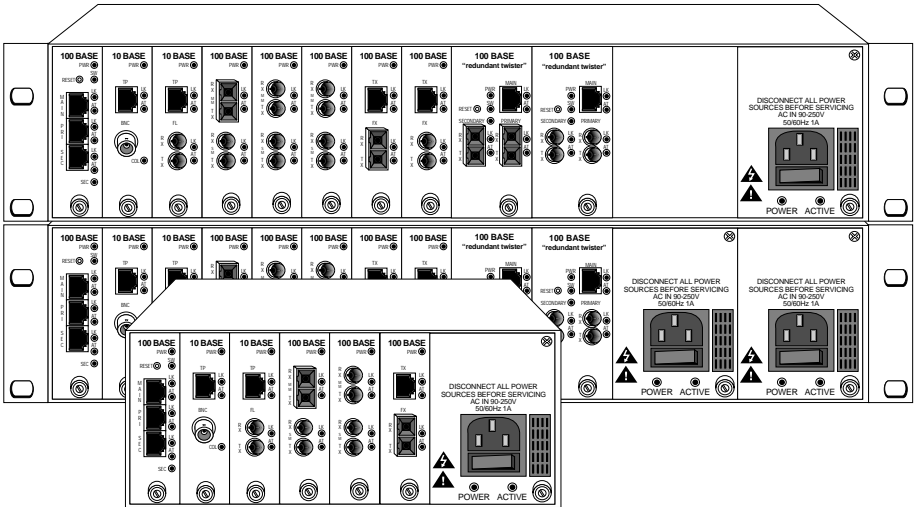




# “twister”™ MEDIA CONVERTER 7000



## *Installation & User Guide*

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***"twister" Media Converter 7000 Chassis:***

LE7300A _____	17-slot 2U chassis with single fixed AC power supply
LE7300A-PS _____	16-slot 2U chassis with dual fixed AC power supplies
LE7306A _____	6-slot 2U chassis with power supply and one 50-pin TELCO
LE7312A-R2 _____	12-slot 2U chassis with single load-sharing capable power supply module and two 50-pin TELCO
LE7312A-PS-R2 _____	12-slot 2U chassis with dual (2) load-sharing capable power supply modules and two 50-pin TELCO

***100Mbps "twister" Media Converter 7000 Modules:***

LH7416C-SX-R2 _____	RJ-45 to SX multimode SC
LH7416C-SXST-R2 _____	RJ-45 to SX multimode ST
LH7402C-TX-R2 _____	RJ-45 to Redundant TX
LH7403C-MMSC-R2 _____	RJ-45 to Redundant FX multimode SC
LH7404C-SMSC-R2 _____	RJ-45 to Redundant FX singlemode SC
LH7403C-MMST-R2 _____	RJ-45 to Redundant FX multimode ST
LH7403C-SMST-R2 _____	RJ-45 to Redundant FX singlemode ST
LH7420C-SCSC-R2 _____	FX multimode SC to FX singlemode SC
LH7420C-SCST-R2 _____	FX multimode SC to FX singlemode ST
LH7421C-STSC-R2 _____	FX multimode ST to FX singlemode SC
LH7421C-STST-R2 _____	FX multimode ST to FX singlemode ST
LH7414C-R2 _____	RJ-45 to FX multimode SC
LH7416C-R2 _____	RJ-45 to FX singlemode SC
LH7415C-R2 _____	RJ-45 to FX multimode ST
LH7416C-ST-R2 _____	RJ-45 to FX singlemode ST
LH7416C-40KM-R2 _____	RJ-45 to FX singlemode SC (40km)

***10Mbps "twister" Media Converter 7000 Modules:***

LE7402C-TX _____	RJ-45 to Redundant RJ-45
LE7313C-R2 _____	RJ-45 to Thinnet Coax
LE7313C-SC-R2 _____	RJ-45 to FL multimode SC
LE7314C-R2 _____	RJ-45 to FL multimode ST
LE7316C-R2 _____	RJ-45 to FL singlemode ST
LE7316C-MM-R2 _____	RJ-45 to FL multimode SMA
LE7302C _____	TELCO to Dual RJ-45
LE7324C-SC _____	TELCO to Dual FL multimode SC
LE7324C _____	TELCO to Dual FL multimode ST
LE7326C _____	TELCO to Dual FL singlemode ST

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# Introduction

**Thank you for choosing the “twister”™ Media Converter 7000.**

The “twister” Media Converter provides a cost-effective means of integrating a mixed media environment. The information in this guide helps you to install and start using your “twister” Media Converter 7000.

## Overview

**Your “twister”™ Media Converter 7000 offers transparent media conversion and provides an effective means for integrating coax, Category 3, 4, or 5 twisted-pair and singlemode or multimode fiber optic LAN segments into either switched or shared Ethernet and Fast Ethernet environments. All “twister” solutions provide media conversion with a low bit delay. The modules reliably convert all signal activity from one cable medium to the other ensuring accurate data flow across the network.**

These IEEE 802.3 and 802.3u compliant media converters are compatible with Ethernet and Fast Ethernet devices from other leading network technology providers. This increases the flexibility of network configurations by ensuring reliable data transmission in multi-vendor, as well as mixed media, environments.

Whether you are updating or expanding your existing network, the “twister”™ Media Converter 7000 supports a wide range of configuration needs. Each chassis unit supports multiple 10 and 100Mbps media types—via “twister” modules—in any combination. In addition, the “redundant twister”™ modules and dual load-sharing power supplies provide redundancy for uninterrupted network operation. While the “twister” Media Converter 7000 chassis support media conversion for any 7000 Module, only certain modules will work in conjunction with the TELCO connector on the back of these chassis. Please refer to the section in this **User Guide** titled **“twister” 7000 Modules** for a complete description of each module.

The “twister” Media Converter 7000 offers front accessible network connections for ease of installation and maintenance. For high density implementations, the units have rear-mounted 50-pin TELCO connectors that provide connection capability for up to six (6) “twister” modules each.

The TELCO connection provides a convenient means of connecting to an MDF-ready hub, switch or patch panel.

The “twister” Media Converter 7000 offers three models with TELCO connectors. The LE7312A-PS-R2 is a 12-slot 2U chassis with dual 50-pin TELCO connectors. This chassis is available with dual load-sharing power supplies to ensure essential non-stop networking for high priority traffic and business-critical applications. The LE7312A-R2 is a 12-slot 2U chassis with a single power supply and dual 50-pin TELCO connectors. These rack-mountable models fit standard 19” equipment racks and the 2U chassis height provides housing for the maximum number of intelligent “twister” modules. The LE7306A “twister” media converter, a 6-slot 2U chassis with a single power supply and a single 50-pin TELCO connector, is designed for environments where the flexibility and functionality of a “twister” chassis is required but where a smaller number of slots are needed. This unit is available with an optional wall-mountable bracket for convenient attachment to a wall or other vertical surface.

The “twister” Media Converter 7000 provides the following key features:

- A Link Loss Carry Forward (LLCF) enable/disable switch is installed on the modules\* as an aid to troubleshooting a remote connection. Refer to the section of this guide titled ***Link Loss Carry Forward*** for more information.
- An MDI-II/MDI-X switch is installed on all TP ports.\*\*
- Fused power on each module protects the rest of the modules in the chassis from a short circuit. The power (PWR) LED on an affected module does not illuminate if the fuse is blown.
- Auto polarity support on all twisted-pair ports.
- “redundant twister” modules can be configured to operate in Dynamic Recovery Mode (DRM) to ensure session integrity and increased uptime, or in Network Select Mode (NSM) to redirect traffic and add security through link isolation.

---

\* Link Loss Carry Forward (LLCF) functionality is not provided on the LE7313C-R2 (BNC) or the LE73XXC (TELCO) modules.

\*\* This is not applicable to the LE7302C (TELCO) module.

## **Related Documentation**

Refer to the following documentation for additional specific information on the “twister” Media Converter 7000:

- Media Converter 7000 “redundant twister”™ Modules  
Installation & User Guide
- “twister”™ Media Converter 7000 Modules  
Quick Reference

# Installation Guide

Follow the simple steps outlined in this section of the manual to install and start using the “twister” Media Converter 7000 chassis.

## 1 **Unpack the chassis and any accessories.**

Check that the following components have been included:

- “twister” Media Converter 7000 chassis
- Power Cord (one each per power supply)
- Rackmounting Hardware

The following items are available separately:

- “twister” Modules
- Wall Mount Bracket and Hardware (LE7306A)
- Blank Panels for unused chassis slots

Your order has been provided with the safest possible packaging, but shipping damage does occasionally occur. Inspect it carefully. If you discover any shipping damage, notify the carrier and follow their instructions for damage and claims. Save the original shipping carton in case return or storage of the unit is necessary.

## 2 **Mount the chassis in an appropriate location.**

The LE7312A-PS-R2 and LE7312A-R2 chassis are designed to be mounted in a standard 19-inch equipment rack. Use the rackmounting hardware included with the unit to secure the mounting brackets to the unit. Use the separate screws provided with the equipment rack to mount the chassis on the rack. Be sure that the mounting of the equipment in the rack does not impose a hazardous condition due to uneven mechanical loading.

