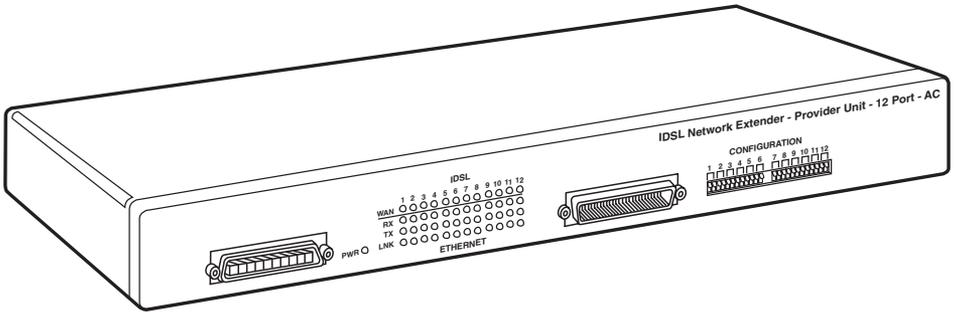




LR0005A-KIT
LR0006A-AC
LR0006A-DC
LR0007A

MARCH 2000
LR0010A-KIT
LR0011A-AC
LR0011A-DC
LR0012A

IDSL and SDSL Network Extenders



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

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

Caution:

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

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 Industry Canada.

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

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 deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

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1. Specifications

Bandwidth —	SDSL models: Selectable to 272 kbps, 528 kbps, 784 kbps, 1.168 Mbps (all bandwidths are symmetrical); IDSL models: 144/128 kbps (symmetrical)
Distance —	<i>Over 24 AWG wire:</i> SDSL: 1.168 Mbps up to 11,000 feet (3352 m), 784 kbps up to 13,000 feet (3962 m), 528 kbps up to 15,000 feet (4572 m), and 272 kbps up to 17,000 feet (5182 m); IDSL: 128 or 144 kbps up to 18,000 feet (5486 m)
IDSL Interface —	All: 2B1Q Encoding; LR0010A-KIT, LR0012A: RJ-45; LR0011A: RJ-21 50-pin telco
Network Interface —	All: IEEE 802.3 Ethernet 10BASE-T; LR0005A-KIT, LR0007A, LR0010A-KIT, LR0012A: RJ-45; LR0006A, LR0011A: (12) RJ-21
SDSL Interface —	All: 2B1Q Encoding; LR0005A-KIT, LR0007A: RJ-45; LR0006A: RJ-21 50-pin telco
Indicators —	Connection, Power, Collision, TX, RX, Link
Power —	LR0005A-KIT, LR0006A-AC, LR0007A, LR0010A-KIT, LR0012A, LR0011A-AC: 100–120 VAC, 60 Hz; LR0006A-DC, LR0011A-DC: 40–56 VDC Positive Ground
Size —	LR0005A-KIT, LR0007A, LR0010A-KIT, LR0012A: 1.3"H x 5.5"W x 4.6"D (3.3 x 14 x 11.4 cm); LR0006A-AC: 1.8"H x 17"W x 17"D (4.6 x 43.2 x 43.2 cm); LR0006A-DC: 1.8"H x 17"W x 14"D (4.6 x 43.2 x 35.6 cm); LR0011A-AC, LR0011A-DC: 1.8"H x 17"W x 18"D (4.6 x 43.2 x 45.7 cm)
Weight —	LR0005A-KIT, LR0007A, LR0010A-KIT, LR0012A: 0.6 lb. (0.3 kg); LR0006A, LR0011A: 7.7 lb. (3.5 kg)

2. Introduction

2.1 Overview

The Network Extenders convert either SDSL (Symmetrical Digital Subscriber Line) or IDSL (ISDN Digital Subscriber Line) to Ethernet. This is a Layer 1 conversion, and Ethernet frames are then passed across the SDSL or IDSL link.

Each model's function is described below.

