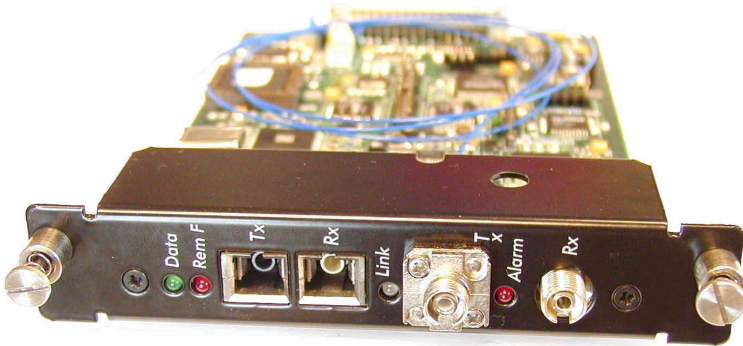




## CityLIGHT<sup>®</sup> Gigabit Ethernet Card



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**CUSTOMER  
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INFORMATION**

Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**  
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**FEDERAL COMMUNICATIONS COMMISSION  
AND  
CANADIAN DEPARTMENT OF COMMUNICATIONS  
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 the Canadian Department of Communications.*

*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 le ministère des Communications du 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.

## CERTIFICATION NOTICE FOR EQUIPMENT USED IN CANADA

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications-network protective, operation, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single-line individual service may be extended by means of a certified connector assembly (extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility—in this case, your supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

### CAUTION:

Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The LOAD NUMBER (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices, subject only to the requirement that the total of the load numbers of all the devices does not exceed 100.

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# 1. SPECIFICATIONS

## Specifications for LCL831/834A Gigabit Ethernet Card

DATA RATE	1000 MBPS (1 GBPS)	
SINGLE-MODE FIBER LINK	SHORT HAUL	LONG HAUL
TYPICAL POWER BUDGET	19dB	21dB
MIN POWER BUDGET	18dB	20dB
TYPICAL LAUNCH POWER	-1dBm	+1dBm
MINIMUM LAUNCH POWER	-2dBm	0dBm
RECEIVE SENSITIVITY	-20dBm	-20dBm
RECEIVE SATURATION	-6dBm	-6dBm
LINK LENGTH (TYPICAL)		
SINGLE-MODE 9/125 $\mu$ m	UP TO 15KM (SHORT HAUL) BASED ON WORK CASE 6PS/NM.KM FIBER.  LONGER DISTANCES CAN BE ACHIEVED ON HIGHER SPECIFICATION FIBER.	UP TO 40KM (LONG HAUL), POWER BUDGET LIMITED.
USER FIBER LINK	MULTIMODE (850)	SINGLE-MODE (1300)
TYPICAL POWER BUDGET	12dB	12dB
MIN POWER BUDGET	7.5dB	7.5dB
TYPICAL LAUNCH POWER	-5dBm	-7dBm
MINIMUM LAUNCH POWER	-9.5dBm	-11.5dBm
RECEIVE SENSITIVITY	-17dBm	-19dBm

## CITYLIGHT GIGABIT ETHERNET CARD

RECEIVE SATURATION 0dBm -3dBm

### LINK LENGTH (TYPICAL)

SINGLE-MODE 9/125 $\mu$ m N/A UP TO 5KM

MULTIMODE 62.5/125 $\mu$ m 275M (MIN) 550M (REQUIRES OFFSET LAUNCH FIBER)

MULTIMODE 50/125 $\mu$ m 500M (MIN) 550M (REQUIRES OFFSET LAUNCH FIBER)

### CONNECTORS

USER PORT SC

SINGLE-MODE LINK SC/FC (ORDER TIME OPTIONS)

### ENVIRONMENTAL

TEMPERATURE 0°C TO 40°C OPERATION

-10°C TO 70°C STORAGE

HUMIDITY MAX 95% (NON-CONDENSING)