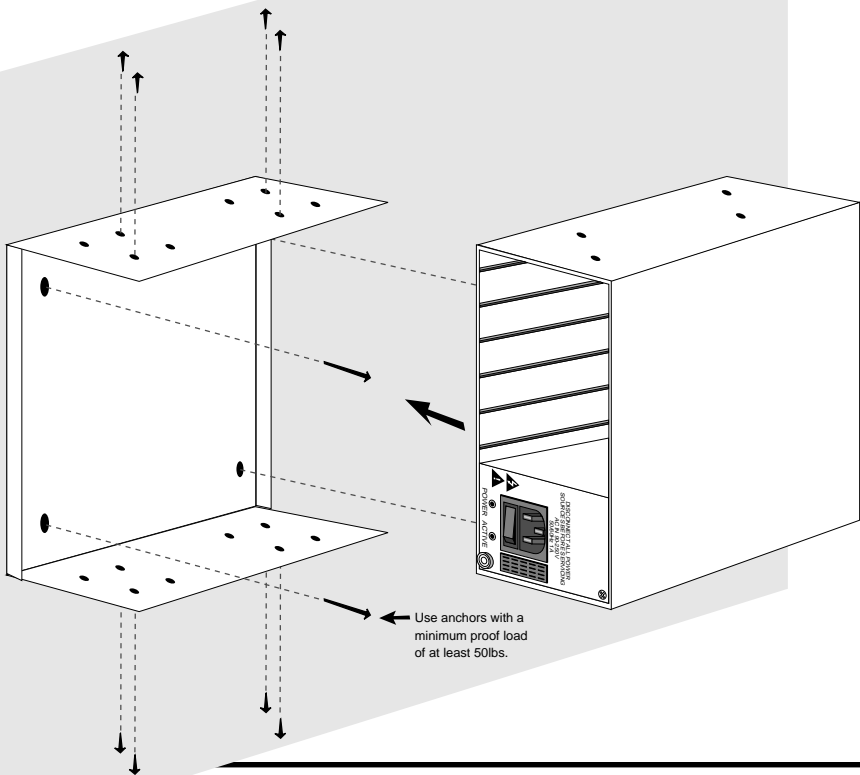
**Caution.** *Elevated ambient conditions may occur in an enclosed equipment rack or multi-rack assembly. Consideration should be taken when installing the chassis to ensure that the exhaust fan at the rear of the unit is not blocked—improper venting of the exhaust fan may cause the unit to overheat.*

**TUV Compliance Note.** *For pluggable equipment, the socket outlet must be installed near the equipment and be easily accessible. Bei Geräten mit Steckanschluß muß die Steckdose nahe dem Gerät angebracht und leicht zugänglich sein.*



Because of its smaller size, the LE7306A chassis can be placed on any flat surface. To save space and keep the installation area organized, use the optional wall mount bracket. Follow these simple instructions and refer to the diagram below:

- Place the bracket up against the wall and use a pencil to mark where the anchors will be placed. Be sure that the chassis will be mounted in such a way that fully exposes the front panel for access to the network and power connections and does not block the rear exhaust fan.
- Secure the bracket to the wall using anchors with a minimum proof load of 50lbs.
- Place the LE7306A inside of the bracket and secure the chassis to the bracket with the hardware provided.

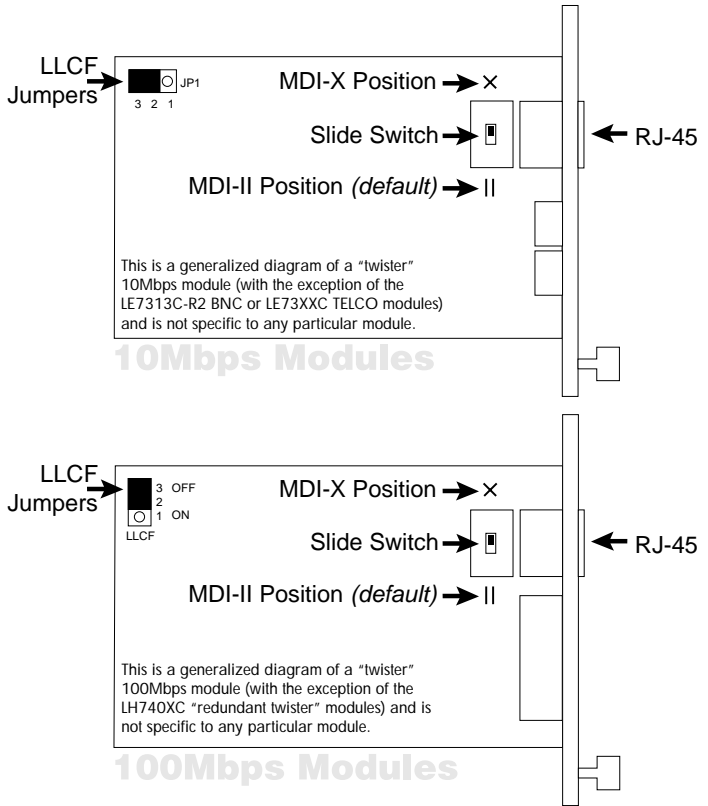


# 3

## Set the Switches and Jumpers.

### Locate the switches and jumpers.

The following illustrations show the orientation of the DIP switches and LLCF jumpers for the 10Mbps and 100Mbps “twister” modules.\* These illustrations are generalized and not specific to a particular module. Refer to the “redundant twister” module diagrams in the *User Guide* section of this document for more detailed information on the location and setting of the DIP switches for these particular modules.



\* This is not applicable to the LE7313C-R2 (BNC) or the LE73XXC (TELCO) modules.

## MDI-II to MDI-X

All “twister” modules with twisted-pair ports\* have an MDI-II to MDI-X switch. This switch is positioned directly behind its associated RJ-45 connector and allows simple setup in either straight through (*default*) or crossover configurations.

When setting the MDI-II to MDI-X switch, observe the positioning of the following symbols:

- the parallel symbol (**||**) indicates a straight through or parallel connection (default)
- the cross symbol (**X**) indicates a crossover connection.

These symbols are clearly marked on the printed circuit board. Simply slide the switch in the direction of the appropriate symbol. Use the following table as a guide:

A device that is wired straight through, needs one crossover connection:	
If the cable is...	... the MDI-II to MDI-X Switch Setting should be
<b>straight through</b>	<b>X</b>
<b>crossover</b>	<b>  </b>

A device that is wired crossover, needs a parallel connection:	
If the cable is...	... the MDI-II to MDI-X Switch Setting should be
<b>straight through</b>	<b>  </b>
<b>crossover</b>	<b>X</b>

## Link Loss Carry Forward (LLCF)\*\*

LLCF functionality is incorporated on all “twister” modules with the exception of the LE7313C-R2 (BNC) and LE73XXC TELCO modules. Refer to the *User Guide* section titled *Link Loss Carry Forward* for more information.

- LE731XC and LH741XC modules have a jumper for setting the LLCF. Refer to the module diagrams in the *User Guide* section of this document for more detailed information regarding configuration of this jumper.
- LH740XC and LE7402C-TX “redundant twister” modules have a DIP switch for setting LLCF. Refer to the “redundant twister” module diagrams in the *User Guide* section of this document for more detailed information regarding the location and setting of this DIP switch.

---

\* This is not applicable to the LE7302C (TELCO) module.

\*\* The LLCF default setting is: *disabled*. Link Loss Carry Forward (LLCF) functionality is not provided on the LE7313C-R2 (BNC) or the LE73XXC (TELCO) modules.

# 4

## **Install the “twister” 7000 Modules.**

Each chassis supports multiple 10 and 100Mbps media types—via “twister” modules—in any combination. The modules offer the ease of plug-and-play installation and are hot-swappable.

While these 7000 Series chassis support media conversion for any Media Converter Module, only certain modules will work in conjunction with the TELCO connector on the back of these chassis.\* A complete listing of available “twister” modules and a short description of the supported media conversion can be found in the front of this product guide. Please refer to the section in the **User Guide** titled “*twister*” 7000 Modules for a complete description of each module.

Before installing any module, please make note of the following:

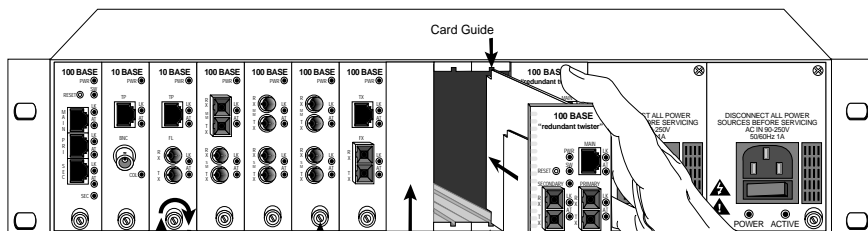
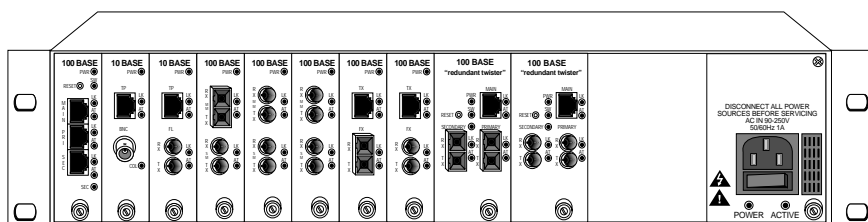
- “redundant twister” modules have a set of DIP switches located on the module board for setting user-selectable configurability options for several modes of operation. These DIP switches must be set before installing the modules in the chassis. Please refer to the section in the “**redundant twister**” **Media Converter 7000 Installation & User Guide** titled *Set the DIP Switches* for more detailed information.
- Because of the size of the “redundant twister” fiber optic modules, each TX-to-redundant FX module uses two slots in the chassis. The TX-to-redundant TX module uses only one slot.
- All “twister” modules must be firmly secured to the chassis before network connections are made.

