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LR0060A-R3

# DSL LAN Extender 400

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To meet FCC requirements, shielded cables and power cords are required to connect this device to a personal computer or other Class B certified device.

This digital apparatus does not exceed the Class B limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

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**Normas Oficiales Mexicanas (NOM)  
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.

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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. Normas Oficiales Mexicanas (NOM) Electrical Safety Statement.

### **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.

# Table of Contents

**INTRODUCTION..... 1**

**PRODUCT DESCRIPTION..... 1**

    Features..... 1

    Package Contents ..... 2

**QUICK START..... 3**

**INSTALLATION..... 4**

    Connections..... 4

    Telephone Wire Requirements ..... 5

    Installation Diagram..... 6

**FRONT PANEL INDICATORS ..... 7**

    Power On ..... 7

    Self-test..... 7

    LED Indication..... 7

**CONFIGURING AND MONITORING A DSL LAN EXTENDER DEVICE..... 8**

    Accessing System ..... 8

    Default Password ..... 8

    Main Menu..... 9

    System Information ..... 9

    Traffic Statistics ..... 10

    DSL Status/Configuration..... 11

    Network Mode Configuration..... 11

    Defining The Device IP Address and Subnet Mask..... 13

    Defining The Ethernet Side Default Gateway ..... 13

    Bandwidth Management..... 13

    Benefits of Using The DSL LAN Extender Device As An Internet Access Gateway ..... 14

    DHCP Status/Configuration..... 15

    SNMP Support ..... 19

    MAC Address Filter ..... 26

    Password Change..... 27

    Software Upgrade ..... 27

**TROUBLESHOOTING.....30**  
    Table 1: Troubleshooting Procedure ..... 30

**APPENDIX A: TECHNICAL SPECIFICATIONS: .....31**  
    Table 2: Technical Specifications for SDSL..... 31  
    Table 3: Line Rate at Different Cable Lengths for SDSL..... 31

**APPENDIX B: PORT PIN LAYOUTS .....32**  
    Console (RS-232) Port Pin Layout ..... 32  
    10BaseT (RJ-45) Port Pin Layout..... 32  
    xDSL Line (RJ-11) Port Pin Layout..... 32

**APPENDIX C: DSL LAN EXTENDER ROUTING MODELS .....33**

**APPENDIX D: INITIAL USE OF TELNET TO ACCESS THE DSL LAN EXTENDER DEVICE .....37**

**APPENDIX E: NORMAL SIGNAL-TO-NOISE RATIO TABLES .....38**

**USER'S REFERENCE FORM.....39**

**TECHNICAL SUPPORT INFORMATION.....40**

## INTRODUCTION

Thank you for purchasing this outstanding Black Box communication product. This user's guide describes how to operate your new Symmetric Digital Subscriber Line (SDSL) device.

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 device(s) after they are installed, such as self-test, LED indication, and troubleshooting.

## PRODUCT DESCRIPTION

Black Box's DSL LAN Extender 400 is a SDSL bridge or router, which offers standard compliance high-speed symmetrical access for Internet services with an ordinary telephone wire pair. It functions as a remote LAN-to-LAN application.

The DSL LAN Extender 400 operates in SDSL mode with CAP encoding. In the SDSL mode, it provides symmetrical 4.64 Mbps performance at distances up to 7,500 feet (2.28 Km) using a 26 AWG wire pair.

The DSL LAN Extender 400 provides an ideal solution for small offices and home offices (SOHO) to reap the benefits of broadband connections to the tenant complex or neighborhood. By over subscribing the expensive broadband connection, all tenants can share economical always-on Internet access, which eliminates dial-up requirements, without sacrificing the individual access privacy of sharing a typical Ethernet LAN network. It supports full IP routing for RIP-1 and RIP-2 together with the convenience of IP address management with NAT, built-in DHCP server, and transparent Bridging.

## Features

- DSL LAN Extender 400 supports SDSL with a symmetrical 4.64 Mbps rate at distances up to 7,500 feet (2.28 Km), or 144 Kbps up to 21,300 feet (6.49 Km) using a single 26 AWG telephone wire pair.
- SDSL line coding for multi-rate selection over a single copper telephone pair
- Ethernet transparent learning bridge
- IP routing with RIP-1 & RIP-2
- Network Address Translation (NAT)
- Dynamic IP assignment with DNS and gateway setting using built-in DHCP Server
- User-definable limits Separate inbound and outbound bandwidth management
- System management via console, VT 100 emulation, local and remote Telnet
- Simple Network Management Protocol (SNMP) management
- Software upgradeable over Ethernet link via TFTP or RS-232 console port
- Support for customer side Web, FTP, and E-mail Servers
- Complete power on self-test (POST)
- Standard 10BaseT Ethernet port for network connections
- System management via RS-232 console port, Telnet, and SNMP

- Users can configure a DSL LAN Extender either as a CO (Central Office) or CP (Customer Premise) device
- A DSL LAN Extender can automatically detect the line rate configured on the other remote DSL LAN Extender and use the lower line rate setting of the two devices
- Stand-alone, compact design with rack-mount kit option

\*Data rates achieved depend on line quality/condition and distance.

## **Package Contents**

The list below shows what is included in your DSL LAN Extender 400 package.