- The LR0005A-KIT includes one Provider unit and one Subscriber unit, to make one individual SDSL-to-Ethernet line.
- The LR0006A-AC/DC is a 12-port Provider unit with 12 individual SDSL-to-Ethernet ports to which you can attach 12 Subscriber units. No bridging or routing is done internally.
- The LR0007A is a single SDSL-to-Ethernet Subscriber unit.
- The LR0010A-KIT includes one Provider unit and one Subscriber unit, to make one individual IDSL-to-Ethernet line.
- The LR0011A-AC/DC is a 12-port Provider unit with 12 individual IDSL-to-Ethernet ports to which you can attach 12 Subscriber units. No bridging or routing is done internally.
- The LR0012A is a single IDSL-to-Ethernet Subscriber unit.

The connection across the SDSL line may be at 272, 528, or 728 kbps or 1.168 Mbps in both directions. Connection across the IDSL line may either 144 or 128 kbps. Speed is selectable and determined by the Provider unit; the remote Subscriber unit will determine its line speed through communication with the Provider unit.

SDSL/IDSL technology is intended for use from the telephone company central office across the local loop to the home or business, or may also be used in multiple-dwelling-unit environments to provide high-speed, long-reach data service over phone-grade copper cable up to 18,000 feet (5486 m). Distance is determined by speed selection and cable grade.

The typical application for IDSL or SDSL technology is high-speed Internet access or remote LAN access.

2.2 Features

- **Traffic Indicators** — All units feature an LED that will steadily pulse (once per second) when the SDSL or IDSL connection is operational and the unit is receiving valid data packets or status packets from the SDSL or IDSL Network Extender on the remote side of the link.
- **Link Down Notification** — Allows for alarm notification for the SDSL or IDSL link to the Ethernet device to which the Provider unit is connected.
- **Broadcast Limiting** (*IDSL and SDSL Subscriber Units Only*) — Ensures that pure broadcast traffic will only be allowed to consume up to 20% of the total SDSL or IDSL bandwidth. Unicast and multicast traffic are guaranteed at least 80% of the total SDSL or IDSL bandwidth.
- **Local Traffic Filtering** (*IDSL and SDSL Provider and Subscriber Units*) — The units will build a database up to 255 MAC addresses and will provide traffic filtering based on the learned MAC addresses. MAC addresses are learned based on the Source Address of the Ethernet packets, and are filtered based on the Destination Address of the Ethernet packets. Addresses are removed from the filtering database if the unit does not receive traffic from that Source for a 5-minute period, but are relearned once the unit receives packets from that Source Address.

2.3 Selecting IDSL Bandwidth

For LR0010A-KIT, LR0011A-AC/DC, and LR0012A, Switch #2 on the Provider Unit's front panel controls the IDSL bandwidth. (Switch #1 is not used.)

If Switch 2 is in the up position, the IDSL connection will provide 128-kbps symmetrical bandwidth. If Switch 2 is in the down position, the IDSL connection will provide 144-kbps symmetrical bandwidth. There is no switch on the Subscriber Unit; it will determine its speed through communication with the Provider Unit.

2.4 Selecting SDSL Bandwidth

For LR0005A-KIT, LR0006A-AC/DC, and LR0007A, two switches are used to select the SDSL bandwidth for each SDSL/Ethernet port pairing. The table below shows switch configurations and associated bandwidth and distance support (in feet).

Left Switch	Right Switch	Bandwidth	26 AWG	24 AWG
Down	Down	1.168 Mbps	9,000	12,000
Down	Up	784 kbps	11,000	13,000
Up	Down	528 kbps	13,000	15,000
Up	Up	272 kbps	15,000	17,000

2.5 LEDs

Indicators for each model are listed below by product code.

LR0005A-KIT (PROVIDER UNIT; SUBSCRIBER UNIT FUNCTIONS AS LR0007A)

SDSL LED: Pulsing green (once per second) indicates that the SDSL connection is operational and the unit is receiving either valid data packets or status packets from the remote unit on the other side of the SDSL connection.

Power: Steady green indicates normal operation.

Collision: Flashing red indicates collision on Ethernet segment.

Rx: Flashing amber indicates data received from Ethernet segment. Steady amber indicates that the SDSL connection is not present.

