



## G.SHDSL Two-Wire Ethernet Network Extender

**Extend Ethernet with full-duplex transmission up to 5.696 Mbps—more than four miles—over a pair of copper wires.**

Complies with ITU-T Rec. G.991.2 G.shdsl.bis standards.

Supports adaptive data rates from 4.608 Mbps to 192 kbps for SHDSL line.

Works at distances up to 22,500 feet over 26 AWG twisted-pair cable.

Has two RJ-45 connectors for 10BASE-T/100BASE-TX Ethernet ports for combining two separate Ethernet data streams over the same G.SHDSL link.

Includes a console port for network management configuration.

### Customer Support Information

Order toll-free in the U.S.: Call 877-877-BBOX (outside U.S. call 724-746-5500) •  
FREE technical support 24 hours a day, 7 days a week: Call 724-746-5500 or fax 724-746-0746 •  
Mailing address: Black Box Corporation, 1000 Park Drive, Lawrence, PA 15055-1018 •  
Web site: [www.blackbox.com](http://www.blackbox.com) • E-mail: [info@blackbox.com](mailto:info@blackbox.com)

## G.SHDSL Two-Wire Ethernet Network Extender

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### Federal Communications Commission and Industry Canada Radio Frequency Interference Statements

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

## G.SHDSL Two-Wire Ethernet Network Extender

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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.
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 debe 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.

### European Community (CE) Electromagnetic Compatibility Directive

This equipment has been tested and found to comply with the protection requirements of European Emission Standard EN55022/EN61000-3 and the Generic European Immunity Standard EN55024.

EMC:

EN55022(2003)/CISPR-2( 2002): Class A

IEC61000-4-2 (2001): 4 KV CD, 8 KV AD

IEC61000-4-3( 2002): 3V/m

IEC61000-4-4(2001): 1 KV (power line), 0.5 KV (signal line)

# G.SHDSL Two-Wire Ethernet Network Extender

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## 1. Specifications

**Data Rate:** 64 kbps–5.696 Mbps

**Distance:** On 26 AWG twisted pair: 5696 kbps: 4500 feet (0.9 miles),  
4608 kbps: 5500 feet (1 miles),  
3088 kbps: 9500 feet (1.8 miles),  
2304 kbps: 12,000 feet (2.3 miles),  
2048 kbps: 13,000 feet (2.5 miles),  
1544 kbps: 13,300 feet (2.5 miles),  
1536 kbps: 13,500 feet (2.6 miles),  
1152 kbps: 15,000 feet (2.8 miles),  
768 kbps: 17,000 feet (3.2 miles),  
512 kbps: 18,000 feet (3.4 miles),  
384 kbps: >18,000 feet (3.4 miles),  
256 kbps: >18,000 feet (3.4 miles),  
192 kbps: >18,000 feet (3.4 miles),  
64 kbps: >18,000 feet (3.4 miles)

**Standards:** ITU-T G.991.2 compliant, TCPAM-16 Level Line Code, IEEE 802.3/IEEE 802.3u, EMI emission standard, FCC Part 15 Class A, CE Mark

**LAN Interface:** Autodetects for 10BASE-T/100BASE-TX and half-/full-duplex; Auto MDI-X

**Connectors:** Each unit: DSL: (1) RJ-48;  
LAN: (2) RJ-45;  
RS-232 console: (1) DB9 F

**Indicators:** (7) LEDs: (1) Test, (1) Power, (1) Loop, (2) 10/100M, (1) LAN1, (1) LAN2

**Power:** Input: 110/220 VAC, 50–60 Hz

**Temperature Tolerance:** Operating: 32 to 122° F (0 to 50° C)

**Humidity Tolerance:** 5 to 95% noncondensing

**Size:** 1.2"H x 6.1"W x 5.5"D (3.1 x 15.4 x 13.9 cm)

**Weight:** 2.2 lb. (1 kg)

# G.SHDSL Two-Wire Ethernet Network Extender

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## 2. Overview

### 2.1 Introduction

The LR0201A-KIT, a G.SHDSL (Single-pair High-bit-rate Digital Subscriber Line) Two-Wire Ethernet Network Extender, provides broadband full-duplex transmission with bandwidth up to 5.696 Mbps over a pair of copper twisted-pair lines for point-to-point LAN connectivity between two Ethernet networks. The LR0201A-KIT is a cost-effective symmetrical broadband solution for bandwidth-hungry applications such as LAN-to-LAN connectivity, Internet access, and VoIP applications over two twisted pairs.

