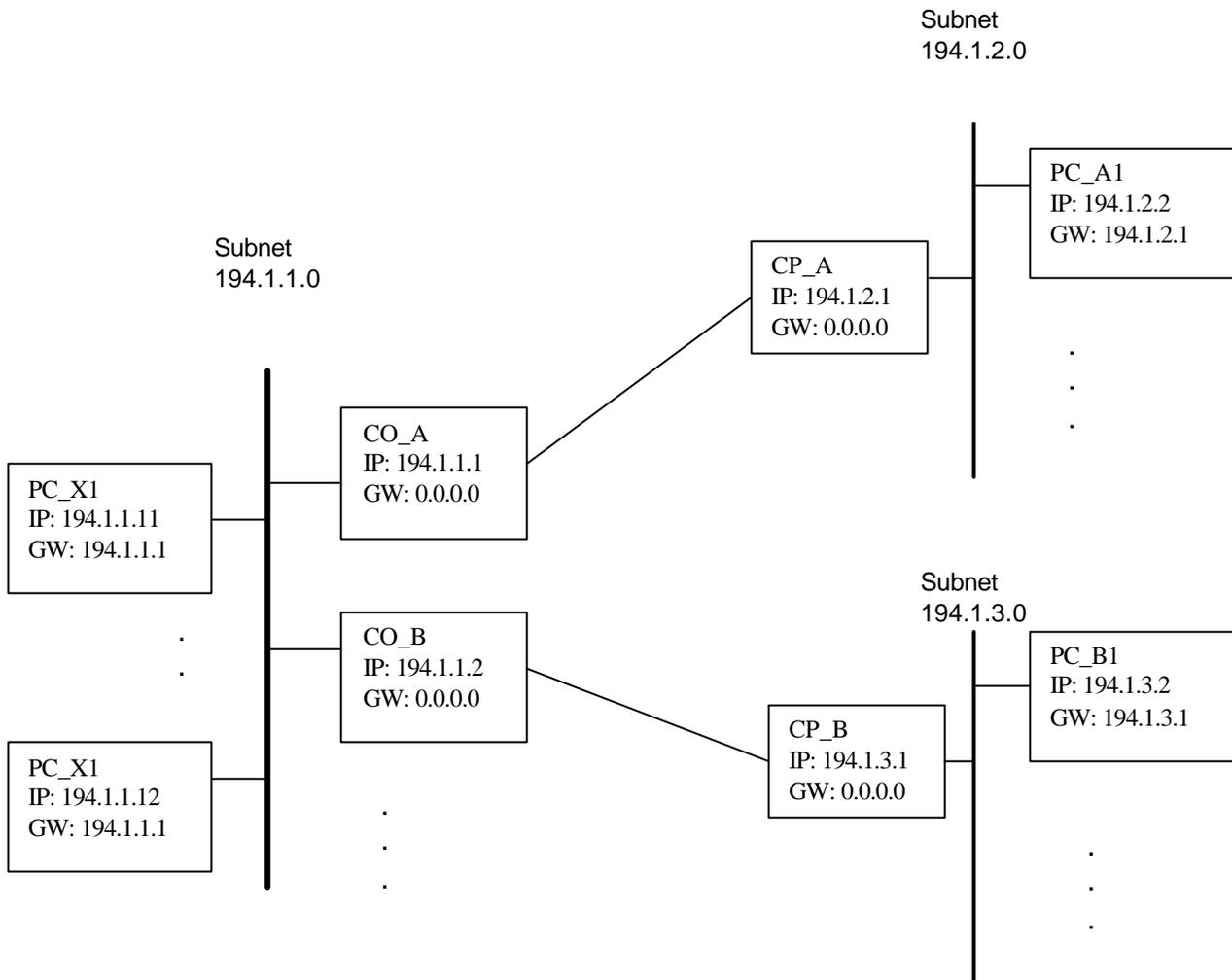
Configurations:

All DSL LAN Extenders have RIP enabled.
 All machines IP setting are shown in the chart.

Example Traffic Path:

PC_A1 sends a packet to PC_B1:

PC_A1 1 → CP_A → CO_A → CO_B → CP_B → PC_B1



Case (B) Branch office connection, one uplink to Internet

Network Structure:

Three subnetworks connected using two DSL LAN Extender pairs.
 (CO_X denotes a DSL LAN Extender configured as CO, CP_X as CP.)
 A WAN router serves the connection to the Internet

Routing Capabilities:

Every machine in the chart can talk to any other machine.
 Every machine in the chart can access the Internet.