- 1 DSL LAN Extender 400 device
- 1 Universal Power Adapter
- 1 Serial Cable (DB9 Male -to-Female extension cable)
- 1 DSL LAN Extender 400 User's Guide – this booklet

## Quick Start

This section provides the basic steps to set up and configure your DSL LAN Extender devices. It is intended for users with network experience who do not need the detailed instructions in this user's guide to set up and configure the DSL LAN Extender 400.

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

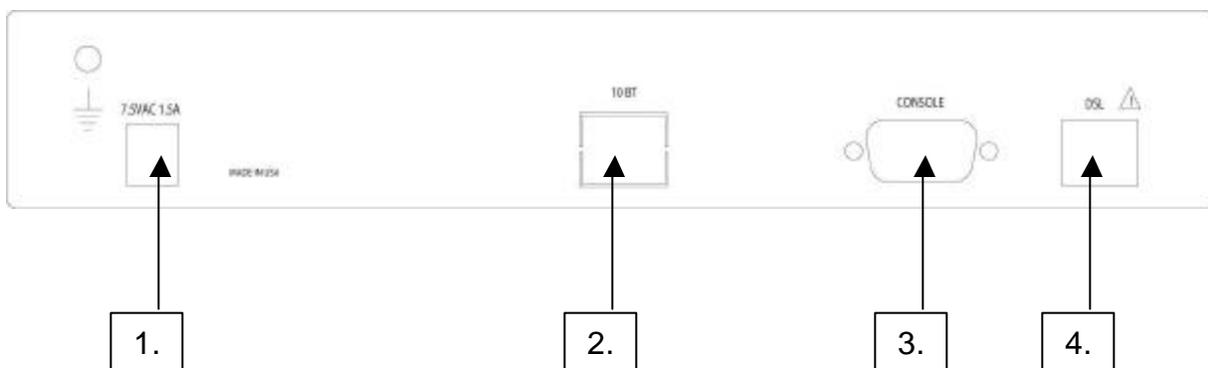
1. Connect the DSL LAN Extender device to your network (LAN) via its 10BaseT port.
2. Connect the DSL LAN Extender device to the DSL line via its Line port.
3. Attach the serial cable to the serial (COM) port on a PC; attach the other end to the DSL LAN Extender device's Console (RS-232) port.
4. Connect the power adapter to a grounded outlet and insert the power jack 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 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. Hit the <Enter> key after you connect the PC to DSL LAN Extender device, the main menu will appear. Select the DSL Status/Configuration option from the Main Menu. When prompted for the password, enter <password>.
7. One of the DSL LAN Extender device is pre-configured as CO and the other device is pre-configured as CP. Select the DSL Status/Configuration menu option to 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 Management 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 subscriber'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 400 devices, you need to use the following cable connection for each device:

- Supplied DC power adapter
- 10BaseT Ethernet 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.
- Please see the section below for Port Pin Layout of Console (RS-232), 10BaseT, and DSL LINE ports.

The illustration below shows the ports on the DSL LAN Extender 400's rear panel to which you connect the cables.



### Connections

- (1) DC power adapter terminal. Connect this terminal with the power jack from the supplied DC power adapter.
- (2) LAN Network Port: Standard 10BaseT Ethernet interface port (RJ-45 Jack).
- (3) Console Port, RS-232 (DB9 Female Connector): Console serial port for system configuration.
- (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 400 are commonly known as Dry Line, Dry Pair, Raw Copper Line, or Alarm Circuit. Now, it is often referred as DSL Line.

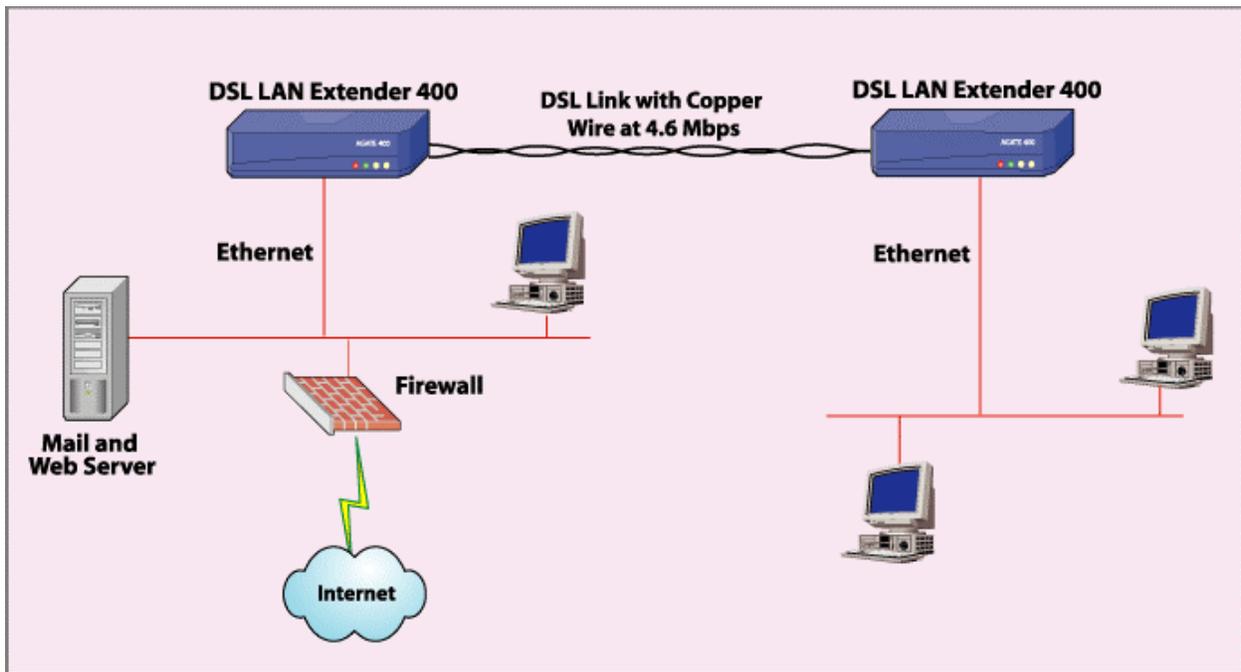
When ordering a DSL line from a Telco, make sure to tell the telephone company that you need a non-loaded line with no bridged taps on it. For example, Pacific Bell's Local Area Data Channels (LADC) uses USOC code to specify a 2-wire dry line as "T6E2D".

