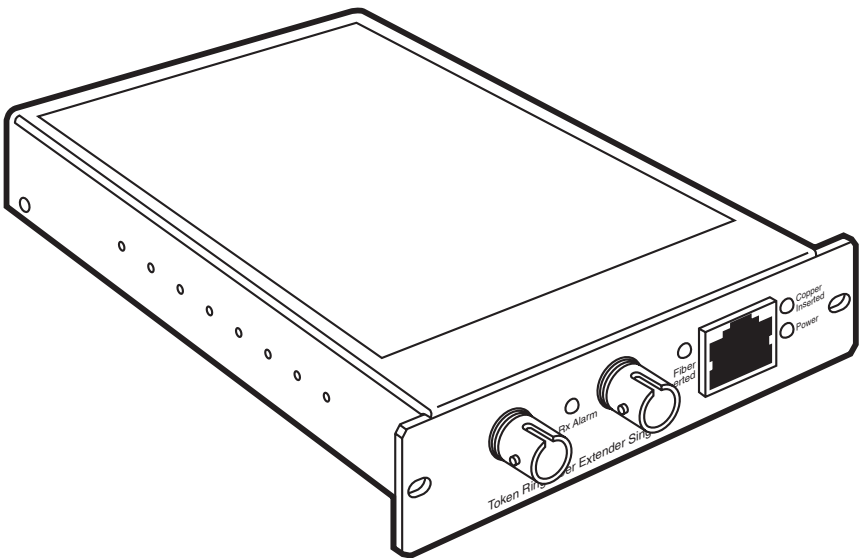




Token Ring Fiber Extenders (Single and Dual)



**CUSTOMER
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STATEMENTS OF COMPLIANCE FOR U.S., CANADA, AND EUROPE

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

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

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

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

Models with internal power supplies are UL® Listed to the requirements of UL 1950, and Certified by UL to the requirements of CSA C22.2 No. 950.

European Union: This equipment complies with the requirements of the European Union's Low-Voltage Directive 72/23/EEC. When used with STP cables, this equipment complies with the requirements of the EMC Directive 89/336/EEC. Declarations of Conformity have been prepared and a copy is kept on file at the manufacturer's location.

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

1.1 Specifications for LT510A and LT511A

Compliance —	EMI/RFI: CE Directive 89/336/EEC, FCC Part 15 Class A, DOC Class/MDC classe A; Safety: CE Directive 73/23/EEC (unit operates in safety extra-low voltage [selv] only), UL 1950, CUL 1950
Standards —	IEEE 802.5 and 802.5J Token Ring
Interfaces —	Copper: Type 3 UTP or Type 1 or 6 STP; Fiber: Multimode fiber
Cable Required —	Copper: 100-Ω Category 5 UTP or 150-Ω Type 1 or Type 6 STP; Fiber: ST-terminated multimode (50/125 or 62.5/125)
Data Rate —	16 or 4 Mbps
Fault-Recovery Time —	5 ms
Bit-Error Rate —	1 in 10 ⁹ maximum
Optical Transmit Power —	-15 dBm (typical into 0.26-NA [Numerical Aperture] fiber)
Optical Receiver Sensitivity —	-32 dBm minimum
Optical Link Budget —	17 dBm typical, 12 dBm lifetime worst case
Maximum Distance —	Fiber: 2.5 km (1.6 mi.) over 62.5/125 multimode or 2 km (1.2 mi.) over 50/125 multimode; Copper: 100 m (328 ft.) total per link
User Controls —	Rear-mounted 4-position operating-mode DIP switch

TOKEN RING FIBER EXTENDERS (SINGLE AND DUAL)