Configurations:

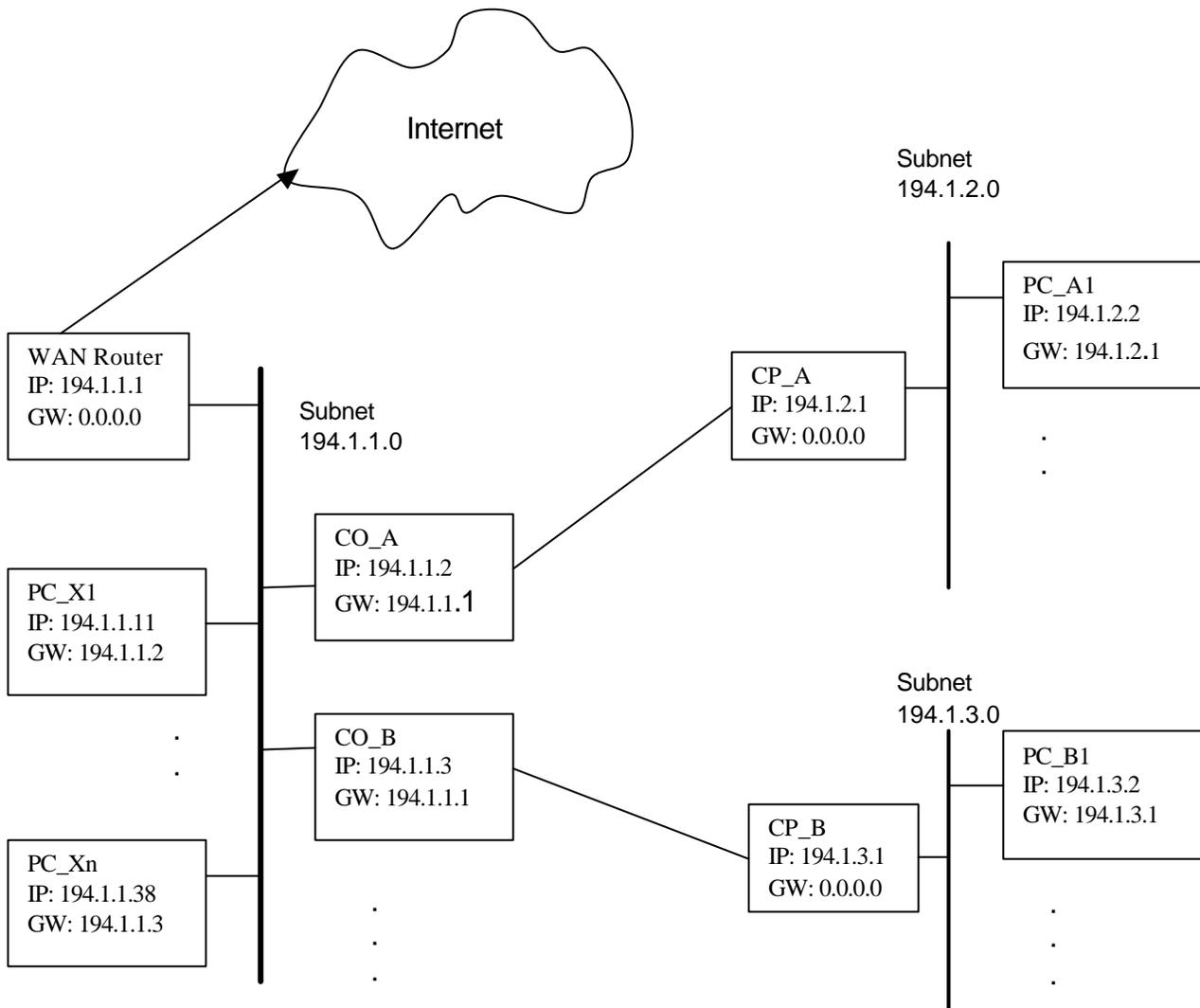
All DSL LAN Extenders have RIP enabled.
 All machines' IP setting are shown in the chart.