Use the extenders for VoIP, Web hosting, or teleconferencing for more performance than you get with SDSL equipment. Distances reach up to 7000 feet (about 2.1 km) at 5.606 Mbps, 10,000 feet (about 3 km) at 4.608 Mbps, or 22,500 feet (about 67.8 km) at 192 kbps. Users can also select a fixed data rate for the copper line ranging from 64 kbps to 5.696 Mbps. Or, use the unit's rate-adaptive feature, which will choose the best data rate for your link from 192 kbps to 4.608 Mbps. The LR0201A-KIT also provides a console port for users to configure the settings and to monitor the connection status.

The LR0201A-KIT can be configured as either the central office (master) side or the remote (slave) side. LR0201A-KIT conforms to the ITU-T Rec. G.991.2, to meet G.shdsl.bis network requirements.

### 2.2 Features

- ITU-T Rec. G.991.2 G.shdsl.bis compliance
- SHDSL trellis-coded pulse amplitude modulation (TCPAM) line code
- Fixed data-rate selection from 5.696 Mbps to 64 kbps for SHDSL line
- Adaptive data rate from 4.608 Mbps to 192 kbps for SHDSL line
- Maximum transmission distance: 22,500 feet (about 6.8 km) over 26 AWG twisted pair
- Noise margin
- 1 dB is guaranteed for fixed-rate and adaptive-rate modes
- STU-R (remote) will follow STU-C's (central office) for 192 kbps to 2.304 Mbps speed in fixed-rate mode
- RJ-48 connector for SHDSL line connection
- Two RJ-45 connectors for 10BASE-T/100BASE-TX Ethernet switch ports are autosensing and autonegotiating
- Ethernet Auto MDI-X for auto Tx/Rx swap so you don't need a crossover cable
- Console port for network management configuration
- (7) LED status indicators



2.3. Application

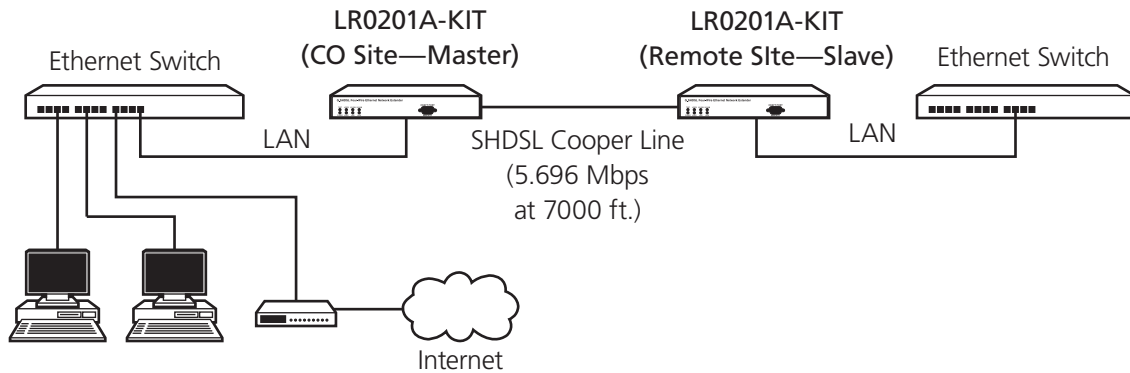


Figure 2-1. Typical application.

2.4 What's Included

Your package should include the following items. If anything is missing or damaged, please contact Black Box Technical Support at 724-746-5500.

- (2) G.SHDSL Two-Wire Ethernet Network Extenders
- (2) Power cords
- (2) CAT5e Ethernet cables
- This user's manual on CD-ROM

2.5 LED Descriptions

Table 2-1. Indicators.

LED	Color	Function
POWER	Green	Lights when power is on.
TEST	Green	Lights when the device is in error. Blinks when the device is in self-test.
LOOP	Green	Lights when SHDSL loop connects successfully. Blinks when SHDSL connection is in progress.
LAN 1/2	Green	Lights when Ethernet is connected. Blinks when Ethernet data is transmitted.
10/100M for LAN 1/2	Green	Lights when Ethernet speed is 100 Mbps. Off when Ethernet speed is 10 Mbps.

# G.SHDSL Two-Wire Ethernet Network Extender

## 2.6 Front and Back Panels

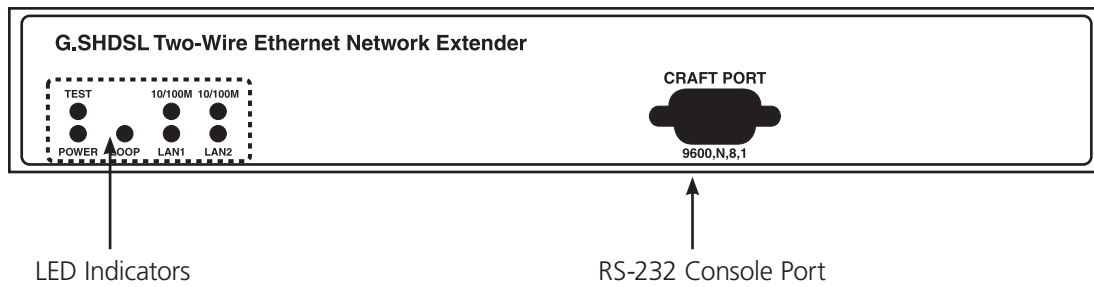


Figure 2-2. Front panel.