---

\* Only the LE7302C, LE7324C-SC, LE7324C, AND LE7326C Modules will work in conjunction with the TELCO connector on the back of these chassis. Refer to the USER GUIDE section titled **10Mbps TELCO Modules** for more detailed information.

Follow these simple steps to install “twister” modules:

- Grasp a module by the front panel as shown.
- Insert the module into a slot making sure that both the top and bottom of the card edges are lined up with the top and bottom slot guides. Do not force the module into the chassis unnecessarily. It should slide in easily and evenly.
- Slide the module in until the top and bottom edges of the front panel are flush and even with the top and bottom edges of the chassis.
- Secure the module to the chassis by turning the thumb screw clockwise until snug.
- The module is now properly installed and ready for connection to the network.



**IMPORTANT!**  
Tighten thumb screw to secure each module firmly to chassis before making network connections.

## 5 **Connect to the Network.**

To connect the individual “twister” modules to the network, refer to the appropriate section in the the **User Guide** section of this manual.

- For more detailed information regarding the “redundant twister” module, refer to the *Media Converter 7000 “redundant twister” Modules Installation & User Guide.*

## 6 **Apply power to the chassis.**

The “twister” Media Converter 7000 Power Supply Module provides up to 60W of power to the chassis.

- The LE7306A is shipped with one factory-installed power supply module. This module is user replaceable. Due to the smaller chassis size, it cannot be upgraded for redundancy or load-sharing.
- The LE7312A-R2 is shipped with one factory-installed power supply module. This module is user replaceable. The chassis can also be upgraded with a second power supply for redundant non-stop operation.
- The LE7312A-PS-R2 is shipped with two factory-installed power supply modules. This redundancy capability provides essential non-stop operation to maximize network reliability and minimize network downtime. Both modules are user replaceable.

### **IMPORTANT**

**The Power Supply Module is an open frame-type power supply — LIVE VOLTAGES ARE PRESENT — and poses a danger if the module is installed improperly.\***

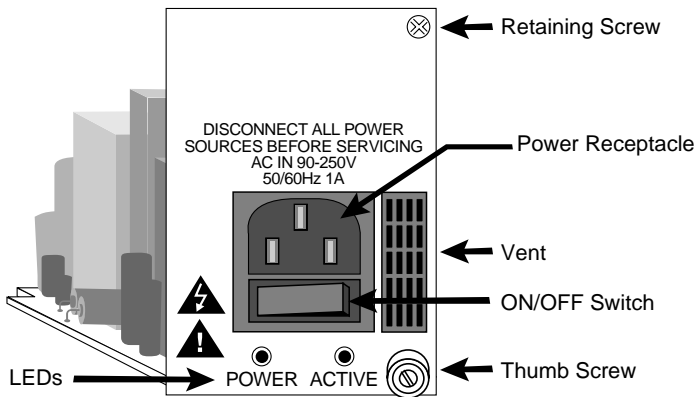
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\*Refer to the USER GUIDE section titled *Power Supply Service Instructions* for a complete description of the procedure to follow when replacing or installing a Redundant Power Supply Module.

Each power supply includes a standard North American 3-pin power cord which is UL (USA), CSA or CUL (Canada) listed or approved. For installation in regions outside North America, replace the power cord with a cord approved by appropriate safety agencies. Any cord must have a CEE-22 standard V female connector on one end and meet IEC 320-030 specifications. European power cords must be harmonized and designated with a HAR marking on the outside of the cord jacket to comply with the CENELEC Harmonized Document HD-21

When making power connections, connect the power cord to the input jack located on the front of the chassis before making the connection to the outlet or appropriate AC voltage source. If your chassis is equipped with two power supply modules, simply connect the individual power cords to separate power sources.

Be sure the switch is set to the ON position for proper operation.



**Caution.** The fully loaded chassis is rated for 2A AC maximum current. Ensure that the supply current available is sufficient to power the chassis. Refer to front panel text for voltage/current ratings. Reliable grounding of rackmount equipment should be maintained. Particular attention should be given to power supply connections other than direct connections to the branch circuit (e.g. use of power strips).





# User Guide

*This section contains more detailed user information regarding certain operating features and maintenance instructions for your “twister” Media Converter 7000.*

## **“twister” 7000 Modules**

Media conversion provides a cost-effective means of integrating various types of Ethernet and Fast Ethernet LAN segments.

All “twister” modules provide media conversion with a low bit delay. All signal activity – including collision detection – is reliably propagated from one cable medium to the other ensuring accurate data flow across the network. Maximum segment lengths are supported on either side of the device. Seamless operation in half-duplex or full-duplex environments ensures interoperability with Ethernet and Fast Ethernet devices from other leading network technology providers. This increases the flexibility of network configurations by ensuring reliable data transmission in multi-vendor, as well as mixed media, environments.

An extensive line of plug-and-play, hot-swappable “twister” modules support 10 or 100Mbps operation and provide a variety of connector combinations for flexibility and adaptability.

**“twister” Media Converter 7000 Modules:**

*100Mbps “twister” Modules:*

LH7416C-SX-R2 \_\_\_\_\_ RJ-45 to SX multimode SC  
LH7416C-SXST-R2 \_\_\_\_\_ RJ-45 to SX multimode ST  
LH7402C-TX-R2 \_\_\_\_\_ RJ-45 to Redundant TX  
LH7403C-MMSC-R2 \_\_\_\_\_ RJ-45 to Redundant FX multimode SC  
LH7404C-SMSC-R2 \_\_\_\_\_ RJ-45 to Redundant FX singlemode SC  
LH7403C-MMST-R2 \_\_\_\_\_ RJ-45 to Redundant FX multimode ST  
LH7403C-SMST-R2 \_\_\_\_\_ RJ-45 to Redundant FX singlemode ST  
LH7420C-SCSC-R2 \_\_\_\_\_ FX multimode SC to FX singlemode SC  
LH7420C-SCST-R2 \_\_\_\_\_ FX multimode SC to FX singlemode ST  
LH7421C-STSC-R2 \_\_\_\_\_ FX multimode ST to FX singlemode SC  
LH7421C-STST-R2 \_\_\_\_\_ FX multimode ST to FX singlemode ST  
LH7414C-R2 \_\_\_\_\_ RJ-45 to FX multimode SC  
LH7416C-R2 \_\_\_\_\_ RJ-45 to FX singlemode SC  
LH7415C-R2 \_\_\_\_\_ RJ-45 to FX multimode ST  
LH7416C-ST-R2 \_\_\_\_\_ RJ-45 to FX singlemode ST  
LH7416C-40KM-R2 \_\_\_\_\_ RJ-45 to FX singlemode SC (40km)

*10Mbps “twister” Modules:*

LE7402C-TX \_\_\_\_\_ RJ-45 to Redundant RJ-45  
LE7313C-R2 \_\_\_\_\_ RJ-45 to Thinnnet Coax  
LE7313C-SC-R2 \_\_\_\_\_ RJ-45 to FL multimode SC  
LE7314C-R2 \_\_\_\_\_ RJ-45 to FL multimode ST  
LE7316C-R2 \_\_\_\_\_ RJ-45 to FL singlemode ST  
LE7316C-MM-R2 \_\_\_\_\_ RJ-45 to FL multimode SMA

LE7302C \_\_\_\_\_ TELCO to Dual RJ-45  
LE7324C-SC \_\_\_\_\_ TELCO to Dual FL multimode SC  
LE7324C \_\_\_\_\_ TELCO to Dual FL multimode ST  
LE7326C \_\_\_\_\_ TELCO to Dual FL singlemode ST

**Caution.** All “twister” modules must be firmly secured to the chassis before network connections are made. Please refer to the section titled **Installing “twister” 7000 Modules** for instructions on the proper installation procedure.