STANDARDS SUPPORTED IEEE 802.3Z

WEIGHT 0.15KG; 0.33LBS

### ELECTRICAL INFORMATION

MAX. CURRENT LESS THAN 2.0A @ 5V

POWER CONSUMPTION LESS THAN 10W

### COMPLIANCE

UL1950

CUL1950

CE 73/23/EEC

CE 89/336/EEC

FCC PT 15 LIMIT B

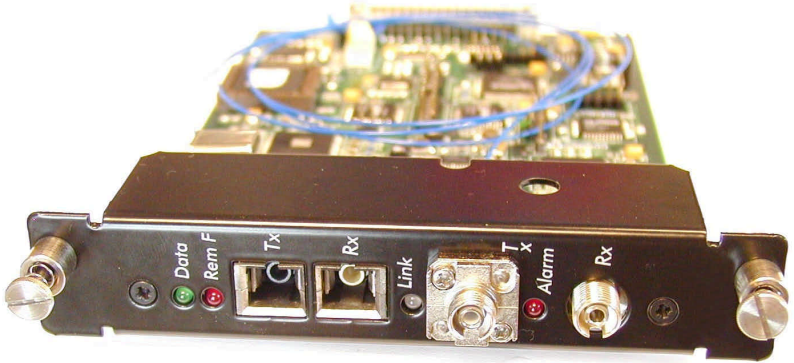


## CARD VARIANTS

LCL831A	GIGABIT ETHERNET, MM SC TO SM SC, 15 KM
LCL832A	GIGABIT ETHERNET, SM SC TO SM SC, 15 KM
LCL833A	GIGABIT ETHERNET, MM SC TO SM SC, 40 KM
LCL834A	GIGABIT ETHERNET, SM SC TO SM SC, 40 KM

## 2. PRODUCT OVERVIEW

The CITYLIGHT Gigabit Ethernet Card is part of the CITYLIGHT system and is designed to provide a basic transport service for Gigabit Ethernet attached devices. It converts multimode (850nm SX) or single-mode (1300nm LX) fiber signals for transmission on single-mode fiber between connected devices over distances up to 15km on single-mode fiber using short haul optics or 40km using long haul optics.



*Figure 1 - CityLIGHT Gigabit Ethernet Card*

### 2.1 Data Rate

The CITYLIGHT Gigabit Ethernet Card transmits at a data rate of 1000 Mbps (1Gbps) using 802.3z format frames.

### 2.2 Drive Distance

The CITYLIGHT Gigabit Ethernet Card allows a user to connect LAN interfaces over extended distances. Every CITYLIGHT Gigabit Ethernet Card single-mode fiber link can be up to 15km using short haul optics or 40km using long haul optics. Note the short haul optics are limited in distance by the spectral width of the laser and not the power budget available on the link. See Specifications for more details.

## 2.3 External Attenuator

All high-power or long haul CityLIGHT cards have been designed for long distance transmission and provide a minimum optical budget ranging between 20dB and 25dB. This provides transmission distances between 40km and 50km based on an average fiber attenuation of 0.5dB/km.

When these products are used for short distance applications, the received power may exceed the saturation limit of the receiver and external attenuation will be necessary to prevent optical overload and the inevitable data errors. For these applications, an external 10dB attenuator is available to ensure that the optical receive power falls within the operating limits of the receiver.

The fixed value 10dB attenuator, LCL505A, is of a doped-fiber design which eliminates the troublesome reflections which an air-gap attenuator may introduce. These reflections can upset the operation of lasers, particularly those used in high data rate systems.

The 10dB attenuator may be deployed anywhere in the single-mode fiber link but it is recommended that it be deployed at the receive end (rather than the transmit end) of any particular point-to-point link.

The attenuator has a female connector at one end and a male connector at the other end. The connector style should be specified at the time of ordering.