Figure 2-3. Rear panel.

### 3. Installation

1. Connect the SHDSL line to the DSL RJ-48 connector on the LR0201A-KIT's rear panel.

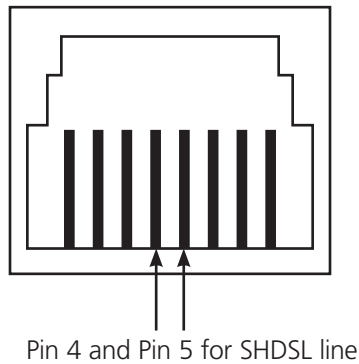


Figure 3-1. RJ-48 connector, Pins 4 and 5.

2. Connect the Ethernet interface to the RJ-45 port with the included CAT5 cable.
3. Connect the included power cord to the AC outlet.

CAUTION: Verify that the AC-DC adapter conforms to your country's AC power requirement and then insert the power plug.

NOTE: The Interconnecting cables should be rated for external use and for the application's voltage, current, anticipated temperature, flammability, and mechanical serviceability.

4. Turn on the power switch. Set one G.SHDSL Two-Wire Ethernet Network Extender as CO (master) site from console port, and the other as remote (slave) site.
5. Set the desired data rate for the SHDSL connection from the console port.

NOTE: Both G.SHDSL Two-Wire Ethernet Network Extenders must have the same data rate settings.

6. Both G.SHDSL Two-Wire Ethernet Network Extenders will automatically connect with each other.

NOTE: Turn on the power switch, and LR0201A-KIT will then execute self-test routines. There will be two or more handshaking cycles when adaptive rate is selected. The system will automatically adapt to the maximum rate according to the loop distances. The maximum rate is 5.696 Mbps for a 1-pair SHDSL line.

# G.SHDSL Two-Wire Ethernet Network Extender

## 4. Console Configuration

The LR0201A-KIT has an RS-232C console port so users can monitor the OA&M status through a VT100 terminal. This section covers the operating procedures and settings for all screen selections.

Connect the RS-232 cable to the COM port of the computer as shown in Figure 4-1. Set the personal computer to VT100 or VT102 type through HyperTerminal. Press the <ESCAPE> key and the main menu will be shown on the screen of the terminal. The terminal operations can then start.

If you press the <ESCAPE> key and the terminal's screen does not display, the COM port setting might be incorrect. Choose the right COM port (COM1 or COM2) on the computer, and press the <ESCAPE> key again to make sure that the main menu appears on the terminal screen.

NOTE: Set the COM port to 9600 bps, no parity, 8 data bits, 1 stop bit, no flow control.

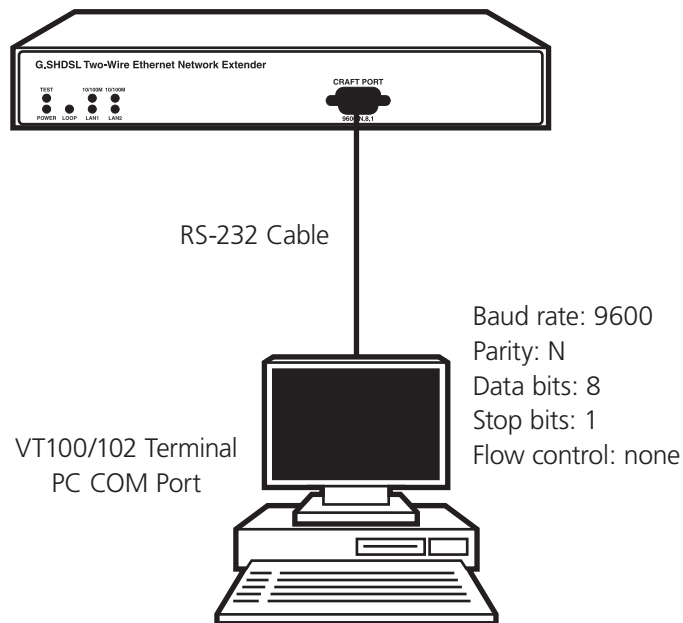


Figure 4-1. Connecting the console port to an RS-232 terminal.

### 4.1. Main Menu

The Main Menu screen enables you to access the LR0201A-KIT's Configuration or Status screens. For details, refer to Figure 4-2.