Tx: Flashing amber indicates data transmitted to Ethernet segment. Steady amber indicates that the SDSL connection is not present.

Lnk: Steady green indicates that an Ethernet link has been established. Steady green (if accompanied by corresponding steady amber Tx and Rx LEDs) indicates that the SDSL connection is not present.

LR0006A-AC/DC

Power: Steady green indicates normal operation.

WAN: Pulsing green (once per second) indicates that the SDSL connection is operational and the unit is receiving either valid data packets or status packets from the remote unit on the other side of the SDSL connection.

Rx: Flashing amber indicates data received from Ethernet segment. Steady amber indicates that the SDSL connection is not present.

Tx: Flashing amber indicates data transmitted to Ethernet segment. Steady amber indicates that the SDSL connection is not present.

Lnk: Steady green indicates that an Ethernet link has been established. Steady green (if accompanied by corresponding steady amber Tx and Rx LEDs) indicates that the SDSL connection is not present.

NOTE

The SDSL connection may take several minutes to establish full connectivity at the desired bandwidth setting. During connection setup, the SDSL line will come up briefly (indicated by WAN LED), but will then shut down and retrain at the appropriate bandwidth setting indicated by the front-panel switches. Once the connection has been established, the WAN LED will function as described above.

LR0007A

SDSL LED: Steady pulsing green (once per second) indicates that the SDSL connection is operational and the unit is receiving either status packets from the SDSL Network Extender on the opposite side of the link or valid data packets across the link.

Power: Steady green indicates normal operation.

Collision: Flashing red indicates collision on Ethernet segment.

Rx: Flashing amber indicates data received from Ethernet segment.

Tx: Flashing amber indicates data transmitted to Ethernet segment.

Lnk: Steady green indicates that an Ethernet link has been established.

LR0010A-KIT (PROVIDER UNIT; SUBSCRIBER UNIT FUNCTIONS AS LR0012A)

IDSLE LED: Pulsing green (once per second) indicates that the IDSLE connection is operational and the unit is receiving either valid data packets or status packets from the remote unit on the other side of the IDSLE connection.

Power: Steady green indicates normal operation.

Collision: Flashing red indicates collision on Ethernet segment.

Rx: Flashing amber indicates data received from Ethernet segment. Steady amber indicates that the IDSLE connection is not present.

Tx: Flashing amber indicates data transmitted to Ethernet segment. Steady amber indicates that the IDSLE connection is not present.

Lnk: Steady green indicates that an Ethernet link has been established. Steady green (if accompanied by corresponding steady amber Tx and Rx LEDs) indicates that the IDSLE connection is not present.

NOTE

The SDSL connection may take several minutes to establish full connectivity at the desired bandwidth setting. During connection setup, the SDSL line will come up briefly (indicated by IDSLE LED), but will then shut down and retrain at the appropriate bandwidth setting indicated by the front-panel switches. Once the connection has been established, the IDSLE LED will function as described above.

LR0011A-AC/DC

Power: Steady green indicates normal operation.

WAN: Pulsing green (once per second) indicates that the IDSLE connection is operational and unit is receiving either valid data packets or status packets from the remote unit on the other side of the IDSLE connection.

Rx: Flashing amber indicates data received from Ethernet segment. Steady amber indicates that the IDSLE connection is not present.

Tx: Flashing amber indicates data transmitted to Ethernet segment. Steady amber indicates that the IDSLE connection is not present.

Lnk: Steady green indicates that an Ethernet link has been established. This LED will also glow steadily if the IDSLE connection is not present.

LR0012A

IDSLS LED: Steady pulsing green (once per second) indicates that the IDSLS connection is operational and the unit is receiving either status packets from the IDSLS Network Extender on the opposite side of the link or valid data packets across the link.

Power: Steady green indicates normal operation.

Collision: Flashing red indicates collision on Ethernet segment.

Rx: Flashing amber indicates data received from Ethernet segment.

Tx: Flashing amber indicates data transmitted to Ethernet segment.

Lnk: Steady green indicates that an Ethernet link has been established.

3. Installation

This chapter provides basic installation procedures. We strongly recommend using proper static-protection techniques when installing and handling the equipment.