## 100Mbps “twister” 7000 Modules

### *Specifications*

Data Rate \_\_\_\_\_ 100Mbps half-duplex  
\_\_\_\_\_ 200Mbps full-duplex  
Bit Delay \_\_\_\_\_ < 40 bits

### *Twisted-Pair Interface*

Connector \_\_\_\_\_ Shielded RJ-45, 8-pin jack  
Impedance \_\_\_\_\_ 100 Ohms nominal  
Signal Level Output (differential) \_\_\_\_\_ .95 to 1.05V  
Signal Level Input \_\_\_\_\_ 350mV minimum  
Supported Link Length \_\_\_\_\_ 100m  
Cable Type \_\_\_\_\_ Category 5 UTP

### *Multimode Fiber Optic Interface*

Connector \_\_\_\_\_ ST or SC  
RX Input Sensitivity \_\_\_\_\_ -31 dBm peak minimum  
Output Power \_\_\_\_\_ -14 dBm to -23.5 dBm (50/125  $\mu$ m)  
\_\_\_\_\_ -14 dBm to -20 dBm (62.5/125  $\mu$ m)  
Supported Link Length \_\_\_\_\_ up to 2km full duplex  
Cable Type \_\_\_\_\_ 50/125, 62.5/125, 100/140  $\mu$ m F/O

### *Singlemode Fiber Optic Interface*

Connector \_\_\_\_\_ ST or SC  
RX Input Sensitivity \_\_\_\_\_ -31 dBm peak minimum  
Output Power \_\_\_\_\_ -8 dBm to -15 dBm (9/125  $\mu$ m)  
Supported Link Length \_\_\_\_\_ up to 15km full duplex  
Cable Type \_\_\_\_\_ 8.3/125, 8.7/125, 9/125, 10/125  $\mu$ m F/O

### *Singlemode Fiber Optic Interface — extended distance support*

Connector \_\_\_\_\_ SC  
RX Input Sensitivity \_\_\_\_\_ -35 dBm minimum  
Output Power \_\_\_\_\_ 0 dBm to -5 dBm (9/125  $\mu$ m)  
Supported Link Length \_\_\_\_\_ up to 40km full duplex  
Cable Type \_\_\_\_\_ 8.3/125, 8.7/125, 9/125, 10/125  $\mu$ m F/O

### 100Mbps “redundant twister” 7000 Modules:

LH7402C-TX-R2	RJ-45 to Redundant RJ-45	_____	100m/100m
LH7403C-MMSC-R2	RJ-45 to Redundant FX multimode SC	___	100m/2km
LH7404C-SMSC-R2	RJ-45 to Redundant FX singlemode SC	___	100m/15km
LH7403C-MMST-R2	RJ-45 to Redundant FX multimode ST	___	100m/2km
LH7403C-SMST-R2	RJ-45 to Redundant FX singlemode ST	___	100m/15km

The “redundant twister” modules provide full redundant data paths for Fast Ethernet devices. The modules incorporate a MAIN port, a PRIMARY port and a SECONDARY port. The redundancy is provided between the PRIMARY and SECONDARY ports.

#### LED Operation:

- **PWR**: normal operation
- **SW**: SECONDARY port active at some point; functions in Dynamic Recovery Mode (DRM) only
- **SECONDARY**: port is active (PRIMARY is inactive)
- (MAIN) **LK**: receiving valid link
- (MAIN) **AT**: receiving data
- (PRIMARY) **LK**: receiving valid link
- (PRIMARY) **AT**: receiving data
- (SECONDARY) **LK**: receiving valid link
- (SECONDARY) **AT**: receiving data

#### DIP switch\* settings:

- TX Switch UP: data from the MAIN port is transmitted simultaneously on the PRIMARY and SECONDARY ports; data from the active port (PRIMARY or SECONDARY) is transmitted on the MAIN port.  
*NOTE: The Link Switch must also be in the UP position in order to send data out the inactive port.*
- TX Switch DOWN (*default*): data received from the MAIN port is transmitted on the active port only.
- AUTO Switch UP: the module automatically reverts back to the PRIMARY port when the primary link is re-established.
- AUTO Switch DOWN (*default*): once the SECONDARY port has become active, the module **will not** revert back to the PRIMARY port when the primary link is re-established, unless the SECONDARY link is absent.
- LINK Switch UP: the module sends link on both the

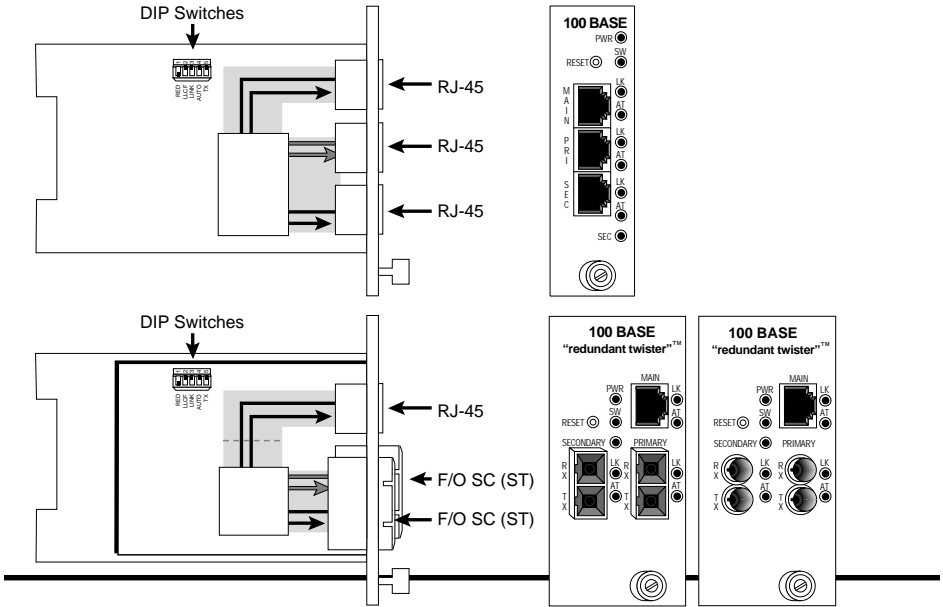
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\* When setting the DIP switches, the UP position is when the lever of the DIP switch is pushed furthest away from the circuit board. The DOWN position is when the lever of the DIP switch is pushed closest to the printed circuit board.

PRIMARY and SECONDARY ports; the end station connected to the module sees a valid link state.

- LINK Switch DOWN (*default*): the module sends link on the active port only; the end station connected to the module sees a valid link state only if the port on the module is active.
- LLCF Switch UP: Link Loss Carry Forward is enabled.
- LLCF Switch DOWN (*default*): Link Loss Carry Forward is disabled.
- RED Switch UP (*default*): redundancy is enabled; the module functions in Dynamic Recovery Mode (DRM).
- RED Switch DOWN: redundancy is disabled; Network Select Mode (NSM) is enabled. *NOTE: In this mode the reset push button toggles the active port between A and B for each switch closure. The AUTO switch selects the initial active port on power-up: UP for SECONDARY; DOWN for PRIMARY. The SW LED remains OFF in NSM.*

For more detailed information regarding the “redundant twister” module, refer to the section titled *Setting the DIP Switches* in the “redundant twister” **Media Converter 7000 Installation & User Guide**.



**“twister” Media Converter 7000**

**100Mbps MM-to-SM “twister” 7000 Modules:**

LH7420C-SCSC-R2	FX multimode SC to FX singlemode SC	__ 2km/15km
LH7420C-SCST-R2	FX multimode SC to FX singlemode ST	__ 2km/15km
LH7421C-STSC-R2	FX multimode ST to FX singlemode SC	__ 2km/15km
LH7421C-STST-R2	FX multimode ST to FX singlemode ST	__ 2km/15km

These modules provide seamless integration between higher bandwidth singlemode and multimode fiber optic segments.

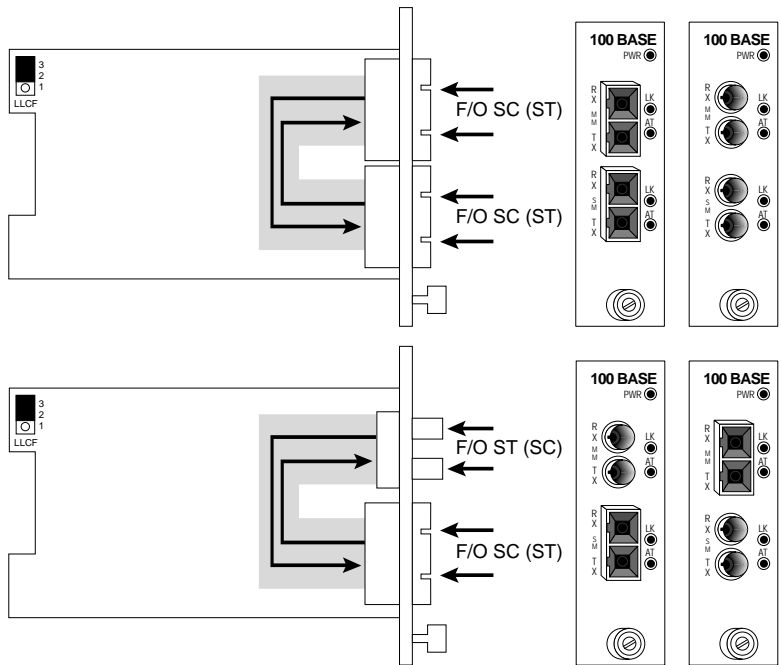
**LED Operation:**

- **PWR**: normal operation
- **LK**: satisfactory receive link status on respective port
- **AT**: receiving data

**Jumper Settings:**

Refer to the diagram below for the location of the Link Loss Carry Forward (LLCF) jumper.

- Set the jumper to enable LLCF by connecting pins 1&2
- Set the jumper to disable LLCF by connecting pins 2&3 (*default*)



**100Mbps TX-to-FX “twister” 7000 Modules:**

LH7416C-SX-R2	RJ-45 to SX multimode SC _____	100m/300m
LH7416C-SXST-R2	RJ-45 to SX multimode ST _____	100m/300m
LH7414C-R2	RJ-45 to FX multimode SC _____	100m/2km
LH7416C-R2	RJ-45 to FX singlemode SC _____	100m/15km
LH7415C-R2	RJ-45 to FX multimode ST _____	100m/2km
LH7416C-ST-R2	RJ-45 to FX singlemode ST _____	100m/15km
LH7416C-40KM-R2	RJ-45 to FX singlemode SC _____	100m/40km

These modules provide transparent integration of 100BASE-TX and 100BASE-FX segments in Fast Ethernet environments.