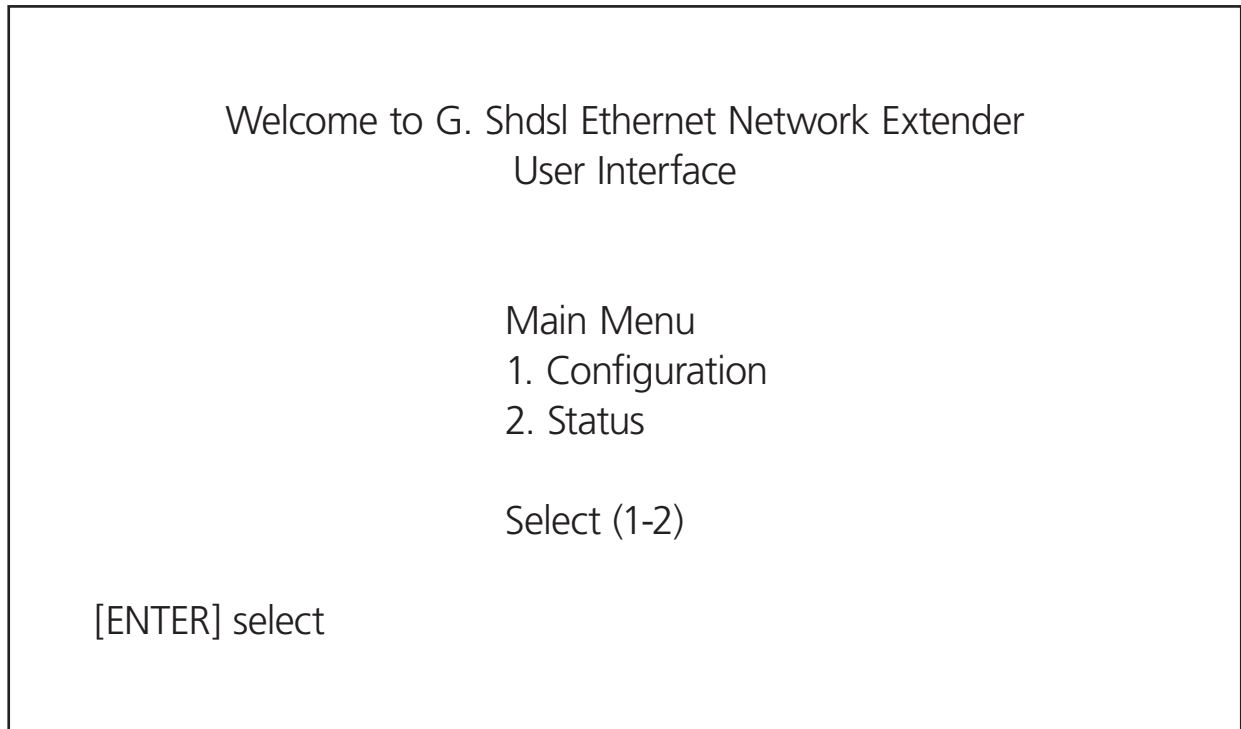


Figure 4-2. Main menu.

The main menu's pull-down tree structure is shown in Figure 4-3.

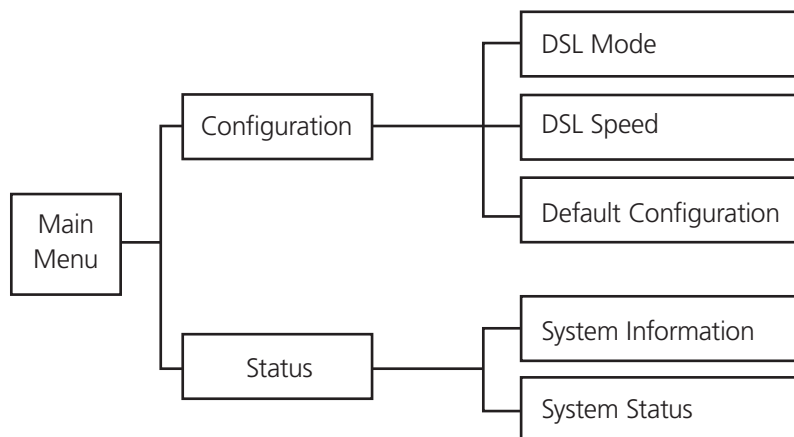


Figure 4-3. Pull-down tree structure of the main menu.

### 4.2. Configuration Screen

The Configuration screen will display the LR0201A-KIT unit's selection. On this screen, you can choose from three settings selections: DSL Mode, DSL Speed, and Default Configuration.