### Note:

The term "non-loaded" or "non-loaded coils" means no passive low pass filter for voice spectrum on the line. With a low pass 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 DC 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 90V~230VAC at 60Hz.

### 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, the DSL Yellow LED flashes indicate device is configured as CO. The DSL Yellow LED is off indicates device is configured as CP. And the Green LED will be on after the self-test. The DSL LAN Extender device is then ready to operate.

### LED Indication

- System:**
- RUN – steady Green LED indicates device is at operational status
  - DSL – steady Yellow LED indicates DSL link is up
  - flashing momentarily Yellow LED before link up, indicates device is configured as CO
  - Yellow LED off indicates device is configured as CP
- Link:**
- LAN – steady Yellow LED indicates Ethernet link is up
  - Alarm – steady/flashing Red LED indicates error/noise occurred/received during transmission.

## CONFIGURING AND MONITORING A DSL LAN EXTENDER DEVICE

### 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 all Black Box's DSL LAN Extender devices. Console connection is through an RS-232 DB9 cable to the terminal/computer's serial COM ports. 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 remotely for system configuration. An appropriate IP address must be configured to the DSL LAN Extender device through a console terminal before the telnet command can be used.

### 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 reboot or connection is timed out. 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.

```
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Main Menu

  1. System Information
  2. Traffic Statistics
  3. DSL Status/Configuration
  4. Network Mode Configuration
  5. DHCP Status/Configuration
  6. SNMP Configuration
  7. MAC Address Filter
  8. Password Change
  9. Software Upgrade
  A. System Reboot
  B. Set Factory Default
  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
```

## System Information

- System Name: This allows the user to give the DSL LAN Extender a System Name.
- Security Level: This permits the user to set the security level to high or low by pressing <Enter>. If security level is set to "High", the Main Menu cannot be accessed without the correct password.
- Allow TFTP Download: This allows the user to enable or disable software upgrades through TFTP.
- The Device Configured as: This indicates if the device is configured as a CO (Central Office or Central Unit) or a CP (Customer Premise or Remote Unit) device.
- The next four lines display the currently assigned MAC Address, Device Main IP Address, Controller Serial No., and Controller HW Version respectively.
- Software Version: This indicates the current software version of the.
- Software Checksum: You should record this checksum and compare it with the displayed one every time the device is reset or power-cycled. This checksum should be the same; if it changes, the device's software has been corrupted. In this case you will have to reload the software. Please note that each new software version has a different checksum.

```

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

. System Name           :
. Security Level        :           Low
. Allow TFTP Download   :           N
. The Device Configured as :       CP
. MAC Address           :       00 E0 F3 00 05 14
. Device Main IP Address :       192.168.100.001
. Controller Serial No. :       00C09C84D30E
. Controller HW Version :           1
. Software Version      :       Ag400 SDSL 1.21
. Software Checksum     :       7B5C

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