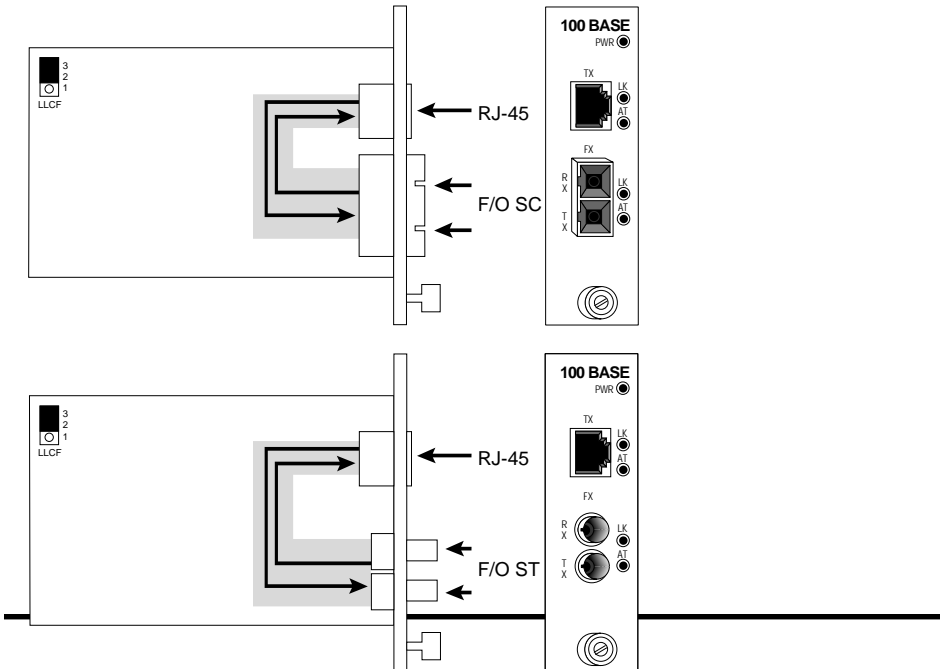
**LED Operation:**

- **PWR**: normal operation
- **LK**: satisfactory receive link status on respective port
- **AT**: receiving data

**Jumper Settings:**

Refer to the diagram below for the location of the Link Loss Carry Forward (LLCF) jumper.

- Set the jumper to enable LLCF by connecting pins 1&2
- Set the jumper to disable LLCF by connecting pins 2&3 (*default*)



## 10Mbps “twister” 7000 Modules

### *Specifications*

Data Rate \_\_\_\_\_ 10Mbps half-duplex  
\_\_\_\_\_ 20Mbps full-duplex  
Bit Delay \_\_\_\_\_ < 5 bits

### *Twisted-Pair Interface*

Connector \_\_\_\_\_ Shielded RJ-45, 8-pin jack  
Impedance \_\_\_\_\_ 100 Ohms nominal  
Signal Level Output \_\_\_\_\_ 2.0 to 2.8V  
Signal Level Input \_\_\_\_\_ 350mV minimum  
Supported Link Length \_\_\_\_\_ 100m  
Cable Type \_\_\_\_\_ Category 3, 4 or 5 UTP

### *Multimode Fiber Optic Interface*

Connector \_\_\_\_\_ ST or SMA  
RX Input Sensitivity \_\_\_\_\_ 10BASE-FL -32.5 dBm peak minimum  
Output Power \_\_\_\_\_ -21.8 dBm to -16.8 dBm (50/125  $\mu$ m)  
\_\_\_\_\_ -19 dBm to -14 dBm (62.5/125  $\mu$ m)  
Supported Link Length \_\_\_\_\_ up to 2km full duplex  
Cable Type \_\_\_\_\_ 50/125, 62.4/125, 100/140  $\mu$ m F/O

### *Singlemode Fiber Optic Interface*

Connector \_\_\_\_\_ ST  
RX Input Sensitivity \_\_\_\_\_ 10BASE-FL -32.5 dBm peak minimum  
Output Power \_\_\_\_\_ -17 dBm to -23 dBm (9/125  $\mu$ m)  
Supported Link Length \_\_\_\_\_ up to 8km full duplex  
Cable Type \_\_\_\_\_ 8.3/125, 8.7/125, 9/125, 10/125  $\mu$ m F/O

### *Thinnet Coax Interface*

Connector \_\_\_\_\_ BNC receptacle  
Internal Transceiver \_\_\_\_\_ IEEE 802.3  
Termination \_\_\_\_\_ User Selectable Jumper  
Supported Link Length \_\_\_\_\_ up to 185m  
Cable Type \_\_\_\_\_ RG-58 coaxial cable



## 10Mbps “redundant twister” 7000 Module:

LE7402C-TX RJ-45 to Redundant RJ-45 \_\_\_\_\_ 100m/100m

The “redundant twister” module provides full redundant data paths for Ethernet devices. The modules incorporate a MAIN port, a PRIMARY port and a SECONDARY port. The redundancy is provided between the PRIMARY and SECONDARY ports.

### LED Operation:

- **PWR**: normal operation
- **SW**: SECONDARY port active at some point; functions in Dynamic Recovery Mode (DRM) only
- **SECONDARY**: port is active (PRIMARY is inactive)
- (MAIN) **LK**: receiving valid link
- (MAIN) **AT**: receiving data
- (PRIMARY) **LK**: receiving valid link
- (PRIMARY) **AT**: receiving data
- (SECONDARY) **LK**: receiving valid link
- (SECONDARY) **AT**: receiving data

### DIP switch\* settings:

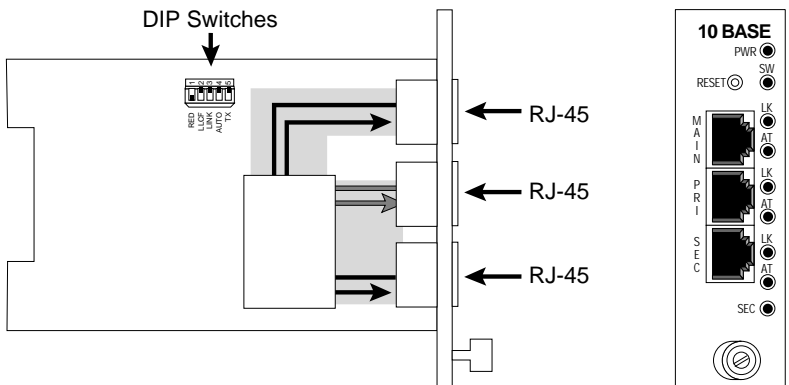
- TX Switch UP: data from the MAIN port is transmitted simultaneously on the PRIMARY and SECONDARY ports; data from the active port (PRIMARY or SECONDARY) is transmitted on the MAIN port.  
*NOTE: The Link Switch must also be in the UP position in order to send data out the inactive port.*
- TX Switch DOWN (*default*): data received from the MAIN port is transmitted on the active port only.
- AUTO Switch UP: the module automatically reverts back to the PRIMARY port when the primary link is re-established.
- AUTO Switch DOWN (*default*): once the SECONDARY port has become active, the module ***will not*** revert back to the PRIMARY port when the primary link is re-established, unless the SECONDARY link is absent.
- LINK Switch UP: the module sends link on both the PRIMARY and SECONDARY ports; the end station connected to the module sees a valid link state.

---

\* When setting the DIP switches, the UP position is when the lever of the DIP switch is pushed furthest away from the circuit board. The DOWN position is when the lever of the DIP switch is pushed closest to the printed circuit board.

- LINK Switch DOWN (*default*): the module sends link on the active port only; the end station connected to the module sees a valid link state only if the port on the module is active.
- LLCF Switch UP: Link Loss Carry Forward is enabled.
- LLCF Switch DOWN (*default*): Link Loss Carry Forward is disabled.
- RED Switch UP (*default*): redundancy is enabled; the module functions in Dynamic Recovery Mode (DRM).
- RED Switch DOWN: redundancy is disabled; Network Select Mode (NSM) is enabled. *NOTE: In this mode the reset push button toggles the active port between A and B for each switch closure. The AUTO switch selects the initial active port on power-up: UP for SECONDARY; DOWN for PRIMARY. The SW LED remains OFF in NSM.*

For more detailed information regarding the “redundant twister” module, refer to the section titled *Setting the DIP Switches* in the “redundant twister” **Media Converter 7000 Installation & User Guide**.



## 10Mbps Thinnet Coaxial “twister” 7000 Module:

LE7313C-R2 RJ-45 to BNC \_\_\_\_\_ 100m/185m

This module provides twisted-pair to Thinnet coax segment integration.