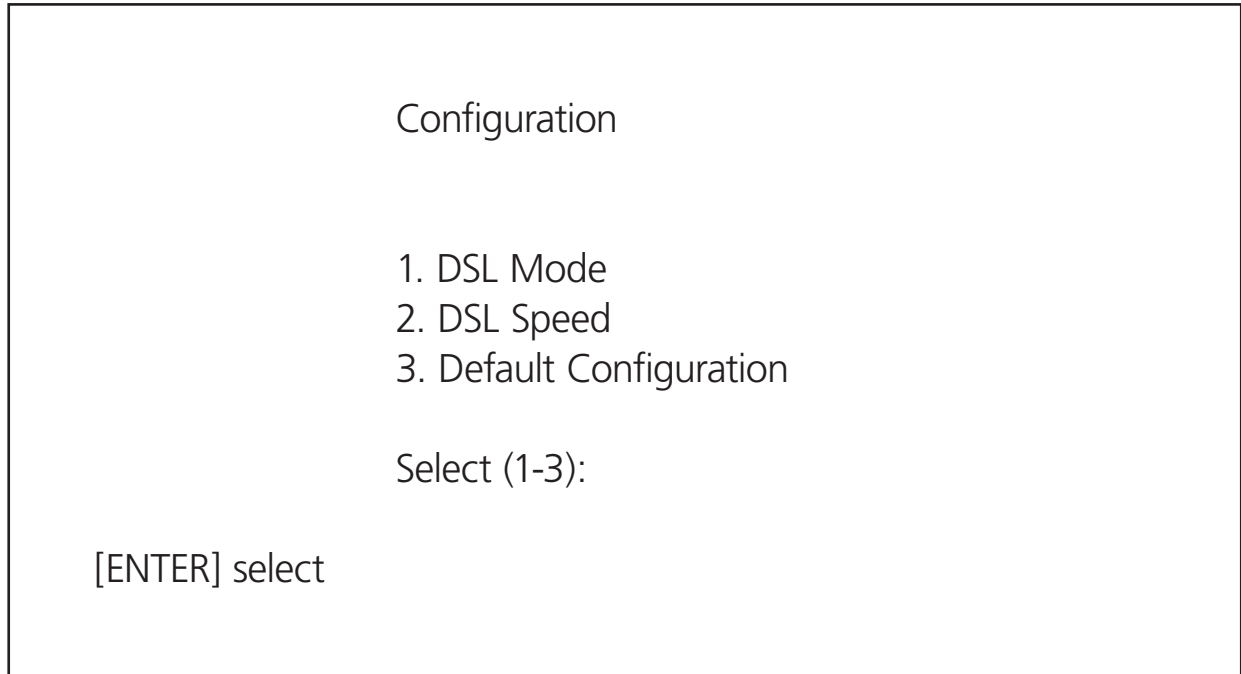


Figure 4-4. Configuration screen.

#### 4.2.1. DSL Mode Screen

From the DSL Mode screen, users can update DSL mode settings. The DSL Mode settings' initial values are read from DIP switches.