## 2.4 Typical Applications

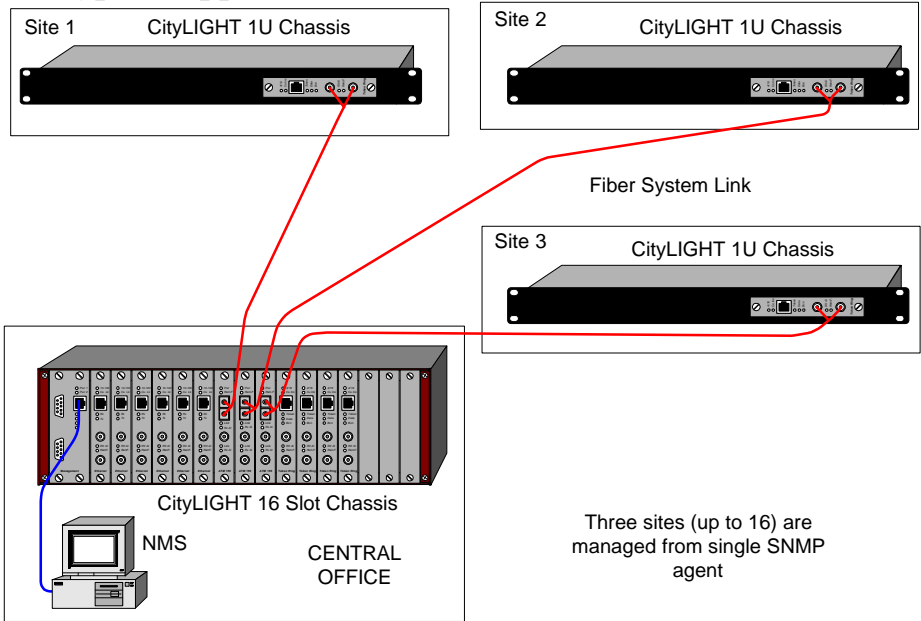


Figure 2 - Three Sites "Backhauled" to a Central Office

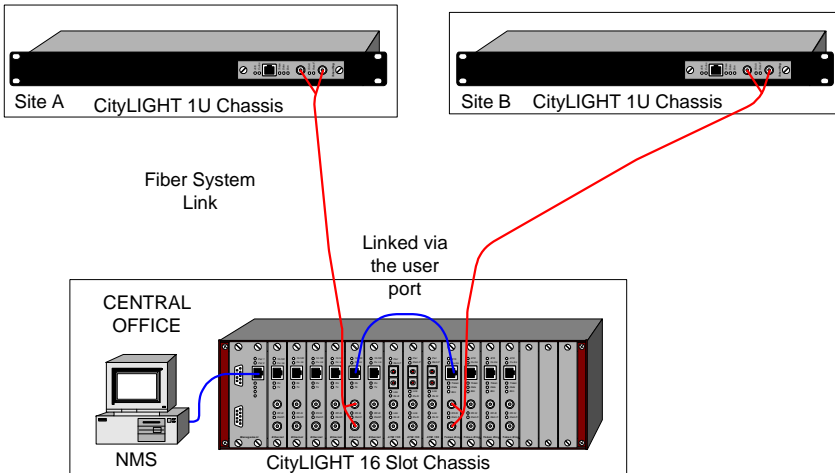


Figure 3 - Linking Two Sites Managed from a Central Office

## 2.5 Ergonomics

The CityLIGHT Gigabit Ethernet Card is able to be installed in either the CityLIGHT 1U or 3U Chassis or in the CityLIGHT 2-Card Chassis.

## 2.6 Power Supply

The CityLIGHT Gigabit Ethernet Card receives all its power requirements from the PSUs mounted in the CityLIGHT 1U or 3U Chassis or the CityLIGHT 2-Card Chassis.

## 2.7 Management

The CityLIGHT Gigabit Ethernet Card is managed via the CityLIGHT SNMP Card.

Once installed in a chassis with an SNMP card or connected via the fiber to a card in an SNMP-managed chassis, the SNMP agent automatically detects the card and displays the following information.

**NOTE:** This information is the same for the local and remote cards and is available via the terminal interface as well as the SNMP MIB.

- i) Card Type.
- ii) Fiber Port Link Status.
- iii) Temperature.
- iv) Fan Status.
- v) Laser Bias Current Alarm.
- vi) Receive Power.
- vii) PSU Voltage.
- viii) Redundant PSU State.
- ix) Serial Number.
- x) Firmware Version Number.
- xi) Location.