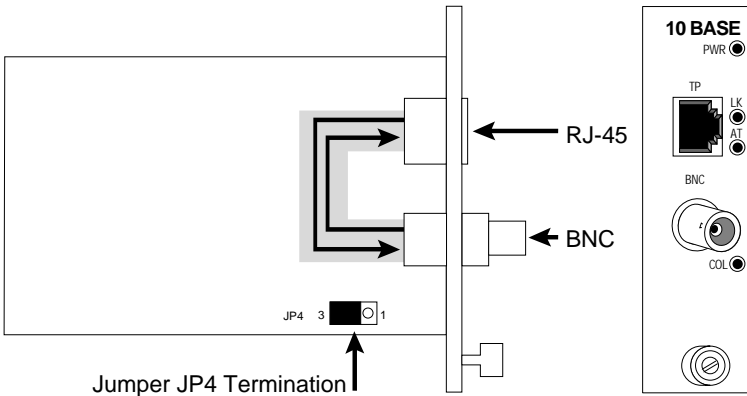
### LED Operation:

- **PWR**: normal operation
- **LK**: satisfactory receive link status on TP port
- **AT**: receiving data
- **COL**: detection of collision condition

### Jumper Settings:

This interface module is shipped with a user selectable jumper installed at the factory. The jumper is located at JP4 and is used to set either internal or external termination of the BNC port.

- Set the jumper to enable internal 50Ω termination by connecting pins 1&2
- Set the jumper to enable use of external termination by connecting pins 2&3 (*default*)



### 10Mbps Fiber Optic “twister” 7000 Modules:

LE7313C-SC-R2	RJ-45 to FL multimode SC	_____	100m/2km
LE7314C-R2	RJ-45 to FL multimode ST	_____	100m/2km
LE7316C-R2	RJ-45 to FL singlemode ST	_____	100m/8km
LE7316C-MM-R2	RJ-45 to FL multimode SMA	_____	100m/2km

These modules provide transparent integration of 10BASE-T and 10BASE-FL segments in Ethernet environments.

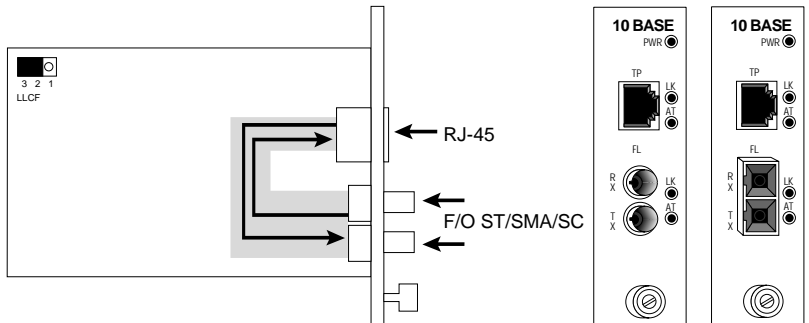
#### LED Operation:

- **PWR**: normal operation
- **LK**: satisfactory receive link status on respective port
- **AT**: receiving data

#### Jumper Settings:

Refer to the diagram below for the location of the Link Loss Carry Forward (LLCF) jumper.

- Set the jumper to enable LLCF by connecting pins 1&2
- Set the jumper to disable LLCF by connecting pins 2&3 (*default*)



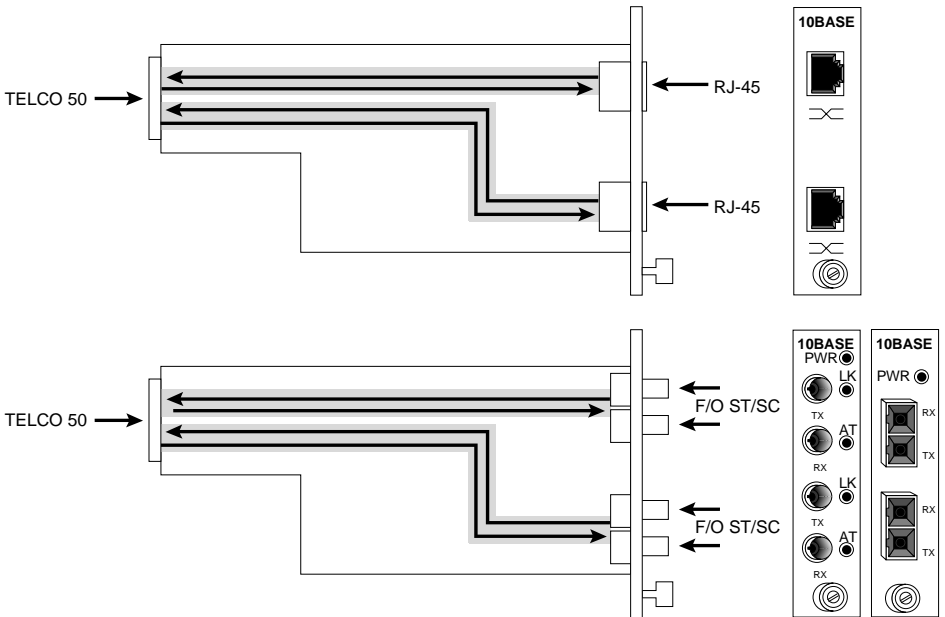
### 10Mbps TELCO Converter Interface Modules:

LE7302C	TELCO to Dual RJ-45	_____	100m/100m
LE7324C-SC	TELCO to Dual FL multimode SC	_____	2km/2km
LE7324C	TELCO to Dual FL multimode ST	_____	2km/2km
LE7326C	TELCO to Dual FL singlemode ST	_____	2km/8km

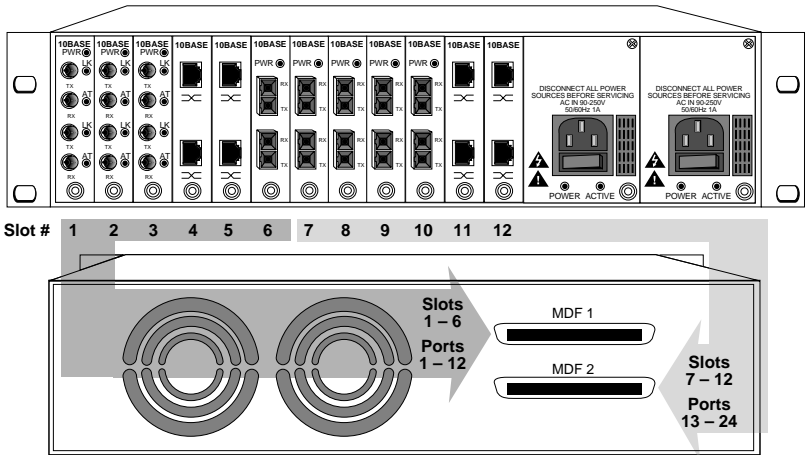
These dual port “twister” modules are designed specifically to provide media conversion between the two individual network connections on the front of the module and a 50-pin TELCO connector on the back of the chassis. Since each module consists of two network connections, up to 24 individual connections can be supported by the LE7312A-R2 and LE7312A-PS-R2 chassis, and up to 12 individual connections can be supported by the LE7306A chassis.

#### LED Operation:

- **PWR**: normal operation
- **LK**: satisfactory receive link status on respective port
- **AT**: receiving data



The diagram below shows the numbering sequence of the module slots. The first six slots (12 ports) connect to the backplane of the TELCO connector labeled MDF 1. The second six slots (12 ports) connect to the backplane of the TELCO connector labeled MDF 2. For a more expanded view, please refer to the *Topology Solutions* diagram in the **User Guide** section titled *Media Converter 7000 with TELCO “twister” modules*.



NOTE: All “twister” 7000 Modules connected to the TELCO connector have their transmit and receive pairs internally crossed over. Please refer to the diagrams titled *Straight/Cross Over RJ-45 Twisted-pair Cables* in the **User Guide** section of this manual.

## **Chassis Technical Specifications**

### **Power**

Input \_\_\_\_\_ 90-250V AC 80W maximum

Output \_\_\_\_\_ 60W

### **Environmental**

Operating Temperature \_\_\_\_\_ 0° — 50° C

Storage Temperature \_\_\_\_\_ -30° — 70° C

Relative Humidity \_\_\_\_\_ 5% — 95% non-condensing

Physical Case \_\_\_\_\_ Fully enclosed metal construction

Dimensions: LE7312A-R2, -PS-R2 \_\_\_\_\_ 11.3" L x 17.0" W x 3.5" H

LE7306A \_\_\_\_\_ 11.3" L x 8.5" W x 3.5" H

Weight: LE7312A-R2, -PS-R2 \_\_\_\_\_ 20lbs (9kg)

LE7306A \_\_\_\_\_ 7 lbs (3.25kg)

### **Regulatory**

Compliance \_\_\_\_\_ IEEE 802.3/802.3u (ISO 8802-3):

10BASE-T, 10BASE-2, 10BASE-FL/FOIRL,

100BASE-TX, 100BASE-FX

Safety \_\_\_\_\_ UL, C-UL, CSA, EN60950 (TUV)

Emissions \_\_\_\_\_ FCC Part 15, Class A, EN55022 a (CISPR)

## Operating Features of the “twister” Power Supply Modules Load Sharing Power Supply Modules (LE7312A-R2, LE7312-PS-R2)

When a chassis is equipped with two load-sharing power supply modules, they operate in tandem and share the connected load. This decreases the demand put on each individual unit.