3.1 Installation for LR0005A-KIT, LR0007A, LR0010A-KIT, and LR0012A

NOTE

A Network Extender Subscriber Unit must be connected (via the DSL line) to a Network Extender Provider. Two Subscriber Units cannot be connected back-to-back.

1. Unpack the Network Extender and power supply.
2. Plug the power supply into both the power source and back of the unit. (It doesn't matter which order.) Verify that the Power LED is lit. On the IDSL Network Extender and SDSL Network Extender Provider Units, the Lnk, Tx, and Rx LEDs will also be lit.
3. Plug in the DSL connection (see the **Appendix** for SDSL connection pinout information). On the Provider Units, verify that the switches on the back of the unit are in the appropriate position (see below).

LR0010A-Kit (Provider Unit) Switch Configuration

Switch #1: Not used.

<u>Switch #2</u>	<u>Bandwidth</u>	<u>Distance (in feet)</u>
Down	144 kbps	18,000
Up	128 kbps	18,000

LR0005A-Kit (Provider Unit) Switch Configuration

Distance Supported (in feet)

<u>Switch #1</u>	<u>Switch #2</u>	<u>Bandwidth</u>	<u>26 AWG</u>	<u>24 AWG</u>
Down	Down	1.168 Mbps	9,000	12,000
Down	Up	784 kbps	11,000	13,000
Up	Down	528 kbps	13,000	15,000
Up	Up	272 kbps	15,000	17,000

The IDSL and SDSL Subscriber Units (LR0010A-KIT, LR0012A, LR0005A-KIT, LR0007A) do not use these switches.

NOTE

The distance of the copper cable between the local Network Extender and the remote Network Extender will affect the linking of the DSL connection. If the distance is greater than a particular speed will support, the units will not link up. Note that it may take anywhere between 1 and 5 minutes for the DSL connection to link up, depending on cable quality and distance.

4. Verify the DSL connection via the DSL LED on the front of the unit. A steadily pulsing LED (once per second) indicates that the DSL connection is established and operational. On the Network Extender Provider Units, the Lnk, Tx, and Rx LEDs will not be lit once the DSL link is operational.
5. Plug in the local Ethernet connection and verify physical link by the Lnk LED on the front of the unit. See the **Appendix** for Ethernet connection pinout information.

Once the units have established both DSL and Ethernet link on both sides of the connection, normal data communication will flow through the units, essentially providing a very long Ethernet connection at DSL speeds.

3.2 Installation for LR0006A-AC/DC and LR0011A-AC/DC

1. Unpack the Network Extender and power cord (AC only). Attach the included rubber feet for stackable installations or attach rackmount brackets and mount the Network Extender in an equipment rack. When mounting unit in an equipment rack, please adhere to the following:
 - a. Maximum recommended ambient temperature is 86°F (30°C). Internal temperatures of rack should be considered for continued safe operation.
 - b. Do not block power-supply vents or otherwise restrict airflow when installing unit in rack.
 - c. Mechanical loading of rack should be considered so that the rack remains stable and unlikely to tip over.
 - d. Consideration of the overall loading of the branch circuit should be given before installing any equipment in a rack environment.
 - e. Make sure that a reliable grounding path is maintained in the rack system. This unit is intended for a grounded connection.

2. For AC units, plug the power cord into both the power source and the back of the unit. (It doesn't matter which order.) For DC units, attach the DC power leads and ground connection to the appropriate terminals indicated on the back of the unit and supply power to the unit. Verify that the Power LED is lit. Until the DSL link is established, the Lnk, Tx, and Rx LEDs will also be lit on each port. When the DSL link has been established, the Tx and Rx LEDs will function normally, indicating activity on the Ethernet segment.
3. Attach the RJ-21 connector/cable to the DSL connector on the unit. This connection is typically made to a punchdown block for copper wire cross connects in a telco office/room, or with an RJ-21 to RJ-45 breakout cable (see the **Appendix** for SDSL connection pinout information).
4. Verify that the switches on the front of the unit are in the appropriate position for each port (see below).

LR0011A-AC/DC Switch Configuration (per port pairing)

Switch #1: Not used.