### Card Type

The type of the card in the slot (Gigabit Ethernet in this case).

### Fiber Port Link Status

This gives an indication of the state of the fiber connections of the CityLIGHT Gigabit Ethernet Card.

The single-mode fiber port states can be:

- i) Inserted (the CityLIGHT Gigabit Ethernet Card is correctly attached).
- ii) Rx Alarm (the CityLIGHT Gigabit Ethernet Card is not receiving light from the far end device. A fault lies in the far end device or the receive fiber path).

The multimode fiber port states can be either:

- i) Link Down (the CityLIGHT Gigabit Ethernet Card is not receiving a carrier signal).
- ii) Link Up (the CityLIGHT Gigabit Ethernet Card is receiving a carrier signal. The far end card is Link Down).
- iii) Active (Both CityLIGHT Gigabit Ethernet Cards are Link Up).

### Temperature

This is the temperature of the CityLIGHT Gigabit Ethernet Card. A trap alarm is generated if the temperature is not within the required range.

**NOTE:** This temperature monitors the actual temperature of the electronics on the card. Acceptable values are from  $-10^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

### Fan Status

The 1U Chassis has fan-assisted cooling. The SNMP Card monitors the fan speed in both the local and remote chassis and an alarm is generated if the fan speed falls below a pre-set limit. Care should be taken not to block the inlets or outlets of the fans on either side or rear of the chassis.

### Laser Bias

This field results from monitoring the drive current required to maintain the correct output power of the lasers on the Gigabit Ethernet transceiver cards. It is used to generate a trap when a threshold value is exceeded. This indicates that the laser is approaching its end of life (though typically the laser will not fail totally for some months after the alarm is raised) and should be replaced during an appropriate maintenance window.

## Rail Voltage

The voltage actually present at the card. In non-redundant PSU chassis this can be used to monitor the state of the power supply and should always be greater than 4.9V.

## PSU

This field gives an indication of the operating state of the PSUs in both the CityLIGHT 1U or 3U Chassis and the CityLIGHT 2-Card Chassis associated with the slot selected. The displayed state of the PSUs can be any one of the following:

- i) Good.
- ii) Under voltage (the voltage on the card is too low).
- iii) Over voltage (the voltage on the card is too high).

## Serial Number

This field gives the serial number of the CityLIGHT Gigabit Ethernet Card in the selected slot of the CityLIGHT management chassis.

## Firmware Version Number

The factory-loaded firmware version resident on this card.

## Location

The location is entered by the user (see CityLIGHT SNMP Card installation manual for details).

## Other Managed Features

The CityLIGHT SNMP Card also monitors the PSUs and cooling fans of both the CityLIGHT 1U or 3U Chassis and CityLIGHT 2-Card Chassis. Refer to the installation manual supplied with the CityLIGHT SNMP Card for more details.

## 2.8 Shipping Contents

The shipping carton contains:

This manual (1)

CityLIGHT Gigabit Ethernet Card (1)

## 3. INSTALLATION

**NOTE:** The CityLIGHT Gigabit Ethernet Card is hot-swappable; the power to the CityLIGHT 1U or 3U Chassis and the CityLIGHT 2-Card Chassis does not need to be turned off during installation.

### 3.1 Tools Required

To install the CityLIGHT Gigabit Ethernet Card, the following tools are required:

Flat-Bladed Screwdriver

Rack/Suitable Bench Space

Fiber Cleaning Kit

Fiber Patch Cords

Loss Set (Power Meter and 1300 nm Light Source)

### 3.2 Before You Start

Make sure you have the following information at hand before you start:

**Fiber Configuration:** Check that the connections on the CityLIGHT Gigabit Ethernet Card, the patch cords used, and the site requirements are compatible.

As the CityLIGHT Gigabit Ethernet Card is a long-distance product, installation is greatly simplified with a technician at each end of the link. This allows link tests to be completed in the least amount of time.