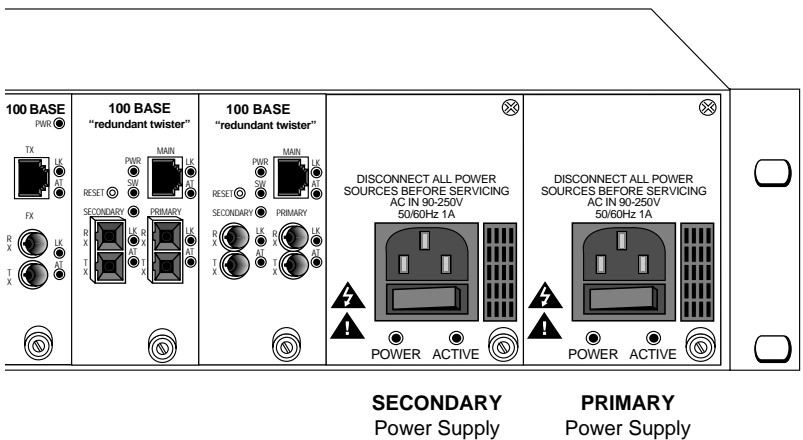
There are two LEDs on the front panel of each Power Supply Module. When illuminated, these LEDs indicate the following:

- POWER LED indicates the connection of an active power source to that Power Module
- ACTIVE LED indicates that the “twister” chassis is getting its power from that particular Power Module

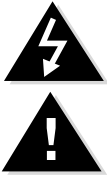
Because the LE7312A-R2 and LE7312-PS-R2 load-shares power, both LEDs – on both units – are illuminated simultaneously.

If the power source to one of the modules should fail or be removed, the remaining module automatically takes over the entire load. This will be indicated by the following:

- The ACTIVE and POWER LEDs on one of the power modules turn off.
- The ACTIVE and POWER LEDs on the other power module remain illuminated.



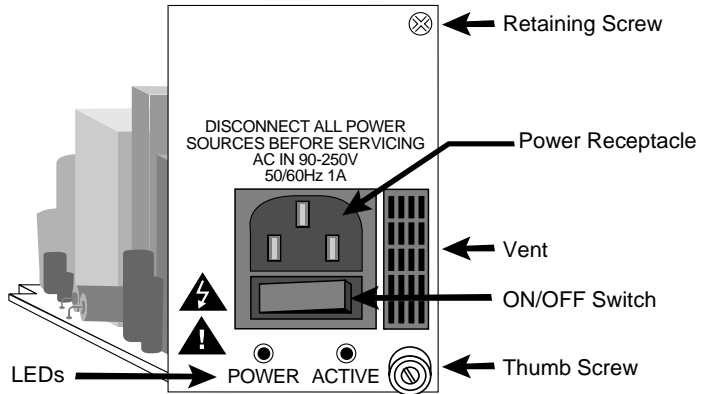




## **Power Supply Service Instructions**

The following instructions explain the procedure to follow when replacing a Power Supply Module or installing a second Power Supply Module in the “twister” LE7306A, LE7312A-R2 or LE7312-PS-R2 chassis.

**IMPORTANT**  
The Power Supply Module is an open frame-type power supply — LIVE VOLTAGES ARE PRESENT — and poses a danger if the module is installed improperly.



- Remove all power cords from AC receptacles located on the Power Supply Module. Do not apply power to the module when it is removed from the chassis.
- Use a Number 1 Phillips screwdriver to remove the retaining screw located on the front panel.
- Turn the thumb screw to the left to un-secure the module/blank panel from the chassis.
- Remove the Power Supply Module/blank panel.

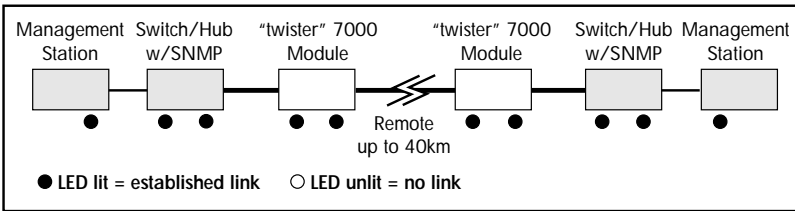
- Insert the module into the slot making sure that the edges are in the guides. Do not force the Power Supply Module into the chassis unnecessarily. The module should slide in easily.
- Slide the Power Supply Module into the chassis until the front panel is flush and even with the chassis.
- Turn the thumb screw to the right and tighten to secure the power module into the chassis.
- Secure the front panel of the Power Supply Module to the chassis with the retaining screw and using the Number 1 Phillips screwdriver.

## Link Loss Carry Forward (LLCF)

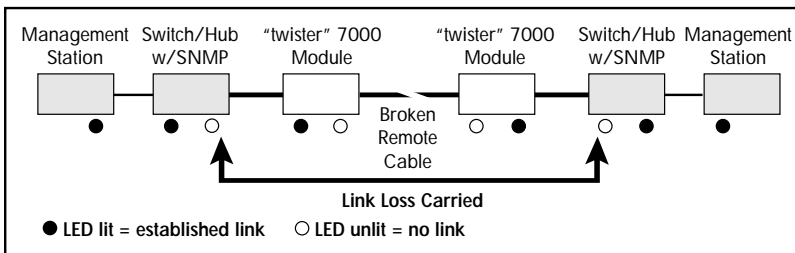
The “twister” modules (with the exception of the 10Mbps BNC and TELCO modules) have been designed with an LLCF function for troubleshooting a remote connection. The modules are shipped with the LLCF disabled.

When LLCF is enabled, the FX ports as well as the TX ports on the “twister” modules, do not transmit a link signal until they receive a link signal from the opposite port. For example, if LLCF is enabled and two “twister” modules are connected via a fiber cable with nothing else connected to them, the Link LED does *not* illuminate. When a valid link is established at the twisted-pair port, a complete connection is accomplished.

The diagram below shows a typical network configuration using a “twister” module for remote connectivity:



If the fiber connection breaks, or the remote device fails, the “twister” module carries that link loss all the way to the switch/hub which generates a trap to the management station. The administrator can then look at the module to determine the source of the loss.



**IMPORTANT:** When connecting a “twister” module with LLCF enabled to an auto-negotiating device, force both sides of the configuration to either 10 or 100Mbps full or half duplex. This allows the interface module to immediately see link pulses and start passing data.

## Straight RJ-45 Twisted-pair Cables

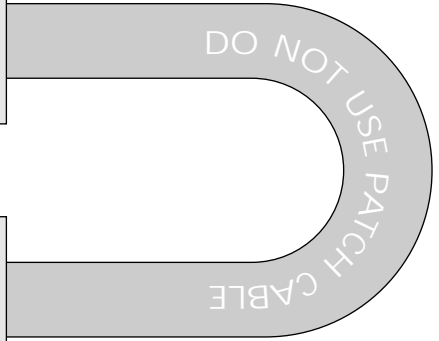
### COLOR • SIGNAL • PIN

	Brown	---	8
	Brown Stripe	---	7
	Green	RX-	6
	Blue Stripe	---	5
	Blue	---	4
	Green Stripe	RX+	3
	Orange	TX-	2
	Orange Stripe	TX+	1

**NOTE:**  
Locking Tab  
on connector is  
facing away.

### COLOR • SIGNAL • PIN

	Brown	---	8
	Brown Stripe	---	7
	Green	RX-	6
	Blue Stripe	---	5
	Blue	---	4
	Green Stripe	RX+	3
	Orange	TX-	2
	Orange Stripe	TX+	1



## Cross Over RJ-45 Twisted-pair Cables

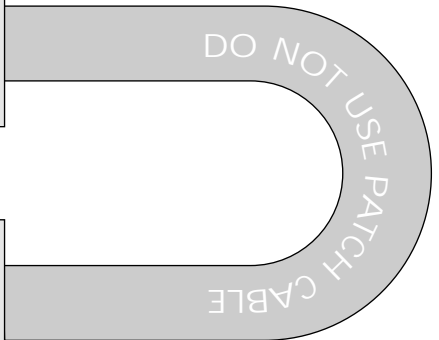
### COLOR • SIGNAL • PIN

		---	8
		---	7
	Orange	RX-	6
		---	5
		---	4
	Orange Stripe	RX+	3
	Green	TX-	2
	Green Stripe	TX+	1

**NOTE:**  
Locking Tab  
on connector is  
facing away.

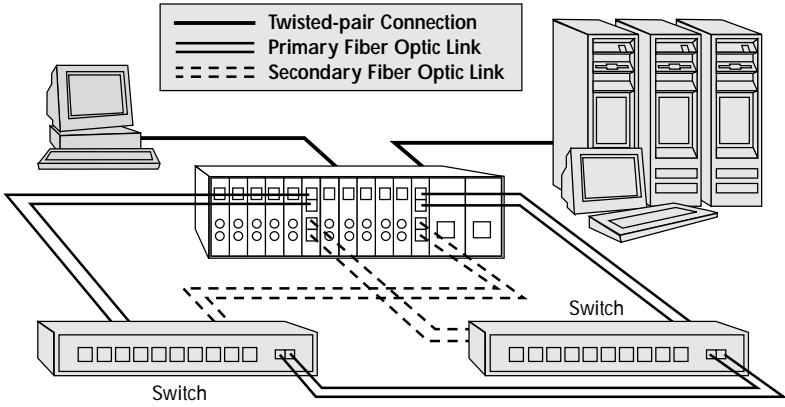
### COLOR • SIGNAL • PIN

		---	8
		---	7
	Green	RX-	6
		---	5
		---	4
	Green Stripe	RX+	3
	Orange	TX-	2
	Orange Stripe	TX+	1