```

## Traffic Statistics

The sub-menu 2 in the Main Menu 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 Errors: 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 device may have at that time

```

===== 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 (Kbps), actual line rate (Kbps), and the signal-to-noise ratio (SNR) of the DSL line (dB).

- 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. This function can be used for devices that are not configured appropriately.
- The Line Rate can be changed by using the arrow keys to get to the Line Rate Selection line. Press the <Enter> or <Space> key to select the appropriate line rate. There are 10 selectable line rate settings for SDSL: 4640, 2320, 2064, 1552, 1040, 784, 528, 400, 272, and 144 Kbps.
- The "Actual line rate" shows the actual line rate (Kbps) in effect on the DSL line. When you connect the CO device to a CP device, they will link up with the lower line rate settings of the two devices.
- Link Status is shown as UP or DOWN when CO and CP devices are linked up or linked down.
- 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 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)  : 4640
. Actual Line Rate(Kbps)    : 0
  (lower rate set by other 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 or Router feature 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
. Router Enabled                  : N
. Bridging Enabled                : Y
. RIP Enabled                     : N
. Device Main IP Address          : 192.168.100. 1
. Device Main IP Subnet Mask      : 255.255.255. 0
. Ethernet Side Default Gateway   : 0. 0. 0. 0

. Bandwidth Limit, Outbound(Kbit/s): 0
. Bandwidth Limit, Inbound(Kbit/s) : 0

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           : CP
. Router Enabled                  : N
. Bridging Enabled                : Y
. RIP Enabled                     : N
. Device Main IP Address          : 192.168.100. 1
. Device Main IP Subnet Mask      : 255.255.255. 0
. Ethernet Side Default Gateway   : 0. 0. 0. 0

. NAT/Router Enabled             : N
(Item below has no effect unless NAT/Router is enabled)
. Subscriber IP Address          : 0. 0. 0. 0
. Subscriber Subnet Mask         : 0. 0. 0. 0
. E-mail Server Enabled          : N
. E-mail Server's IP Address     : 255.255.255. 0
. 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 sub-network as the Ethernet to which it is directly connected.

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

## 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 sub-network 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 Device Main IP 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 sub-network 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 DSL LAN Extender Ethernet port. Please see Appendix C for examples of setting the IP parameters for different network environments.

## Bandwidth Management

The bandwidth management feature allows you to manage bandwidth from the CO device. Inbound bandwidth management refers to traffic going into the Ethernet port of the CO device. And outbound bandwidth management refers to traffic going out of the Ethernet port of the CO device. In a typical Internet access application, 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 hosting their own Web site, 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 management feature 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 or software. In addition, bandwidth management allows users to reconfigure the bandwidth without reconfiguring the line rate. Bandwidth management will not exceed the line rate that the device is connected at. The maximum setting for bandwidth management will equal the connected line rate.

To define the desired amount of bandwidth for outbound traffic (that is, traffic flowing out of the Ethernet port of the CO device), enter the desired bandwidth in the Outbound Bandwidth Mgmt. 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 into the Ethernet port of the CO device), enter the desired bandwidth (in Kbps) in the Inbound Bandwidth Mgmt. 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 management in both directions, specify 0 for both the Inbound and Outbound Bandwidth Mgmt. fields. To turn off bandwidth management in either the outbound or inbound direction, specify 0 for the Outbound or Inbound field, depending on the direction you want. Specifying 0 indicates NO bandwidth management.

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

**Note:** When using bandwidth management, configure the DSL LAN Extender device for the highest line rate supported by the length and condition of the DSL cable.

## **Benefits of Using The DSL LAN Extender Device 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 device.

### **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 Subnet Mask (such as 255.255.255.0).

The CP routing configuration allows public IP addresses to co-exist with the sub-network 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 a HTTP/FTP server, you can also enter its IP address in the next field.



## Defining Information for The DHCP Server

You must define certain information in the DSL LAN Extender software to use the DHCP feature. This information is described in the section below.

**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 and 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 sub-network as the sub-network 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.
2. Type the starting IP address for the range.
3. Use the arrow keys to position the cursor beside the second DHCP Range field.
4. Type the ending IP address for the range.
5. Press <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.
2. Type the IP address for the first DNS server. 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 a total of 3 DNS servers. Press <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 day (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.
2. Type the number of days (up to 999) you want the IP information to stay in effect.
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.)
4. Type the desired number of hours (up to 99). Press <Ctrl-s> to save the new settings.

## 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. 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. Press <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. Press <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 user 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 Management Information Bases (MIB) file that can be requested from Black Box Technical Support Department (info@blackbox.com). 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 BLACK BOX MIB files and can be requested through Black Box Technical Support Department (info@blackbox.com). You should 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.

### 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.xx 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 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   |                 |              |       |
|   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

```

The SNMP 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 as below.

### Selecting Settings for SNMP Options

You can enter and edit text in the following fields in the SNMP 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 <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).
5. Press the <Up/Down/Left/Right> 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. Navigate and position the cursor in the row you want to delete.
2. Press <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 Option” section to modify the information in the new row.

### **Saving Changes**

After you make any changes to the contents of the SNMP 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, press <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 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

The list below defines the available 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 MIB, as defined in RFC 1213.
- Supports Black Box private MIB: BlackBox.mib. These features are described below.

### **Standard MIB Support**

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

### **System**

Provides overall information about the system.

### **Interface**

Provides information about the interfaces the device offers.

### **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.

## **Black Box Private MIB**

Black Box provides a private MIB for the DSL LAN Extender devices: a Black Box system MIB (BlackBox.mib).

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

### **Products**

This group defines all 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.xx 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 400 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 400 model, there is a one-to-one mapping between the logical and physical interfaces. 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 ExtenderDHCPServPars**

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 ExtenderDHCPLeaseTable**

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

## MAC Address Filter

MAC Address Filter provides user access control through the DSL LAN Extender. User needs to manually generate a table of MAC Addresses. These are the MAC Addresses of the network adapter on the user's machine. Once the MAC Addresses table is generated, it can be used as 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 the 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 the DSL LAN Extender.

To add a MAC Address to the table:

1. Use the arrow key to navigate to the Add a MAC Address field.
2. Type in the MAC address of the machine that you wish to add using the following format:  
aabbccddeeff.
3. Press <Ctrl-S> to save the new settings.

To delete a MAC Address from the table:

1. Locate the MAC address that you intend to delete.
2. Use the arrow key to navigate to the Delete a MAC Address field.
3. Enter the row and column of the MAC address that you intend to delete in the following format:  
Row, Column
4. Press <Ctrl-S> to save the new settings.

```

==== MAC Address Filter =====
. 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

```



1. Connect a proper serial cable from the PC to the DSL LAN Extender device.
2. Start your VT100 emulator program.
3. Enter the console management session. Press the <Enter> key until the Main Menu is displayed.
4. Now setup the program to use YModem file transfer protocol.
5. In the Main Menu select the Software Upgrade option.
6. You will then be prompt to confirm the upgrade.
7. Upon confirmation, you will now start to see letters "CC..." shown in the screen, indicating the DSL LAN Extender device is waiting for file download.
8. Now select the command to download the file and execute it.
9. The process can take as long as 10 minutes. The terminal emulator program indicates the progress and error if any.