### 3.3 General Set-Up

- 1) If an SNMP Card is used on the link, set switch 1 on both cards to 'R' (Remote).

If no SNMP card is present, one card must be set to 'L' (Local); the other card must be set to 'R' (Remote). Unspecified results will occur if not configured in this way.

- 2) Position the CityLIGHT Gigabit Ethernet Card at the required slot of either the CityLIGHT 1U or 3U Chassis or the CityLIGHT 2-Card Chassis.



- 3) Push the CityLIGHT Gigabit Ethernet Card along the card guides into the slot until it engages with the connector inside the CityLIGHT management chassis.
- 4) Tighten the two captive screws on the front panel of both CityLIGHT Gigabit Ethernet Cards to secure them in position.
- 5) Make sure the Rx Alarm LED and Link LED on the front panel of both CityLIGHT Gigabit Ethernet Cards illuminate.
- 6) Using the loss set, and ideally a technician at either end of the link, check that the link budget is less than 18dB for the short haul unit or 20dB for the long haul unit.
- 7) **VERY IMPORTANT:** Thoroughly clean the connectors using pure alcohol and lint-free materials. Allow to air dry or blow with clean compressed air. Never blow dry using breath. If available fiber cleaning tape may be used.
- 8) Connect the fiber cables to the Tx connectors at both ends of the link.
- 9) Measure the received light level at the far end of the link. Check that the received light level is between -6dBm and -20dBm. If the received light level is greater than -6dBm an attenuator is required.
- 10) Make sure the single-mode Alarm LED is extinguished, see Section 4 – Diagnostic LEDs. If the Alarm LED is illuminated, check that the receive power is greater than -20dBm. If it is less than -20dBm check the launch power of the far end device and that the fiber connections are correctly made Tx to Rx.
- 11) Power up the local user equipment and make sure the Link LED is green indicating that the link to the connected Gigabit port is now active. If the Link LED remains red, check that the receive power at the user port is greater than -17dBm. If it is less than -17dBm, check the launch power of the connected device. Check the fiber connections are correctly made Tx to Rx.

**NOTE:** The receive power figures detailed above are for the SX version. For the LX version, receive power must be greater than -19dBm.

- 12) Once the link is correctly inserted, check the following:
  - i) The Link LED is green.
  - ii) The Rem F LED is extinguished.
  - iii) The Alarm LED is extinguished.

## CITYLIGHT GIGABIT ETHERNET CARD

If any of the LEDs is not correctly illuminated/extinguished see Appendix A - Troubleshooting for possible causes.

**NOTE:** During commissioning most faults are associated with bad/wrong cabling, dirty connectors, incorrect patching, loss of power, or excessive power budget.

The hardware installation is now complete. To enable management, refer to the Management Serial Interface section of the CityLIGHT Card installation manual.

## 4. DIAGNOSTIC LEDs

LED	COLOR	CONDITION
DATA	GREEN	USER DATA PRESENT ON THE LOCAL PORT.
REM F	RED	THE SINGLE-MODE FIBER LINK TO THE FAR END CITYLIGHT GIGABIT ETHERNET CARD HAS A FAULT. THE FAULT LIES IN THE PATH FROM THE TRANSMITTER OF THIS CARD TO THE FAR END CARD RECEIVER.
LINK	RED/GREEN	<p>RED – A RECEIVE ALARM CONDITION EXISTS ON THE USER PORT. CHECK THE FIBER CONNECTED TO THE LOCAL EQUIPMENT AND CHECK THAT THE LOCAL EQUIPMENT IS POWERED UP.</p> <p>GREEN – THE LINK TO THE LOCAL CUSTOMER EQUIPMENT IS GOOD.</p>
ALARM	RED	THIS INDICATES THAT A SIGNAL HAS NOT BEEN DETECTED ON THE SINGLE-MODE FIBER PORT, I.E. THE RECEIVED LIGHT LEVEL IS LESS THAN -20DBM.