Indicators —	All front-mounted LEDs: Both Models: (1) Power, (1) Copper Inserted; LT510A: (1) Fiber Inserted, (1) Rx Alarm; LT511A: (2) Fiber Inserted, (2) Rx Alarm
Connectors —	All rear-mounted: Both models: (1) Shielded RJ-45 female; LT510A: (2) ST female; LT511A: (4) ST female
Leads Supported —	RJ-45: Pins 3, 4, 5, and 6 (Rx+, Tx+, Tx-, and Rx- respectively)
MTBF —	LT510A: 145,000 hours; LT511A: 143,000 hours
Temperature Tolerance —	Operating: 32 to 104°F (0 to 40°C) Storage: -4 to 158°F (-20 to 70°C)
Humidity Tolerance —	Up to 95% noncondensing
Power —	From desktop power supply: Input: 110 VAC, 60 Hz; Output: LT510A: 12 VDC at 400 mA; LT511A: 12 VDC at 750 mA; Consumption: LT510A: 4.8 watts typical, 9.6 watts maximum; LT511A: 8 watts typical, 16 watts maximum
Size —	LT510A: 1"H x 3.9"W x 5.5"D (2.5 x 10 x 14 cm); LT511A: 2"H x 3.9"W x 5.5"D (5 x 10 x 14 cm); Included power supply: 2.4"H x 3.9"W x 3"D (6 x 10 x 7.5 cm); input and output cords are at least 1 m (3.3 ft.) long;
Weight —	Net: LT510A: 1.8 lb. (0.8 kg); LT511A: 2.4 lb. (1.1 kg); Shipping: LT510A: 2.6 lb. (1.2 kg); LT511A: 3.3 lb. (1.5 kg)

1.2 Specifications for PS500

Compliance —	EMI/RFI: FCC Curve B, Vfg 243/91, VCCI 2, and EN55022B; Safety: UL 1950, CSA 22.2 No. 234, and EN 60950
Input —	100 to 240 VAC, 50 to 60 Hz (autosensing)
Output —	12 ±0.5 VDC at 8.5 amps
Temperature Tolerance —	Operating: 32 to 104°F (0 to 40°C) Storage: 14 to 158°F (-10 to 70°C)
Humidity Tolerance —	20 to 90% noncondensing
Vibration Tolerance —	Resists twenty 3-minute 2-G cycles (from 10 to 55 Hz and back) along X-axis, then Y-axis, then Z-axis
Size —	3.9"H x 2"W x 11.2"D (10 x 5 x 28.4 cm)
Weight —	Net: 3.5 lb. (1.6 kg); Shipping: 4.4 lb. (2 kg)

1.3 Specifications for RM510A

Material —	Steel
Size —	5.25" (3U) H x 19"W x 2"D (13.3 x 48.3 x 5.2 cm)
Weight —	Net: 2.8 lb. (1.3 kg); Shipping: 4.3 lb. (1.9 kg)

2. Introduction

With Token Ring Fiber Extenders (TRFEs), you can interconnect Token Ring stations, hubs, and switches over multimode fiberoptic links up to 2 km long. You can use TRFEs with most “classic” (standard) Token Ring products and protocols and newer “Dedicated Token Ring” equipment, including:

- Classic Token Ring stations
- Classic Token Ring concentrators
- 802.5J (Fiber Optic Station Attach) fiber ports
- Dedicated Token Ring concentrator ports
- Dedicated Token Ring node ports
- Redundant links from classic stations to Ring In/Ring Out ports
- Links between TCU (Trunk Coupling Unit) ports of hubs

Refer to **Section 2.3** for examples of common applications.

2.1 Key Features

Drive Distances

If you don't exceed their fiberoptic link budgets, you can link Token Ring Fiber Extenders across distances as great as 2 to 2.5 km (1.2 to 1.6 mi.). The link budget is a maximum of 12dBm (worst-case lifetime figure). The copper distance that is supported on a TRFE link is 100 m (328 ft.).

Universal Copper Port

The Token Ring Fiber Extenders' copper-wire interface, consisting of one or two shielded RJ-45 connectors, automatically supports both 100-ohm unshielded twisted-pair (UTP) and 150-ohm shielded twisted-pair (STP) cables.

Station Count

The Token Ring Fiber Extenders don't add to your station count. (Only 72 stations may be attached to regular UTP Token Rings; only 250 may be attached to STP Rings or to UTP Rings with jitter suppression.)