Example Traffic Path:

PC_A1 sends a packet to the Internet: PC_A1 → CP_A → CO_A → WAN Router → Internet

PC_X1 sends a packet to the Internet: PC_X1 → CO_A → WAN Router → Internet

PC_Xn sends a packet to the Internet: PC_Xn → CO_B → WAN Router → Internet



Case (C) ISP servicing SOHOs

Network Structure:

Three subnetworks connected using two DSL LAN Extender pairs.
 (CO_X denotes a DSL LAN Extender configured as CO, CP_X as CP.)
 A WAN router serves the connection to the Internet

Routing Capabilities:

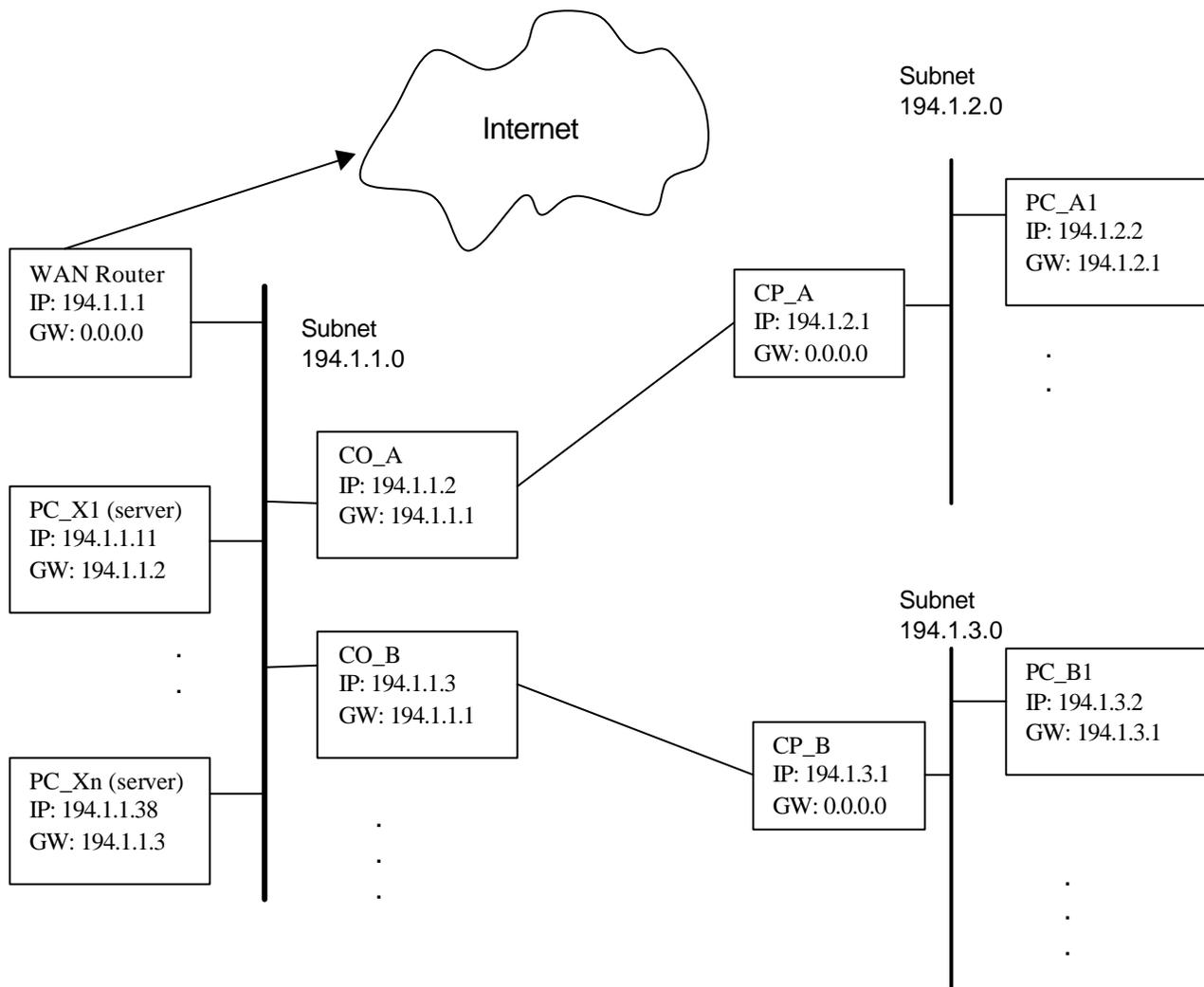
Every machine in the chart can talk to any other machine.
 Every machine in the chart can access the Internet.

Configurations:

All DSL LAN Extenders have RIP enabled.
 All machines' IP setting are shown in the chart.