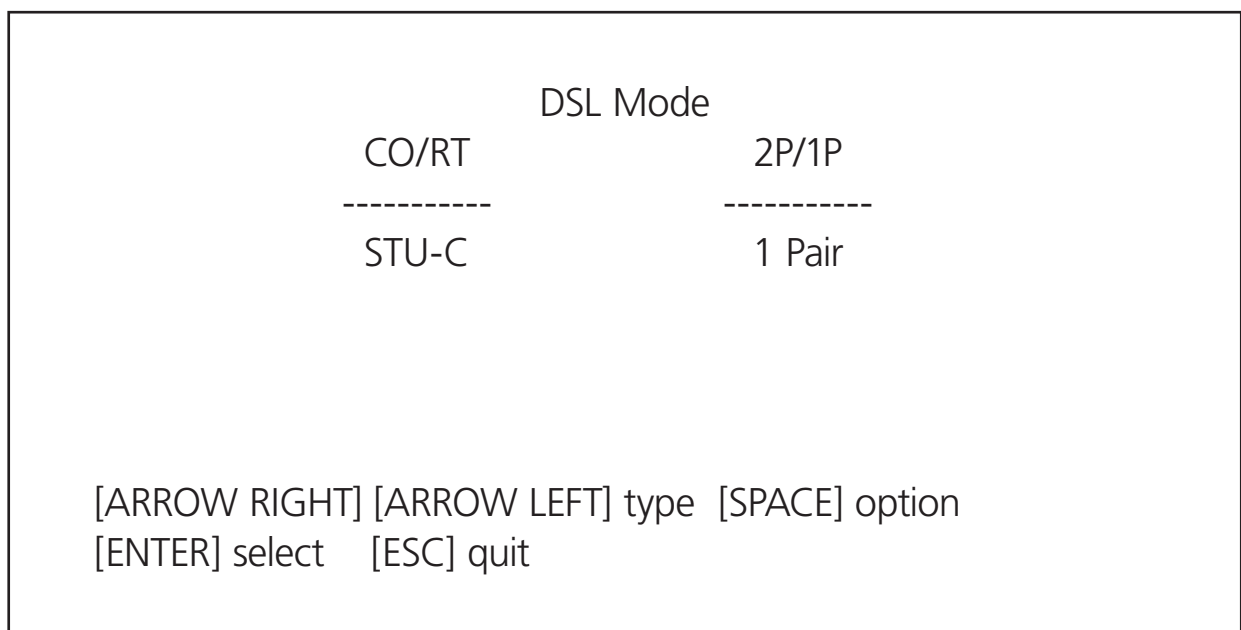


Figure 4-5. DSL Mode screen.

### CO/RT:

CO/RT has 2 options: STU-C and STU-R. To establish a successful connection for two G.SHDSL Two-Wire Ethernet Network Extenders, set one unit to STU-C (CO Site) and the other unit to STU-R (Remote Site).

### 2P/1P:

2P/1P has 2 options: 1 Pair and 2 Pairs. The LR0201A-KIT only supports a 1-pair SHDSL application. To establish a successful connection for LR0201A-KIT, set the two units to the same selection.

### 4.2.2 DSL Speed Screen

From the DSL Speed screen, users can configure the DSL transmission rate.

Options for 1-pair setting in the DSL Mode menu are:

64 kbps, 128 kbps, 192 kbps, 256 kbps, 384 kbps, 512 kbps, 768 kbps, 1152 kbps, 1536 kbps, 1544 kbps, 2048 kbps, 2304 kbps, 3072 kbps, 4608 kbps, 5696 kbps, and Adaptive speed.

Set both LR0201A-KIT units to the same speed to establish a successful connection for 64 kbps, 128 kbps, 3072 kbps, 4608 kbps, 5696 kbps, and Adaptive speed.

For the rate speed options between 192 kbps and 2304 kbps, the remote (slave) site will follow the CO (master) site's speed, regardless of the speed selected for the remote site unit.

When setting for adaptive rate, two or more activation cycles are necessary. The system will automatically adapt to maximum speed according to the loop distances. The maximum speed is 5.696 Mbps for 1-pair mode.

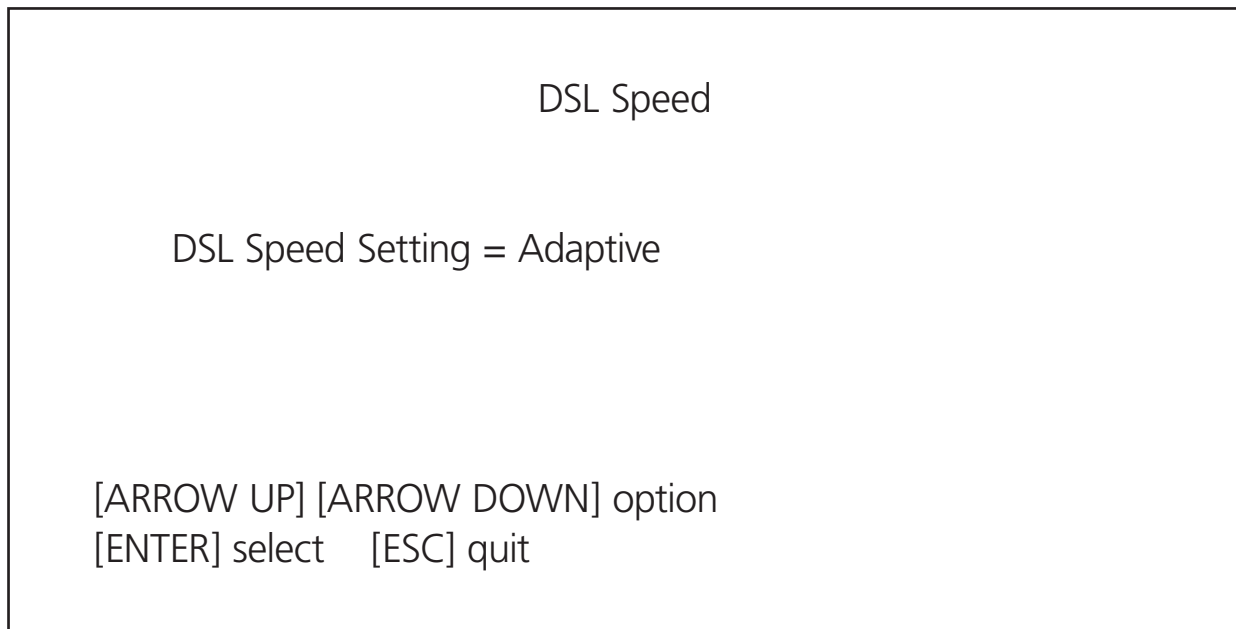


Figure 4-6. DSL Speed screen.