Ergonomics

The Token Ring Fiber Extenders are packaged in small freestanding cases that can be mounted in a 19" rack using the 19" Rackmount Chassis (our product code RM510). This Chassis supports as many as 16 single or 8 dual TRFE units in a 3U-high frame.

Power Supplies

The Token Ring Fiber Extenders are normally powered from the small external power supply that they ship with. Any TRFEs you mount in the 19" Rackmount Chassis, however, can be powered from the Rackmount Power Supply (our part number PS500) that takes up 2 spaces in the Chassis and supports as many as 14 single or 7 dual TRFEs.

2.2 The TRFEs Illustrated

Figure 2-1 below shows the front and rear panels of the Token Ring Fiber Extender-Single (LT510A). Figure 2-2 on the next page shows the front and rear panels of the Token Ring Fiber Extender-Dual (LT511A).

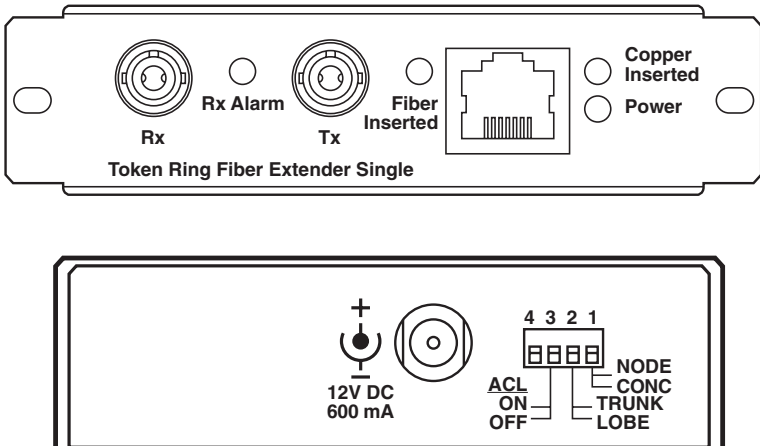


Figure 2-1. The front and back of the Extender-Single.

TOKEN RING FIBER EXTENDERS (SINGLE AND DUAL)

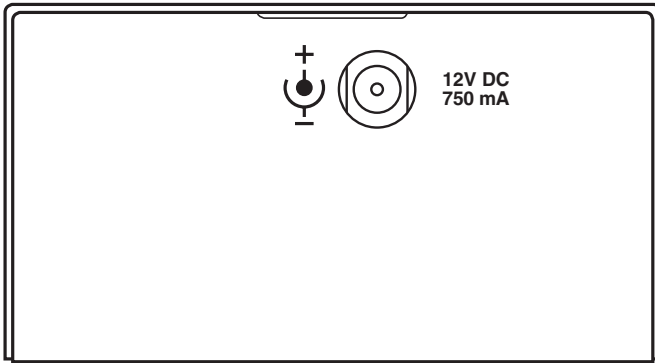
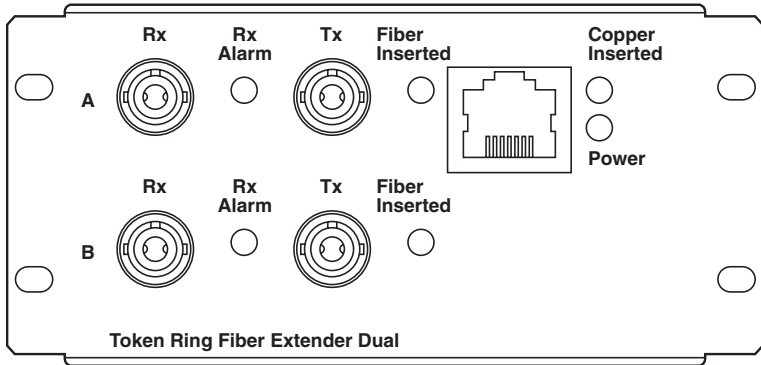


Figure 2-2. The front and back of the Extender-Dual.