Example Traffic Path:

PC_A1 sends a packet to the Internet: PC_A1 → CP_A → CO_A → WAN Router → Internet
 PC_X1 sends a packet to the Internet: PC_X1 → CO_A → WAN Router → Internet



Case (D) ISP servicing SOHOs, using DSL LAN Extender as uplink for an area

Network Structure:

Subnetwork 194.1.1.0 is at area center, where CP_ISP serves as the uplink for 194.1.1.0, 194.1.2.0, and 194.1.3.0. (CO_X denotes a DSL LAN Extender configured as CO, CP_X as CP.)

A WAN router at ISP's POP serves the connection to the Internet

Routing Capabilities:

Every machine in the chart can talk to any other machine.

Every machine in the chart can access the Internet.

Configurations:

All DSL LAN Extenders have RIP enabled.

All machines' IP setting are shown in the chart.

All DSL LAN Extenders at 194.1.1.0 (CO_A, CO_B,..., CP_ISP) can be replaced by an IP Address Translator.

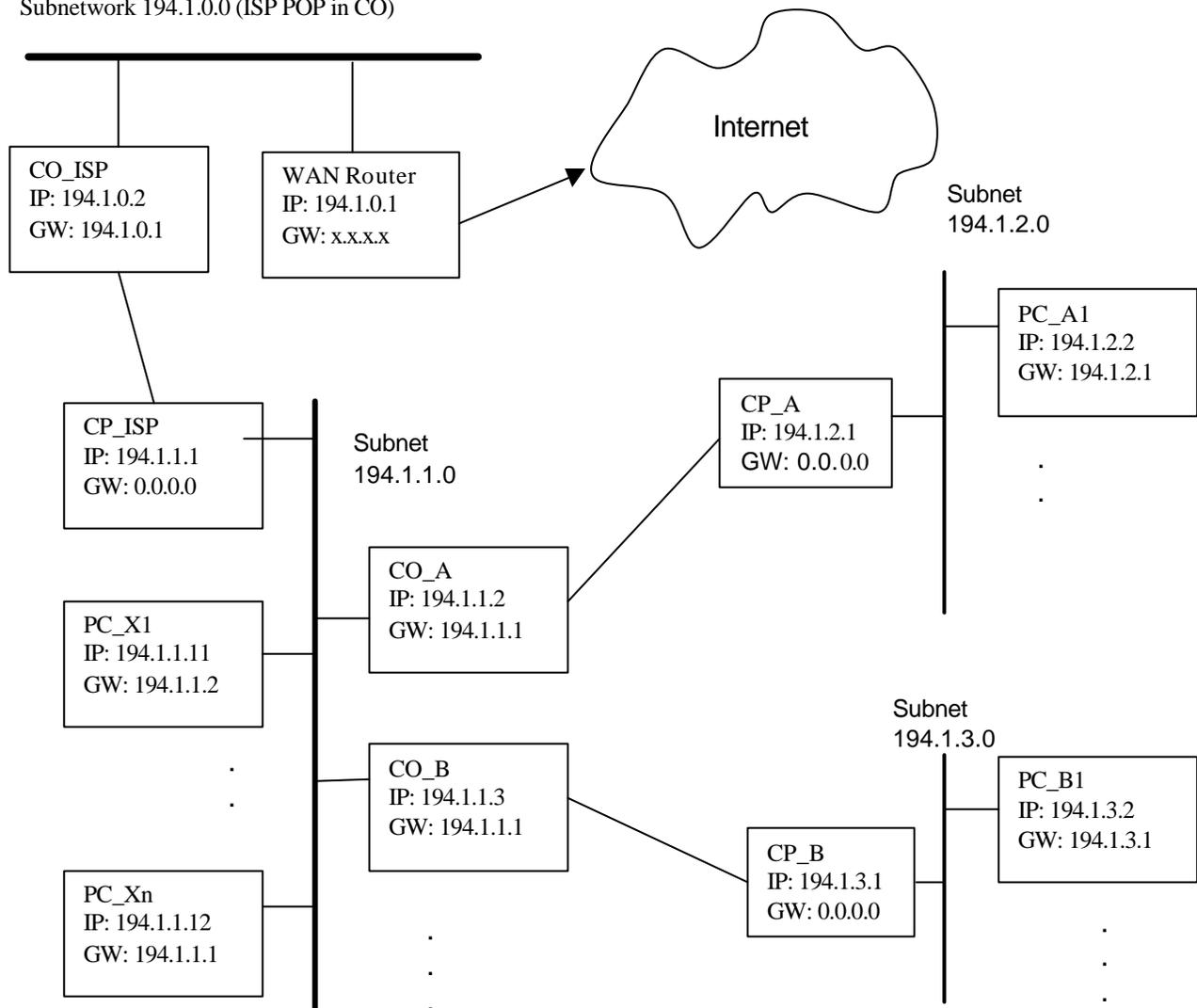
Example Traffic Path:

PC_A1 sends to Internet: PC_A1 → CP_A → CO_A → CP_ISP → CO_ISP → WAN Router → Internet

PC_X1 sends to Internet: PC_X1 → CO_A → CP_ISP → CO_ISP → WAN Router → Internet

PC_Xn sends to Internet: PC_Xn → CP_ISP → CO_ISP → WAN Router → Internet

Subnetwork 194.1.0.0 (ISP POP in CO)



Case (E) DSL LAN Extender CPs NAT enabled, all machines using private IP

As shown in the example on next page, the client side computers are all using private IP addresses in subnetwork 192.168.1.0. To the outside world, all machines are using a single IP address, that is the main IP address of the DSL LAN Extender CP, 192.168.1.1. This includes customer side servers if they exist.

If the site wants to host its own Web server or e-mail server, their IP addresses need to be entered in the DSL LAN Extender CP device. And users need to register through DNS with both e-mail and Web servers as 194.1.2. That is, both e-mail server and Web server are known as having IP address of the DSL LAN Extender CP device, rather than their real IP addresses, which are private.

Network Structure:

ISP assigns IP addresses 194.1.1.1 to 194.1.1.7 to the customer site.

Customer site has NAT enabled, all machines using private IP addresses in subnetwork 192.168.1.0.

Customer Site Capabilities:

A single IP address serves the whole group, including e-mail and Web servers.

The e-mail server (using private IP 192.168.1.2) can be accessed from both inside and outside.

The Web server (using private IP 192.168.1.3) can be accessed from both inside and outside.

Configurations:

All machines' IP settings are shown in the chart.

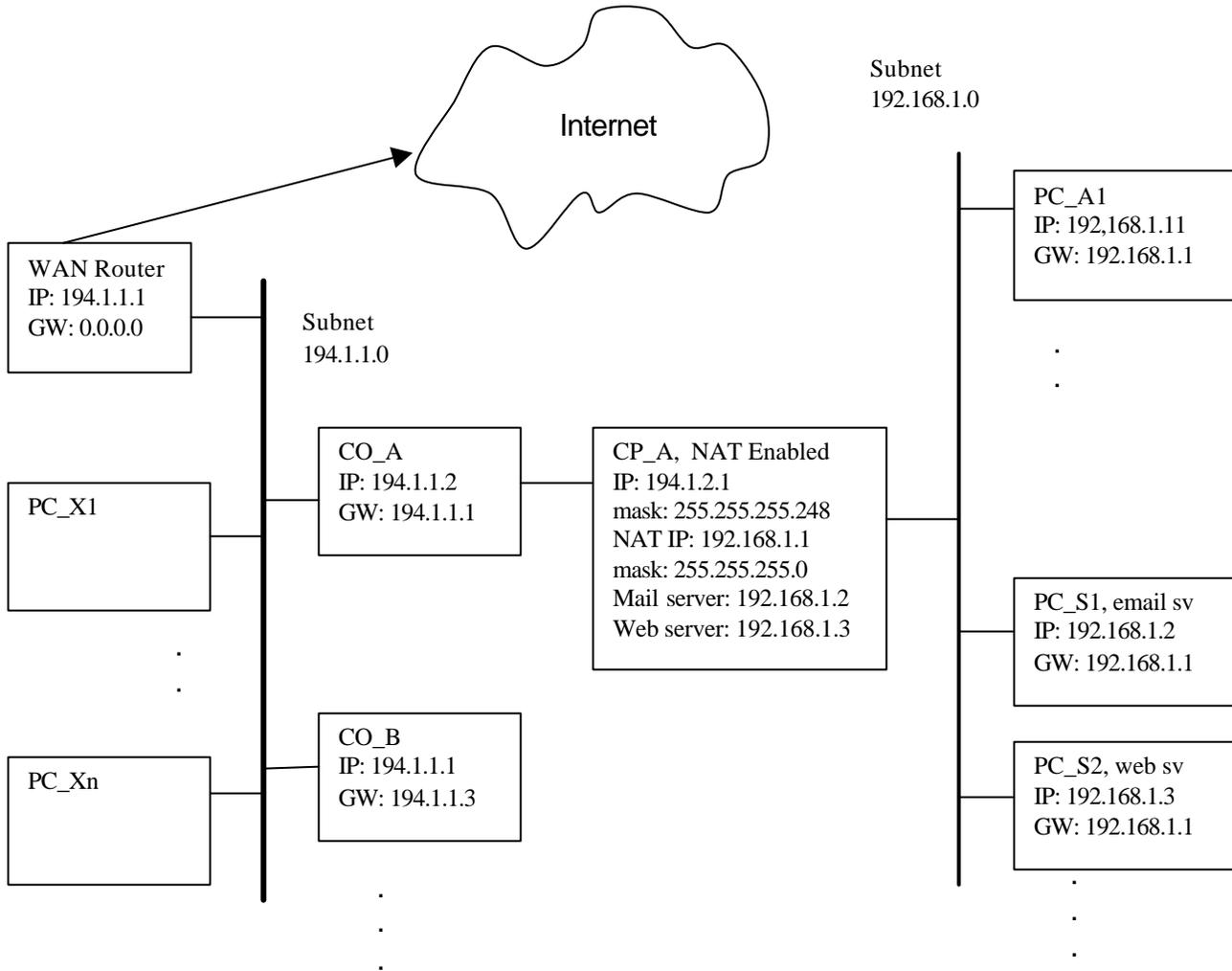
See box CP_A for the settings in this device.