- **DOWNLOAD VIA ETHERNET/TFTP (MS-DOS VERSION)**

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

1. If you don't have TFTP DOS software version, please download it first.
2. Make sure your PC has an Ethernet connection to the DSL LAN Extender device.
3. Start a MS-DOS session from your PC.
4. Navigate to the folder where you have the new software located.
5. Enter the following DOS command, assuming the device's IP address is 10.0.0.1 and the file you want to upgrade is wcsr1001.21s: `tftp -i 10.0.0.1 put wcsr1001.21s`
6. Now check the progress and see if the download is successful. Soon after you entered the TFTP command, the LEDs will be flashing cyclically, indicating that it has accepted the downloading command and is processing it. Typically, it takes 50 to 60 seconds to finish the upgrade, and the DSL LAN Extender device will automatically reboot and start operation immediately.
7. 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.
8. If the LEDs on the DSL LAN Extender device display a normal pattern after you entered the TFTP command, then either the PC doesn't have a good Ethernet connection to the device or the IP address you entered is incorrect.
9. If the LEDs kept circulating, then the download has failed in the middle. You have to reboot the device by powering off and on. If the problem occurred at the earlier stage and the flash ROM has not been overwritten, then the device will boot as usual; otherwise, both red and green LEDs will be on steadily, indicating it can't perform a normal boot up and is only waiting for a download.
10. Now, try to perform the upgrade again.

• **DOWNLOAD VIA ETHERNET/TFTP (WINDOWS 95 VERSION)**

1. If you don't have TFTP windows version software, please download it first.
2. Next, install the software (the software will step you through the installation).
3. Make sure your PC has an Ethernet connection to the device.
4. Start the TFTP program by pressing the "Start" button, go to Programs\TFTP Suite 95 Pro and click on the TFTP Client 32 Executable.
5. Go to "Options" menu and click on "Setup".
6. Under Setup make sure that the Outbound File Path is the correct path to where the file is located on the PC.
7. The "Truncate long file names" box should not be enabled (checked).
8. Put in the "Host" box the correct IP Address for the device that will be upgraded.
9. The "Port" box should show "69".
10. The "Timeout" box should show "10".
11. The "Blocksize" should be "512".
12. The "Match Files" and "Binary" boxes should both be enabled (checked).
13. The "Local File" and "Remote File" should both be the same and it should be the correct software upgrade file (i.e. wcgr1001.21s, etc.).
14. Finally, just press "Send" to send the file to the device and complete the upgrade.
15. Now check the progress of the download to see if it was successful. Soon after you send the file, the LEDs will be flashing cyclically. This indicates that it has accepted the downloading command and is processing it. Typically, it takes 50 to 60 seconds to finish the upgrade, and the DSL LAN Extender device will automatically reboot and start operation immediately. If for some reason the upgrade fails, a "Timeout" message will be displayed on the bottom left hand corner of the TFTP screen.
16. If the LEDs on the DSL LAN Extender device displays a normal pattern after you press "Send" then either the PC doesn't have a good Ethernet connection to the device or the IP address you entered is incorrect.
17. If the LEDs kept circulating, then the download has failed in the middle. You have to reboot the device by powering off and on. If the problem occurred at the earlier stage and the flash ROM has not been overwritten, then the device will boot as usual; otherwise, both red and green LEDs will be on steadily, indicating it can't perform a normal boot up and is only waiting for a download.
18. Now, try to perform the upgrade again.

## TROUBLESHOOTING

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

**Table 1: Troubleshooting Procedure**

SYMPTOM	PROBLEM	SOLUTION
No LED display	DC Power adapter unplugged	Check power adapter connection
Red LED ON after link up	Bad connection	Check phone jack/cable
Green light/all LED steady ON	System Down	Try rebooting the device by power off and on
Both yellow LEDs OFF after power-up/reboot	Bad internal connection	Contact Black Box Technical Support Department
No response from LAN port	Possibly wrong 10BaseT cable being used	-Use straight 10BaseT cable when connect to hub/switch -Use crossover 10BaseT cable when connect to PC/laptop
Both green and red LEDs are ON	Software upgrade failure	Re-upgrade the software
Cannot Telnet to the DSL LAN Extender device	Possibly an IP address not assigned to the DSL LAN Extender yet	Assign an IP address to the device
Cannot Telnet/Ping to the remote DSL LAN Extender	This feature is not available	Will be available in future S/W release

## Appendix A: TECHNICAL SPECIFICATIONS:

**Table 2: Technical Specifications for SDSL**

Items	Specifications
Line Code	SDSL (CAP 8 ~ CAP 256)
Line Rate	144 Kbps ~ 4.64 Mbps
DSL Line Output	7.4 ~ 13.0 dBm
xDSL Interface	2 wire, RJ-11 SDSL
Console Port	RS-232, DB9
Network Interface	Standard Ethernet 10BaseT RJ-45 Jack
Power Requirements	9 VDC 1 ~ 1.5 A
Environmental Humidity Operating Temp Storage Temp	Up to 95% 32° ~ 122°F -4° ~ 158°F
Physical Dimensions	9.2" (W) x 7.5" (D) x 1.75" (H)