### 4.2.3. Default Configuration Screen

When Default Configuration is selected, all the settings of the LR0201A-KIT will go back to default settings. The screen shown in Figure 4-7 indicates that the setting is finished. Press <ESC> key to return to the previous screen. The LR0201A-KIT's default settings are:

STU-C

1 Pair

Adaptive speed

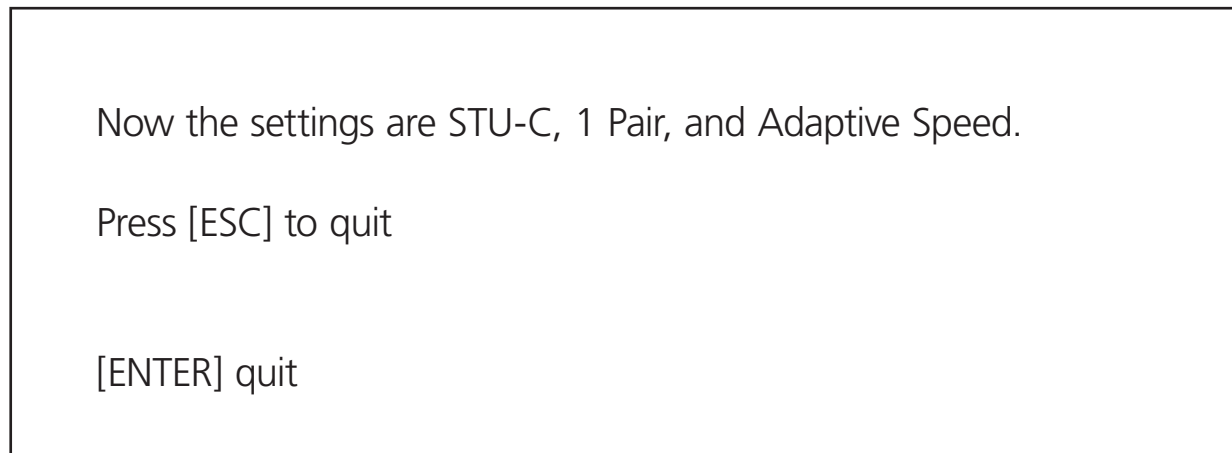


Figure 4-7. Default Configuration screen.



### 4.3 Status Screen

The Status screen shows the LR0201A-KIT's connection status. The screen covers two selections: System Information and System Status.

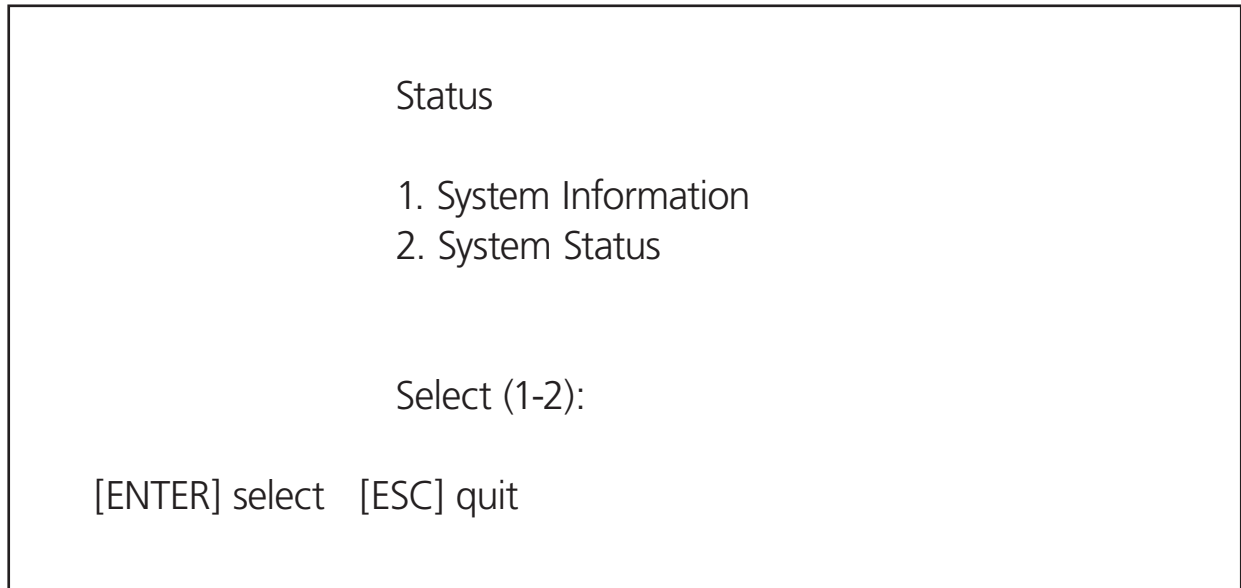


Figure 4-8. Status screen.