## 5. SWITCH POSITIONS

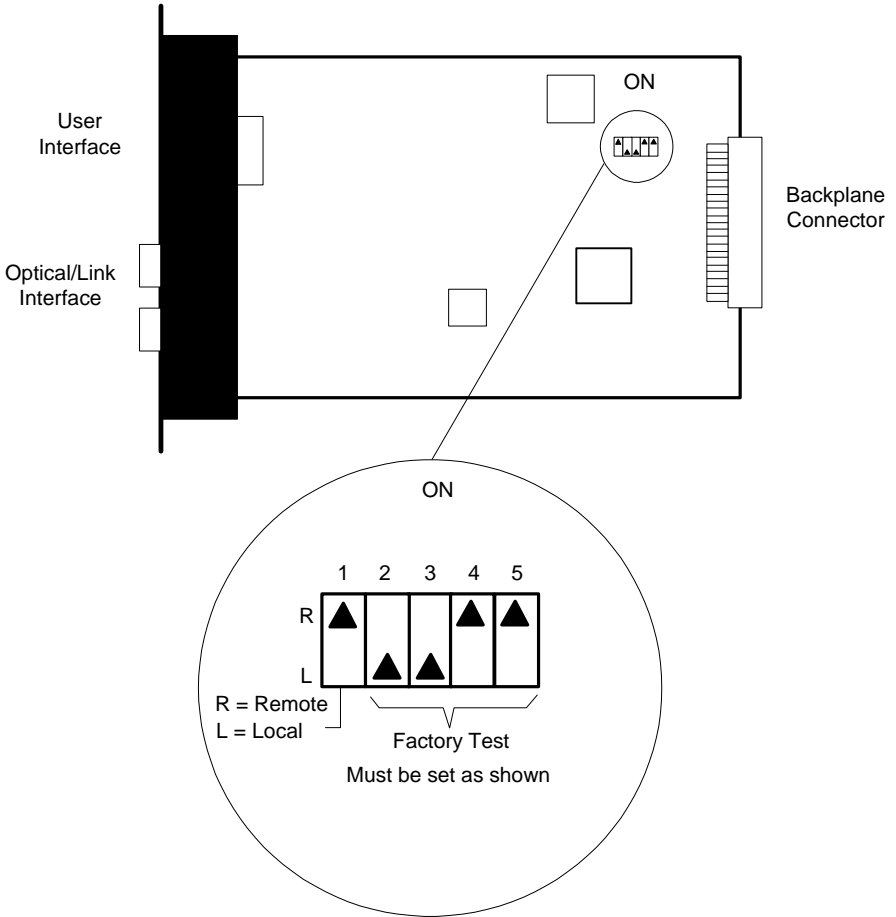


Figure 4 - Switch Positions

SWITCH	POSITION	FUNCTION
1	LOCAL (OFF)	THERE IS NO SNMP CARD PRESENT AT EITHER END OF THE LINK. ONE CARD ON THE LINK MUST BE SET TO 'L' (LOCAL) AND THE OTHER SET TO 'R' (REMOTE).
	REMOTE (ON)	IF AN SNMP CARD IS PRESENT AT EITHER END OF THE LINK SET BOTH CARDS TO REMOTE. IF NO SNMP CARD IS PRESENT AT EITHER END OF THE LINK ONE CARD MUST BE SET TO 'L' (LOCAL) AND THE OTHER SET TO 'R' (REMOTE).
2, 3	ALWAYS OFF	FACTORY TEST; MUST BE SET TO OFF.
4, 5	ALWAYS ON	FACTORY TEST; MUST BE SET TO ON.