**Table 3: Line Rate at Different Cable Lengths for SDSL**

**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)
4640	7.5 / 2.28	8.0 / 2.43
2320	10.3 / 3.14	13.7 / 4.17
2064	11.0 / 3.35	14.7 / 4.48
1552	12.5 / 3.81	16.9 / 5.15
1040	14.1 / 4.30	19.3 / 5.88
784	15.0 / 4.57	20.5 / 6.25
528	17.7 / 5.39	24.8 / 7.56
400	18.8 / 5.73	26.0 / 7.92
272	20.6 / 6.28	27.9 / 8.50
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

### 10BaseT (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 10BaseT cable to connect to a Hub, Switch, etc. To connect to a PC, Router, etc., you must use a crossed 10BaseT 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's 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 will also 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 an DSL LAN Extender pair; one side is configured as a CO (Central Office) device and the other as a CP (Customer Premises) device. Each side is then connected to an Ethernet network, and traffic can be bridged/routed between the two devices.

The CO and CP devices are connected by a regular telephone line running xDSL signals, which carries packets between these two devices with bit rates up to 4.6 Mbps (DSL LAN Extender 400) or 7.1 Mbps (DSL LAN Extender 800/700). Even though the distance can be as long as 4 or 5 miles, this link is a dedicated link between the two devices (DSL LAN Extender CO and DSL LAN Extender CP in this case). To simplify the settings, there are not many parameters users need to configure 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-1/RIP-2 protocol for IP packet routing
- Bridging and RIP routing can be enabled at the same time

#### Distinguished Features of each device:

- CP device supports Network Address Translation (NAT)
- CP device can serve as a Dynamic Host Configuration Protocol (DHCP) server
- CP device can serve as a router to the customer premises' LAN
- CO device supports Bandwidth Management of the link

### Bridging, Router, RIP, and NAT

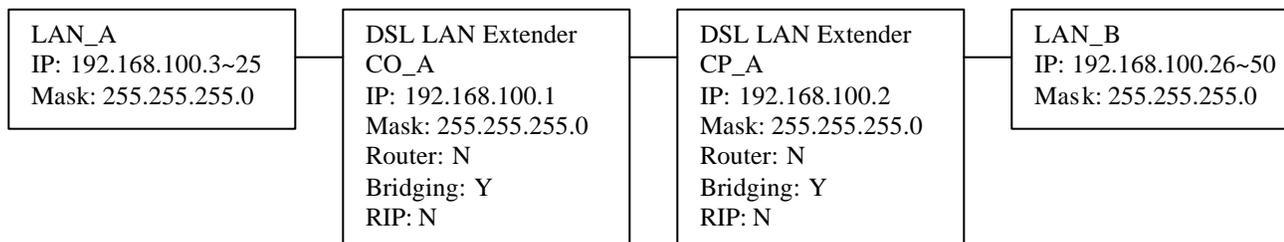
The following are the parameters in the device that users will need to configure to have the device properly handle packets:

- Bridging Enabled
- Router Enabled
- RIP Enabled
- NAT Enabled

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.