#### 4.3.1 System Information Screen

Firmware Version: Indicates the firmware version in this unit.

Vendor Model: Indicates this device's vendor model name.

Vendor Information: Indicates the vendor's Web site address.

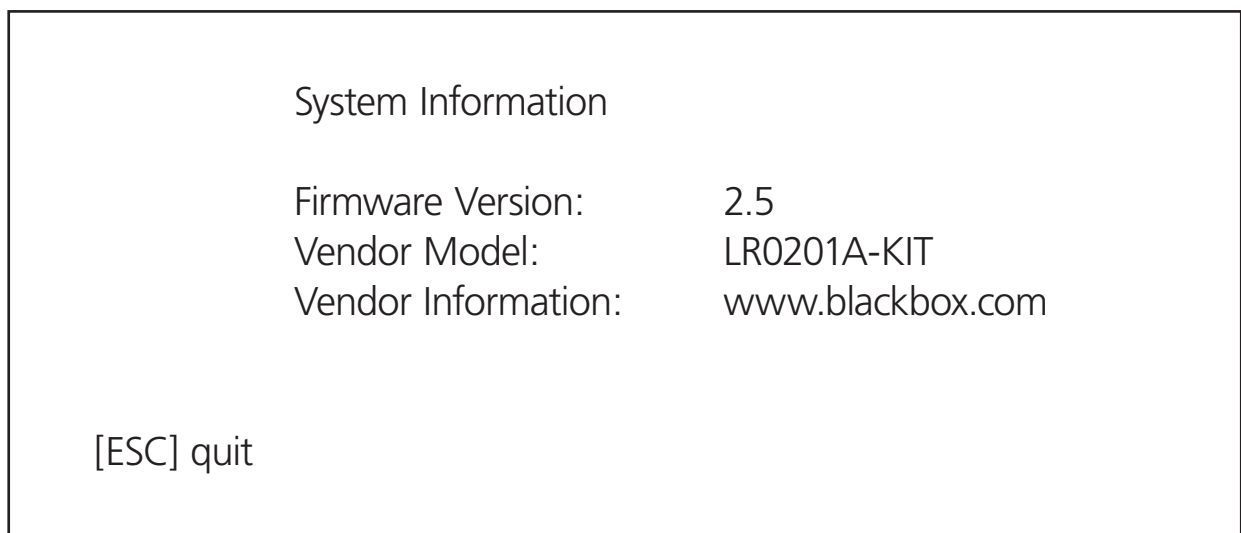


Figure 4-9. System Information screen.

### 4.3.2 System Status Screen

DSL mode: Indicates the current DSL mode setting.

Speed setting: Indicates the current DSL speed setting.

Speed actual (kbps): Indicates the actual DSL speed in kilobits per second.

Link status of Pair #1: Indicates the DSL connection status (either up or down) for Pair #1.

Link status of Pair #2: Indicates the DSL connection status (either up or down) for Pair #2.

Noise margin of Pair #1 (dB): Indicates the Noise Margin in dB of Pair #1.

Noise margin of Pair #2 (dB): Indicates the Noise Margin in dB of Pair #2.

Line attenuation of Pair #1 (dB): Indicates the line attenuation value in dB of Pair #1. The maximum value is 43 dB when the DSL distance is 22,500 ft. 26 AWG.

Line attenuation of Pair #2 (dB): Indicates the line attenuation value in dB of Pair #2. The maximum value is 43 dB when the DSL distance is 22,500 ft. 26 AWG.

Activation state of Pair #1 (dB): Indicates the DSL startup activation state of Pair #1. The value starts from 05 and gradually reaches the final value of 16. The value 16 is the DSL link up state value. The general activation state sequence is 05 → 20 → 10 → 12 → 16.

Activation state of Pair #2 (dB): Indicates the DSL startup activation state of Pair #2. The value starts from 05 and gradually reaches the final value of 16. The value 16 is the DSL link up state value. The general activation state sequence is 05 → 20 → 10 → 12 → 16.

```
System Status

DSL Mode:                STU-C  1 Pair
Speed Setting:           Adaptive
Speed Actual (kbps):    4608
Link Status of Pair #1:  up
Link Status of Pair #2:
Noise Margin of Pair #1 (dB):  08
Noise Margin of Pair #2 (dB):
Line Attenuation of Pair #1 (dB):  22
Line Attenuation of Pair #2 (dB):
Activation State of Pair #1:    16
Activation State of Pair #2:

[ESC] quit
```

Figure 4-10. System Status screen. This example shows settings for a 1-pair 26 AWG cable.

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