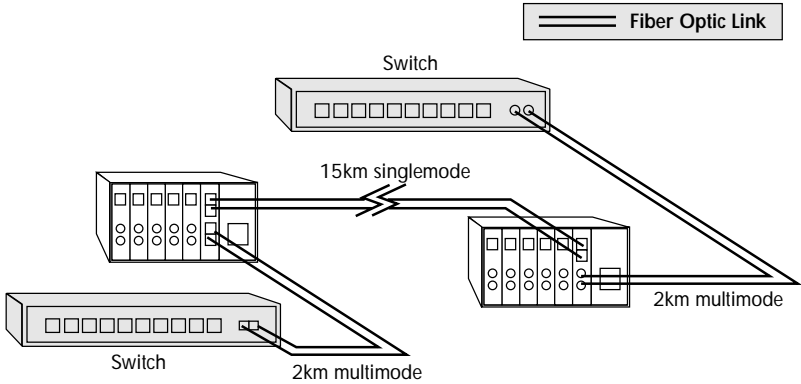


## Topology Solutions

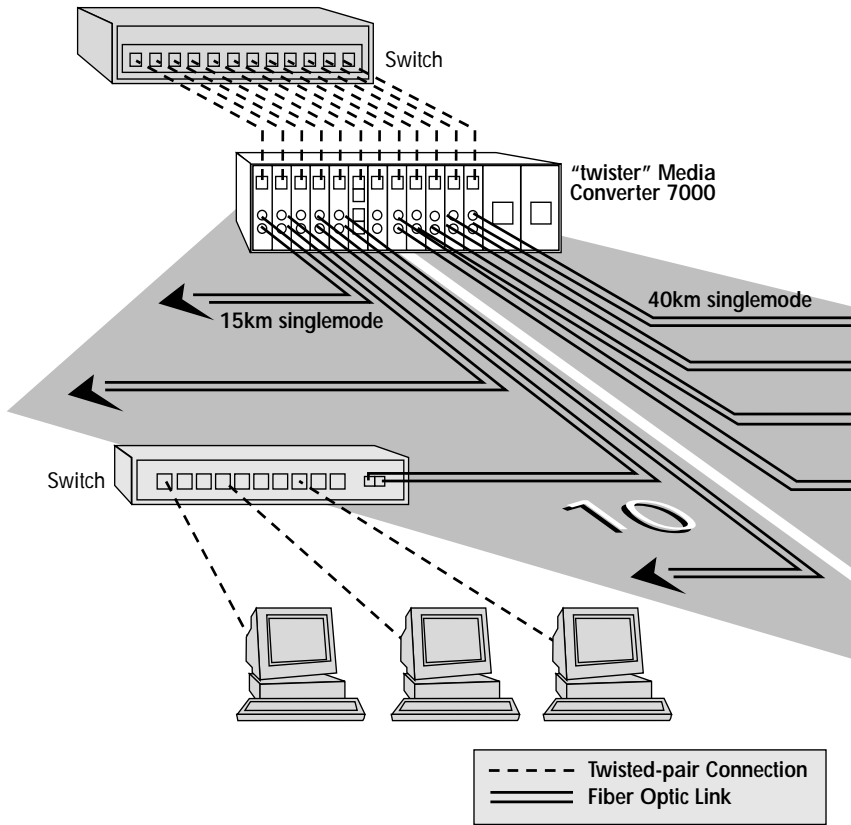
Media Converter 7000 with “redundant twister” modules:

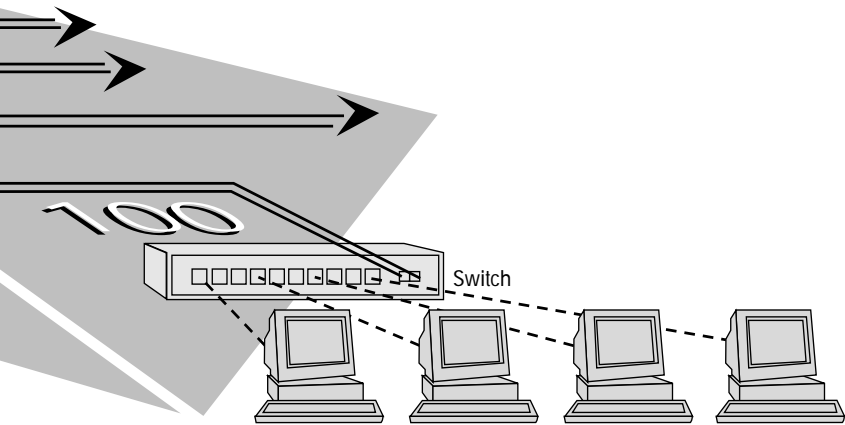


Media Converter 7000 with MM-to-SM (multimode-to-singlemode) “twister” modules:



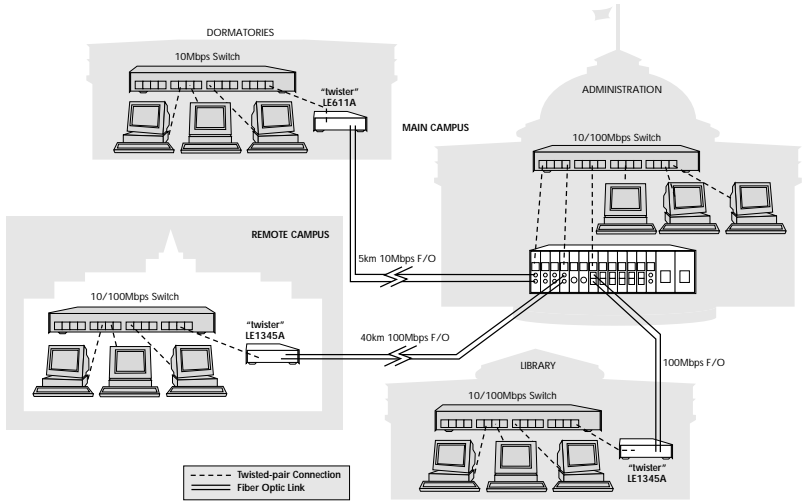
## Topology Solution





## Topology Solutions

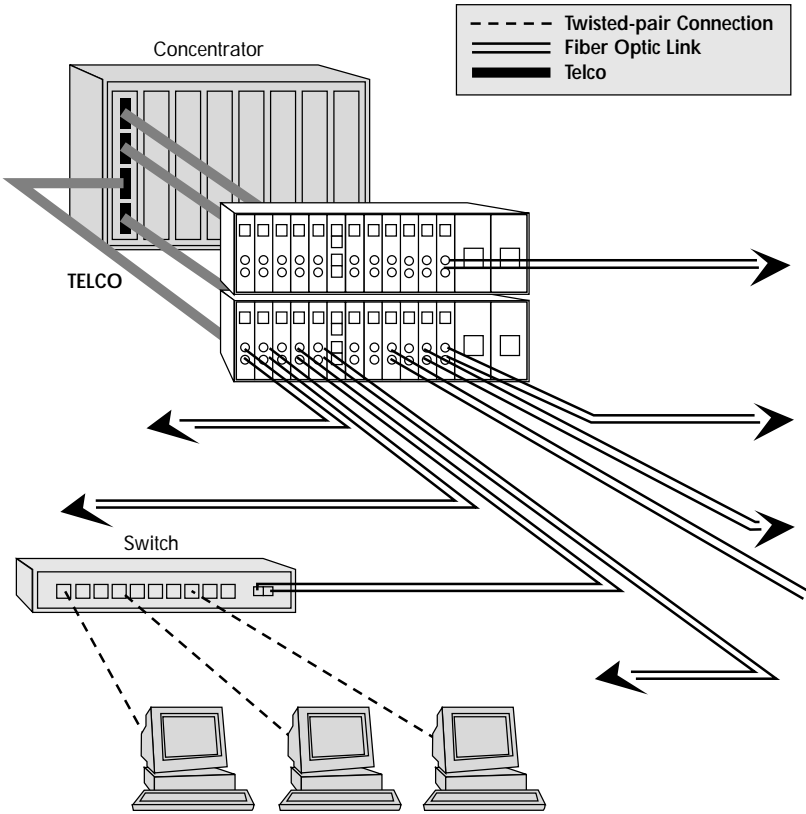
Media Converter 7000 with stand-alone “twisters” in mixed 10/100Mbps environment:





# Topology Solutions

Media Converter 7000 with TELCO "twister" modules:



## **Product Safety, EMC and Compliance Statements**

This equipment complies with the following requirements:

- UL
- CSA
- EN60950 (safety)
- FCC Part 15, Class A
- EN55022 Class A (emissions)
- EN50082-1 (immunity)
- IEC 825-1 Classification  
Class 1 Laser Product
- TUV

### **Radio Frequency Interference Statements**

#### ***FCC Radio Frequency Interference Statement***

This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communication. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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

#### ***Canadian Radio Frequency Interference Statement***

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## **Electrical Safety Statement**

### ***Normas Oficiales Mexicanas (NOM)***

#### ***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.
-









**Black Box Corporation**  
*The World's Source for Cabling and Network Connectivity<sup>SM</sup>*

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