2.3 Typical Applications

2.3.1 STATION-TO-CONCENTRATOR LINKS

You can use Token Ring Fiber Extenders to connect a remote station, switch, or router to a MAU across a fiber link, as shown in Figure 2-3 below.

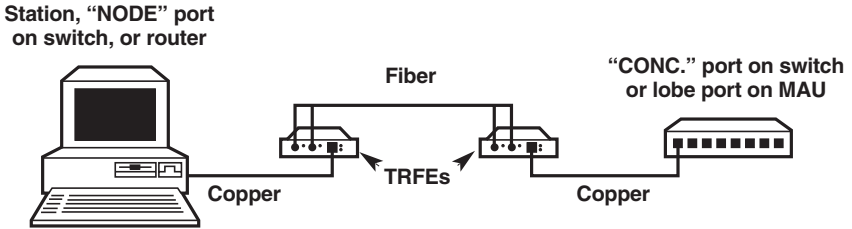


Figure 2-3. Connecting a station to a concentrator.

The total copper link can be up to 100 m (328 ft.) long; the fiber link can be up to 2 km (1.2 mi.) long.

You could also use this configuration to connect a remote server or router to a switch, or even to connect two switches. (In the latter situation, however, if your switch is a Dedicated Token Ring switch, do *not* use automatic switch configuration. The switch at one end must be defined as a station [node] and the one at the other end as a concentrator, as shown above.)

2.3.2 STATION-TO-STATION LINKS

For links between servers, switches, or routers, you can use TRFEs to provide a point-to-point link as shown in Figure 2-4 below.

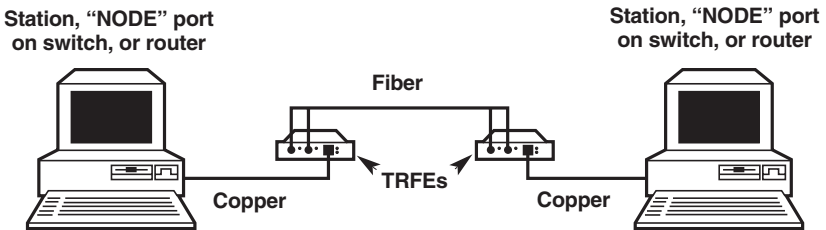


Figure 2-4. Connecting stations.

TOKEN RING FIBER EXTENDERS (SINGLE AND DUAL)

2.3.3 CONCENTRATOR-TO-CONCENTRATOR LINKS

For switch-to MAU links, or to interconnect two Token Ring networks through the TCU ports of two MAUs or switches, the TRFEs should be configured as shown in Figure 2-5 below.

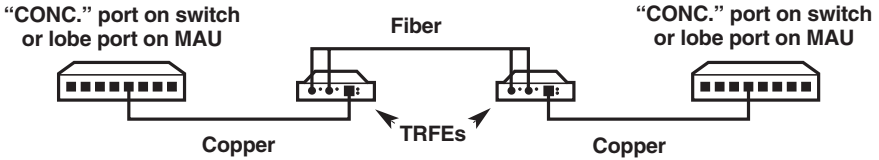


Figure 2-5. Connecting concentrators.

2.3.4 REDUNDANT LINKS

You can use a TRFE-Dual to create a redundant link between a station and the main ring (Ring In/Ring Out) path of a classic Token Ring, as shown in Figure 2-6 below, or to create a redundant station-to-MAU link, as shown in Figure 2-7.

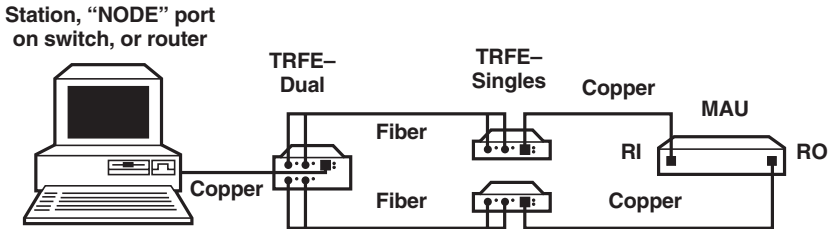


Figure 2-6. Dual (redundant) main-ring link.