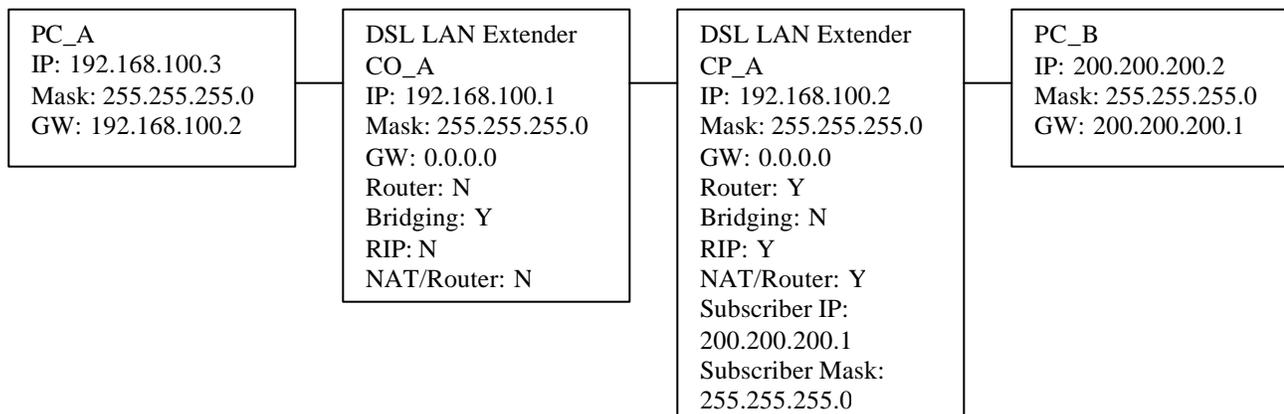
## Example of Applications

### Case (A) Bridging two LANs, no connection to the Internet using Bridge mode



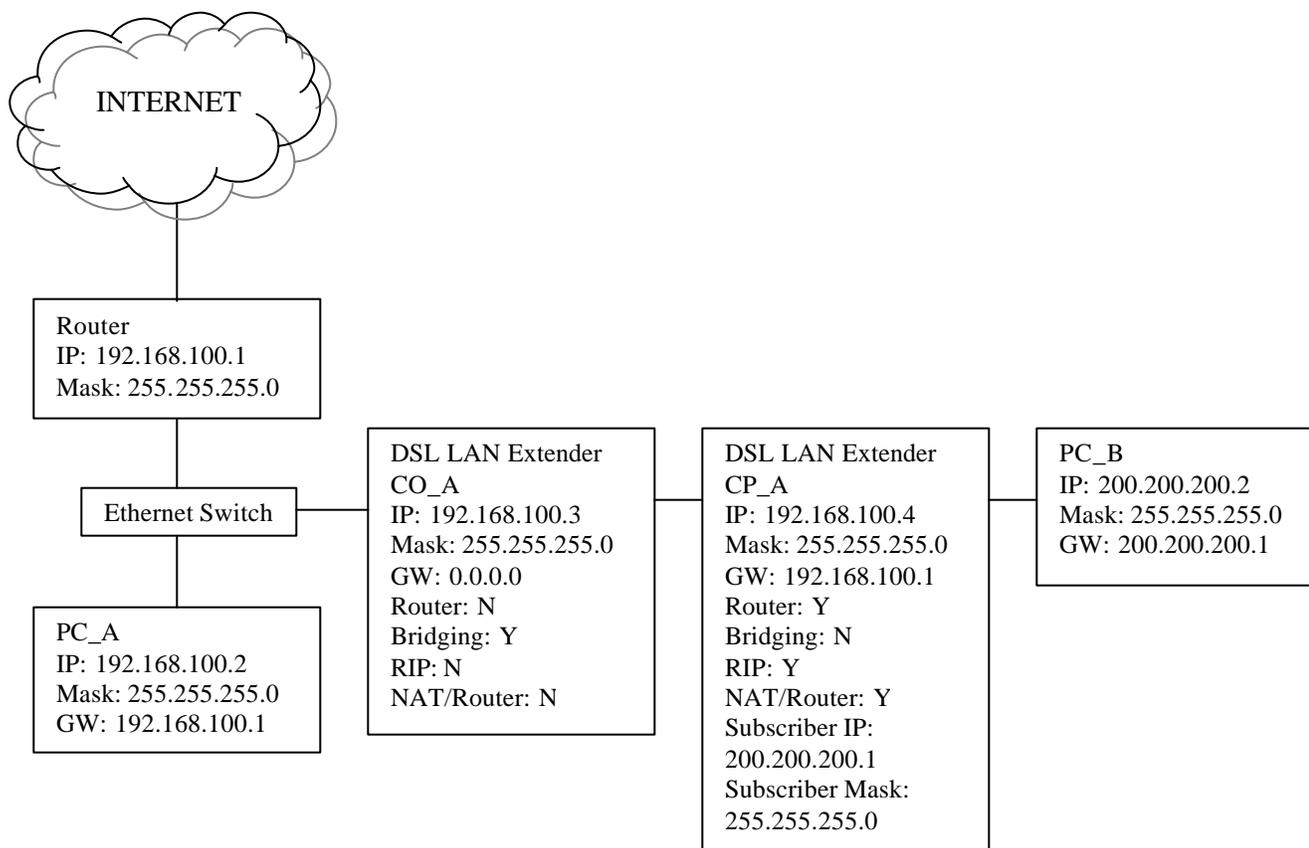
1. This is the default configuration of the DSL LAN Extenders.
2. In this configuration, DSL LAN Extenders bridges the two LANs.
3. The DSL LAN Extenders (CO\_A and CP\_A) will appear transparent to both LAN\_A and LAN\_B.
4. PCs in LAN\_B can access servers/PCs in LAN\_A and vice versa.
5. The DSL LAN Extenders are to be configured as shown above.