**APPENDIX A - TROUBLESHOOTING**

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>
THE LINK LED IS NOT LIT	THE CITYLIGHT GIGABIT ETHERNET CARD IS NOT RECEIVING POWER. CHECK THAT THE CARD IS CORRECTLY INSERTED INTO THE CHASSIS AND THAT POWER IS CORRECTLY SUPPLIED TO THAT CHASSIS.
THE LINK DOES NOT PASS DATA OR IS NOT RESPONDING TO MANAGEMENT	THE RECEIVE LIGHT LEVEL IS NOT CORRECT. CHECK THAT THE RECEIVE LIGHT LEVEL IS BETWEEN -6DBM AND -20DBM
THE DATA LED DOES NOT ILLUMINATE	THE CITYLIGHT GIGABIT ETHERNET CARD IS NOT RECEIVING DATA FROM THE LOCAL USER DEVICE. CHECK THAT ALL UNITS ARE POWERED UP AND CONNECTED CORRECTLY. CHECK THE LAUNCH POWER OF THE USER EQUIPMENT AND CHECK IT IS WITHIN THE RANGE SPECIFIED FOR THE INTERFACE TYPE. SEE SPECIFICATIONS SECTION FOR MORE DETAILS.
THE REM F LED IS RED	THERE IS A FAULT IN THE FIBER PATH FROM THE SINGLE-MODE TX PORT ON THE CITYLIGHT GIGABIT ETHERNET CARD TO THE REMOTE CARD.  CHECK THE TRANSMIT LINK FROM THIS CITYLIGHT GIGABIT ETHERNET CARD TO THE REMOTE CARD RECEIVER. CHECK THAT THE REMOTE RECEIVE LIGHT LEVEL IS GREATER THAN -20DBM.
THE LINK LED IS RED	THE CITYLIGHT GIGABIT ETHERNET CARD HAS A RECEIVE ALARM CONDITION ON THE USER PORT. CHECK THAT THE USER EQUIPMENT IS POWERED UP AND THAT THE RECEIVE LIGHT LEVEL IS BOTH THE CORRECT LEVEL AND WAVELENGTH FOR THE CARD TYPE BEING USED (SX OR LX). SEE SPECIFICATIONS SECTION FOR MORE DETAILS.
THE LINK LED IS GREEN	THE LOCAL USER PORT IS OPERATING CORRECTLY.

THE ALARM LED IS RED	THE SINGLE-MODE FIBER LINK IS NOT WORKING. CHECK THE RECEIVE CONNECTORS AND MAKE SURE POWER IS CORRECTLY SUPPLIED TO ALL DEVICES. THE RECEIVE POWER LIGHT LEVEL SHOULD BE GREATER THAN -20DBM. IF THE RECEIVE POWER IS LESS THAN -20DBM CHECK THAT THE LAUNCH POWER OF THE REMOTE CITYLIGHT GIGABIT ETHERNET CARD IS -2DBM FOR THE SHORT HAUL UNIT AND 0DBM FOR THE HIGH POWER UNIT.
----------------------	--

If, after going through the troubleshooting section, you fail to resolve your problem and require more help, please contact Black Box Technical Support at 724-746-5500 with the following information:

1. Unit type.
2. Unit serial number.
3. Environment lay-out. Include hubs, bridges and routers (with model numbers), estimated cable lengths (between equipment), and type of cable used.
4. A description of the problem you are experiencing.
5. List of tests performed.

## **APPENDIX B - GLOSSARY OF TERMS**

GIGABIT	DATA TRANSFER AT 1000 MEGABITS PER SECOND.
LAN	LOCAL AREA NETWORK.
LED	LIGHT EMITTING DIODE.
MIB	MANAGEMENT INFORMATION BASE. THIS IS A TEXT DESCRIPTION OF A MANAGED DEVICE WRITTEN IN ABSTRACT SYNTAX NOTATION 1 (ASN1) THAT IS USED WITH SNMP MANAGEMENT SYSTEMS.
MULTIMODE	AN OPTICAL FIBER IN WHICH LIGHT PROPAGATES DOWN THE FIBER IN MULTIPLE MODES.
PSU	POWER SUPPLY UNIT.
RX	RECEIVE.
SINGLE-MODE	AN OPTICAL FIBER IN WHICH LIGHT TRAVELS IN ONE MODE WHICH DOES NOT INTRODUCE MODAL DISPERSION. CONSEQUENTLY SINGLE-MODE FIBER MAY HAVE GREATER DISTANCE CAPABILITY THAN MULTIMODE.
SNMP	SIMPLE NETWORK MANAGEMENT PROTOCOL.
TX	TRANSMIT.





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