Register through DNS with both e-mail and Web servers as 194.1.2.1.

Example Traffic Path:

PC_A1 sends a packet to the Internet: PC_A1 → CP_A → CO_A → WAN Router → Internet

PC_S1 sends a packet to the Internet: PC_S1 → CP_A → CO_A → WAN Router → Internet



Case (F) DSL LAN Extender CPs NAT enabled, some using private IP, some using public IP

As shown in the example on next page, the client side computers are assigned to two groups: group PC_S using public IP addresses in subnetwork 194.1.2.x; and group PC_A using private IP addresses in subnetwork 192.168.1.x, using private IP addresses. The routing functions built into the DSL LAN Extender CP supports the following:

- Group PC_A and group PC_S talking to each other using TCP/IP protocol
- The DSL LAN Extender CP supports two IP subnetworks simultaneously on the single Ethernet port

Besides, because the two groups are sharing the same physical Ethernet bus, other protocols (e.g. NetWare, NetBEUI) will automatically work.

If the site wants to host its own Web server or e-mail server, the servers should be assigned in the group of public IP addresses (i.e. PC_S) if possible. This way, the IP address of the servers does not need to be translated, as it does for a private IP, and therefore this way has a little performance gain.

If it's not possible to assign a public IP to the Web server or e-mail server, users can still assign them a private IP. In this case, users need to enter these servers' IP addresses to the proper entries using the DSL LAN Extender console user interface.

Network Structure:

ISP assigns IP addresses 194.1.1.1 to 194.1.1.7 to the customer site

Customer site is NAT enabled, some machines using private IP addresses in subnetwork 192.168.1.0; others, preferably servers, are using public IP addresses.

Customer Site Capabilities:

Every machine in the chart can access the Internet.

The e-mail server (using public IP 194.1.2.2) can be accessed from both inside and outside.

The Web server (using private IP 194.1.2.3) can be accessed from both inside and outside.

All machines in site A can talk any other protocols (NetBEUI, NetWare, AppleTalk) among themselves.

Configurations:

All DSL LAN Extenders have RIP enabled.