<u>Switch #2</u>	<u>Bandwidth</u>	<u>Distance (in feet)</u>
Down	144 kbps	18,000
Up	128 kbps	18,000

LR0011A-AC/DC Switch Configuration (per port pairing)

Distance Supported (in feet)

<u>Switch #1</u>	<u>Switch #2</u>	<u>Bandwidth</u>	<u>26 AWG</u>	<u>24 AWG</u>
Down	Down	1.168 Mbps	9,000	11,000
Down	Up	784 kbps	11,000	13,000
Up	Down	528 kbps	13,000	15,000
Up	Up	272 kbps	15,000	17,000

NOTE

The distance of the copper cable between the local Network Extender and the remote Network Extender will affect the linking of the DSL connection. If the distance is greater than a particular speed will support, the units will not link up. Additionally, it may take anywhere between 1 and 5 minutes for the DSL connection to link up, depending on cable quality and distance.

5. Verify the DSL connection via the DSL LED on the front of the unit. A steadily pulsing LED (once per second) indicates that the DSL connection is established and operational.
6. Connect the local RJ-21 Ethernet connector/cable to network equipment (such as an Ethernet switch) and verify physical link by the Lnk LED on the front of the unit. See the **Appendix** for Ethernet connection pinout information.

NOTE

The Network Extender Provider Units do not present Ethernet link (Lnk) to the Ethernet network equipment if the DSL connection is not present. This feature allows for remote monitoring of the DSL line by simply monitoring the Ethernet port for link status.

Once the units have established both DSL and Ethernet link on both sides of the connection, normal data communication will flow through the units, essentially providing a very long Ethernet connection at DSL speeds.

Appendix: Port Pinouts

A.1 LR0005A-KIT, LR0007A, LR0010A-KIT, and LR0012A

<u>Ethernet Pinout</u>		<u>SDSL or IDSL Pinout</u>	
Pin 1	RX+	Pin 1	
Pin 2	RX-	Pin 2	
Pin 3	TX+	Pin 3	
Pin 4		Pin 4	Ring
Pin 5		Pin 5	Tip
Pin 6	TX-	Pin 6	
Pin 7		Pin 7	
Pin 8		Pin 8	

A.2 LR0006A-AC/DC and LR0011A-AC/DC

<u>Ethernet RJ-21</u>			<u>SDSL or IDSL RJ-21</u>		
Port	Pin		Port	Pin	
1	26	TX1+	1	26	Tip
	1	TX1-		1	Ring
	27	RX1+		2	27
2	RX1-	2	Ring		
2	28	TX2+	3	28	Tip
	3	TX2-		3	Ring
	29	RX2+		4	29
4	RX2-	4	Ring		
3	30	TX3+	5	30	Tip
	5	TX3-		5	Ring
	31	RX3+		6	31
6	RX3-	6	Ring		
4	32	TX4+	7	32	Tip
	7	TX4-		7	Ring
	33	RX4+		8	33
8	RX4-	8	Ring		
5	34	TX5+	9	34	Tip
	9	TX5-		9	Ring
	35	RX5+		10	35

LR0006A-AC/DC (continued)

<u>Ethernet RJ-21</u>			<u>SDSL or IDSL RJ-21</u>		
<u>Port</u>	<u>Pin</u>		<u>Port</u>	<u>Pin</u>	
6	10	RX5-	11	10	Ring
	36	TX6+		36	Tip
	11	TX6-		11	Ring
	37	RX6+	12	37	Tip
12	RX6-	12		Ring	
7	38	TX7+			
	13	TX7-			
	39	RX7+			
8	14	RX7-			
	40	TX8+			
	15	TX8-			
9	41	RX8+			
	16	RX8-			
	42	TX9+			
	17	TX9-			
10	43	RX9+			
	18	RX9-			
	44	TX10+			
11	19	TX10-			
	45	RX10+			
	20	RX10-			
	46	TX11+			
12	21	TX11-			
	47	RX11+			
	22	RX11-			
12	48	TX12+			
	23	TX12-			
	49	RX12+			
	24	RX12-			



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