### Case (B) Connecting two LANs (different subnet mask), no connection to the Internet using Router mode



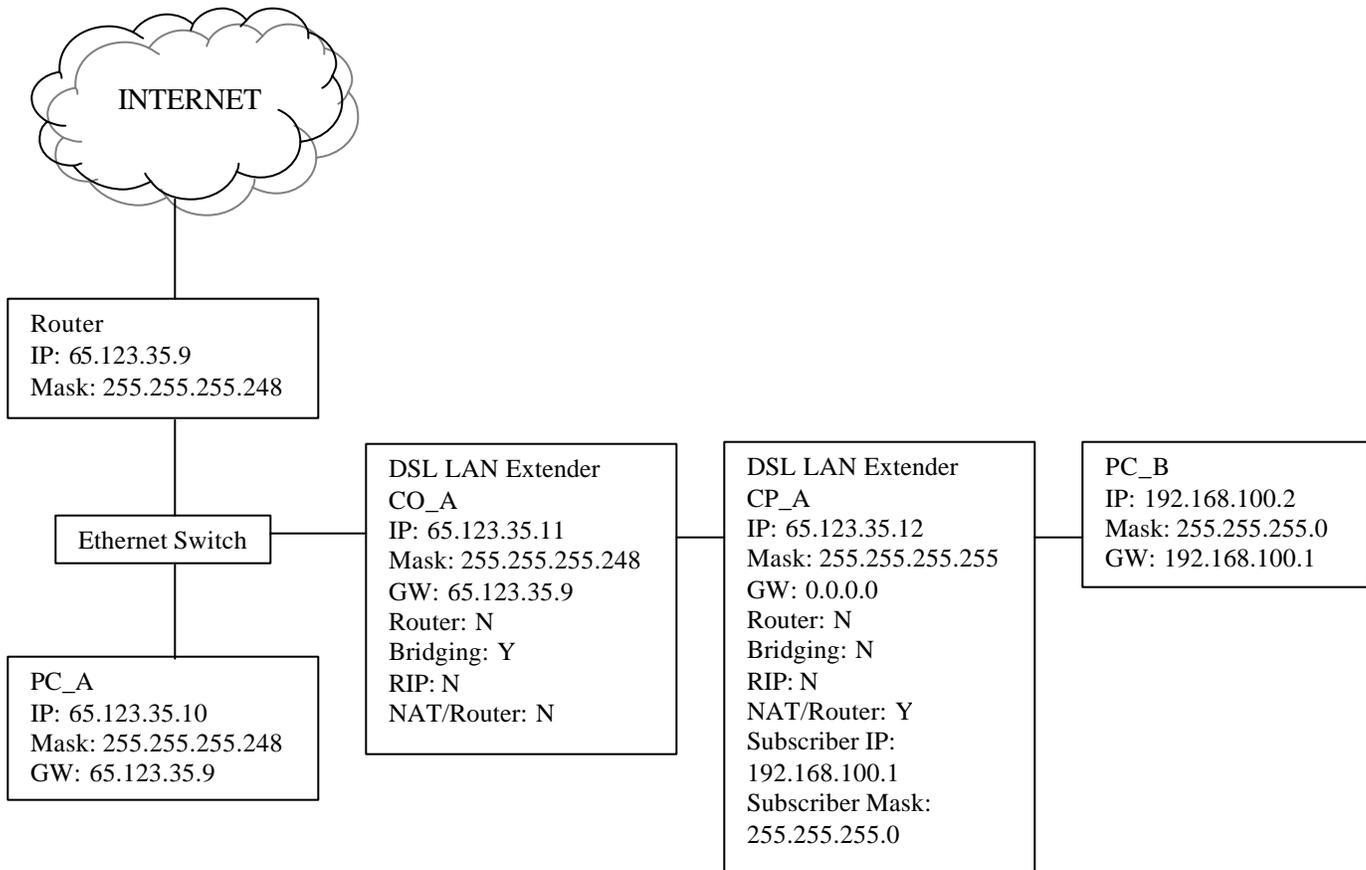
1. In this configuration, DSL LAN Extenders connects the two LANs with different subnet mask.
2. PCs in LAN\_B (200.200.200.X) can access servers/PCs in LAN\_A (192.168.100.X) and vice versa.
3. IP addresses of PCs in LAN\_B can be assigned through DHCP server in DSL LAN Extender CP\_A.
4. The DSL LAN Extenders are to be configured as shown above.

### Case (C) Connecting two LANs (different subnet mask), with connection to the Internet using Router mode



1. In this configuration, DSL LAN Extenders connects the two LANs with different subnet mask.
2. PCs in LAN\_B (200.200.200.X) can access servers/PCs in LAN\_A (192.168.100.X) and vice versa.
3. And at the same time, it also allows the PCs in the remote location (LAN\_B) to access the Internet.
4. IP addresses of PCs in LAN\_B can be assigned through DHCP server in DSL LAN Extender CP\_A.
5. The DSL LAN Extenders are to be configured as shown above.

### Case (D) Connecting two LANs (different subnet mask), with connection to the Internet using NAT



1. In this configuration, DSL LAN Extenders bridges the two LANs with different subnet mask.
2. PCs in LAN\_B (192.168.100.X) can access servers/PCs in LAN\_A.
3. However, PCs in LAN\_A is not able to access PCs in LAN\_B.
4. PCs in LAN\_B are firewall protected through NAT.
5. IP addresses of PCs in LAN\_B can be assigned through DHCP server in DSL LAN Extender CP\_A.
6. The DSL LAN Extenders are to be configured as shown above.

## 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:

- 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. You can also connect the DSL LAN Extender device directly to the PC through a crossover Ethernet cable. (For two IP devices to communicate locally, they both must be on the same sub-network; 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.X (X can be any integer between 2 and 254)
- 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, have NetBEUI installed.

4. Use Telnet to connect to the DSL LAN Extender device (the device's default 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 (the device's default password is "Black Box").
7. Change the default Device Main IP Address and Device Main IP Subnet Mask to a valid host address and mask on your sub-network. Press CTRL-s to save changes.
8. Reboot 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 400

SDSL unit connects to (Central Office, PC, Network, video encoder/ decoder...etc) \_\_\_\_\_

The copper pair's length between two DSL units is: \_\_\_\_\_ (K ft); Impedance: \_\_\_\_\_ (ohm)

System Install Date: \_\_\_\_\_ Line/ Circuit Number: \_\_\_\_\_

Location of the Local Unit is: \_\_\_\_\_

Location of the Remote Unit is: \_\_\_\_\_

### Local Unit References:

The software version is: \_\_\_\_\_

The console management password is: \_\_\_\_\_

The configuration on the DSL unit is: # \_\_\_\_\_

For Ethernet interface,

The Ethernet Address assigned to the DSL device is: \_\_\_\_\_

The IP Address assigned to the DSL device is: \_\_\_\_\_

### Remote Unit References:

The software version is: \_\_\_\_\_

The console management password is: \_\_\_\_\_

The configuration on the DSL unit is: # \_\_\_\_\_

For Ethernet interface,

The Ethernet Address assigned to the DSL device is: \_\_\_\_\_

The IP Address assigned to the DSL device is: \_\_\_\_\_





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