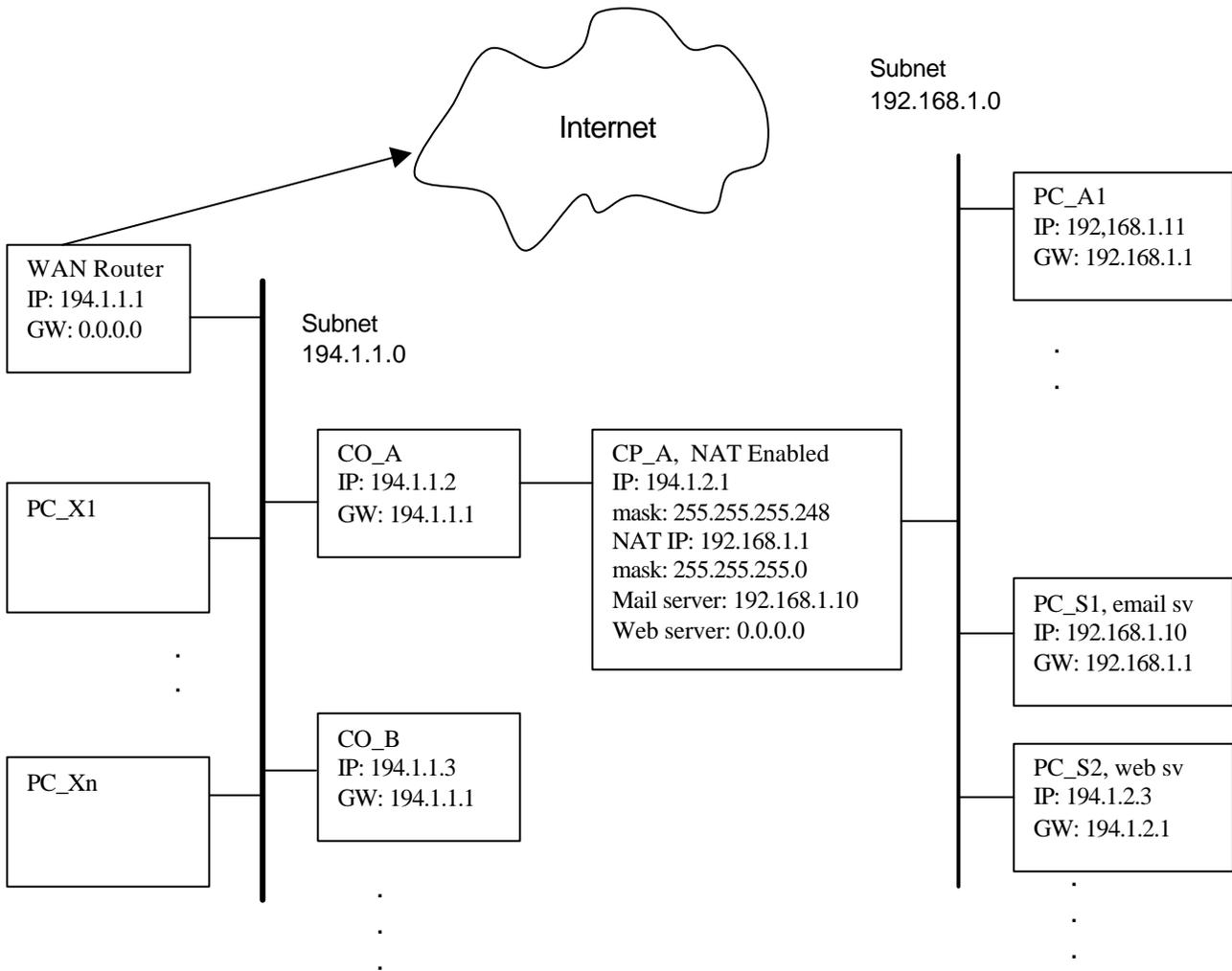
In CP_A, the Web server is set as address 0.0.0.0 because it has a public IP. The mail server has a private IP, 192.168.1.10.

Register through DNS is the Web server as 194.1.2.3.

Example Traffic Path:

PC_A1 sends a packet to the Internet: PC_A1 → CP_A → CO_A → WAN Router → Internet

PC_S1 sends a packet to the Internet: PC_S1 → CP_A → CO_A → WAN Router → Internet



Appendix D: Initial Use of Telnet to Access the DSL LAN Extender Device

Below is some information designed to help you connect to a DSL LAN Extender device using the telnet protocol. The information provides the basic steps for setting up a PC on your network to communicate with a DSL LAN Extender device.

Before you telnet to a DSL LAN Extender device, make sure you check the following:

- The device is correctly plugged in and connected to your network (see your DSL LAN Extender User's Guide for information).
- Make sure the DSL LAN Extender device is connected to the same Ethernet as the PC you plan to use to configure it. Typically, the DSL LAN Extender device and PC will be connected through an Ethernet hub. (For two IP devices to communicate locally, they must both be on the same subnetwork; that is, they must be using the same subnet mask and their IP addresses must belong to the same Ethernet network.)

Follow the steps outlined below to establish a telnet session with the DSL LAN Extender device:

1. Write down the PC's current settings for the following network options:
 - IP address
 - Subnet mask
 - Default gateway
2. Change the PC's network settings to the following:
 - IP address = 192.168.100.2 (you can specify any integer between 2 and 254 for the last number)
 - Subnet mask = 255.255.255.0
 - Default gateway = 192.168.100.1
3. Restart the PC to implement these changes.

NOTE: If your network uses TCP/IP as the primary network protocol, after you make the changes described above and then restart the PC, it's possible the PC won't be able to see other devices on the network. If you are operating in a Windows environment, make sure the PC you are using, as well as the file servers on the network, has NetBEUI installed.

4. Use telnet to connect to the DSL LAN Extender device (the device's pre-defined IP address is 192.168.100.1).
5. After you successfully establish a console session, the DSL LAN Extender main menu appears.
6. Select the Network Mode Configuration option. If prompted, enter your password.
7. Change the default Device main IP address to a valid host address on your subnetwork. Save the device's new IP address. Exit from the DSL LAN Extender software and end your telnet session.
8. Restart the DSL LAN Extender device.
9. Change the PC's IP address, subnet mask, and default gateway values back to their original settings.
10. Restart the PC. You should now be able to telnet to the DSL LAN Extender device using the IP address you defined for its Device Main IP address.

Appendix E: Normal Signal-to-Noise Ratio Tables

Normal Signal-to-Noise Ratio Table for 26 AWG wire pair

Distance (ft)	SNR Values at Different Speeds (dB)				
	2320 (Kbps)	2060 (Kbps)	1552 (Kbps)	1040 (Kbps)	528 (Kbps)
6000	37.2	40.0	41.0	40.3	41.0
7000	36.5	37.0	39.1	39.1	41.5
8000	34.2	35.3	37.7	38.3	39.7
9000	30.6	33.4	35.8	37.0	41.0
10000	28.2	30.2	33.0	35.0	39.2
11000	-	-	30.0	31.9	37.7
12000	-	-	26.8	29.1	36.6
13000	-	-	-	25.7	34.2
14000	-	-	-	-	31.9
15000	-	-	-	-	28.8

Normal Signal-to-Noise Ratio Table for 24 AWG wire pair

Distance (ft)	SNR Values at Different Speeds (dB)				
	2320 (Kbps)	2060 (Kbps)	1552 (Kbps)	1040 (Kbps)	528 (Kbps)
6000	38.8	40.2	41.1	41.1	42.7
7000	37.7	38.4	39.4	40.2	40.3
8000	37.0	38.1	39.1	39.0	40.0
9000	35.8	37.7	38.5	38.3	39.6
10000	33.7	37.2	37.7	37.7	38.7
11000	32.6	33.8	36.6	37.5	39.2
12000	30.2	31.6	34.3	37.1	38.2
13000	27.5	29.7	33.3	35.2	37.6
14000	25.4	28.0	31.0	33.0	37.1
15000	-	26.6	29.3	30.9	36.6
16000	-	-	26.9	29.0	35.5
17000	-	-	-	27.2	33.7
18000	-	-	-	-	32.8

User's Reference Form

DSL LAN Extender 200

MSDSL unit connects to (Central Office, PC, Network, video encoder/decoder...etc) _____

The copper pair's length between two MSDSL units is: _____ (K ft); Impedance: _____ Ω

System Install Date: _____ Line/ Circuit Number: _____

Location of the Local Unit is: _____

Location of the Remote Unit is: _____

Local Unit References:

The firmware version is: _____

The console management password is: _____

The configuration on the MSDSL unit is: # _____

For Ethernet interface,

The Ethernet Address assigned to the MSDSL

device is: _____

The IP Address assigned to the MSDSL device is:

Remote Unit References:

The firmware version is: _____

The console management password is: _____

The configuration on the MSDSL unit is: # _____

For Ethernet interface,

The Ethernet Address assigned to the MSDSL

device is: _____

The IP Address assigned to the MSDSL device is:

Technical Support Information

Black Box Corporation
1000 Park Drive
Lawrence, PA 15055

Technical Support: Phone: 724-746-5500
 Fax: 800-321-0746
 Email: info@blackbox.com
 Response within one working day

URL: www.blackbox.com–
 for additional information, diagrams and firmware updates



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