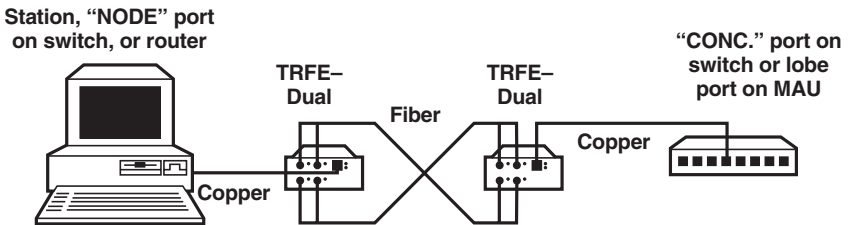


Figure 2-7. Dual (redundant) lobe link.

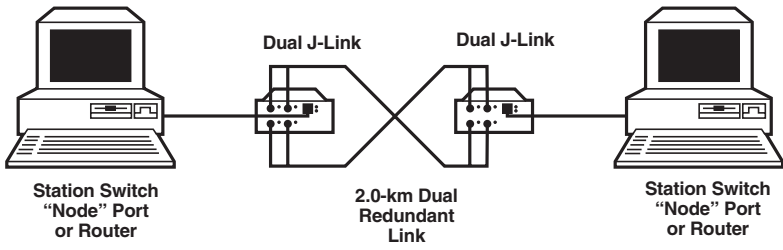


Figure 2-8. Dual (redundant) station to station link.

3. Installation

3.1 The Complete Packages

Before you install your Token Ring Fiber Extenders as standalones or in your racks, and before you install the RM510 rackmount frame or the PS500 rack-power supply, make sure you have received everything that is supposed to come with the unit(s).

The complete package for each TRFE (LT510A or LT511A) includes:

- (1) TRFE unit;
- (1) In-line (desktop) power supply with a 6-in. (15.2-cm) input pigtail ending in an IEC 320 male inlet and a 6-ft. (1.8-m) 18-AWG 2-conductor output cord ending in a barrel plug;
- (1) 7-inch (17.8-cm) rack-power cord with a 2-pin Molex® male plug on one end and a barrel plug on the other end, for optional connection to the power-supply bus of the RM510 rackmount frame;
- (1) 2-m (6.6-ft.) crossover patch cable with RJ-45 male connectors at both ends, for optional cross-pinned data connections;
- (1) Copy of this manual; and
- (1) 2-m (6.6-ft.) input-power cord with a NEMA 5-15P plug on one end and an IEC 320 female outlet on the other. (Outside North America you might have to purchase a cord specific to your region separately.)

The complete package for each RM510A rackmount frame includes:

- (1) Rackmount frame;
- (4) M6 cage nuts and (4) M6 screws for attaching the frame to a rack;
- (32) M3 screws for attaching TRFEs and/or a PS500 power supply to the frame; and
- (1) Copy of this manual.

The complete package for each PS500 rack-power supply includes:

- (1) Power supply;
- (1) Output cord with 4-pin Molex male plugs on both ends;

TOKEN RING FIBER EXTENDERS (SINGLE AND DUAL)

- (1) Copy of this manual; and
- (1) 2-m (6.6-ft.) input-power cord with a NEMA 5-15P plug on one end and an IEC 320 female outlet on the other. (Outside North America you might have to purchase a cord specific to your region separately.)

3.2 Installing the Rack Components (For Rackmounting Applications Only)

If you want to rackmount your Token Ring Fiber Extenders, you will first need to install the RM510A rackmount frame (see Figure 3-1 below) in your equipment rack, then mount the PS500 rack-power supply in the frame. (If you will not be rackmounting the TRFEs, skip to the next section.)

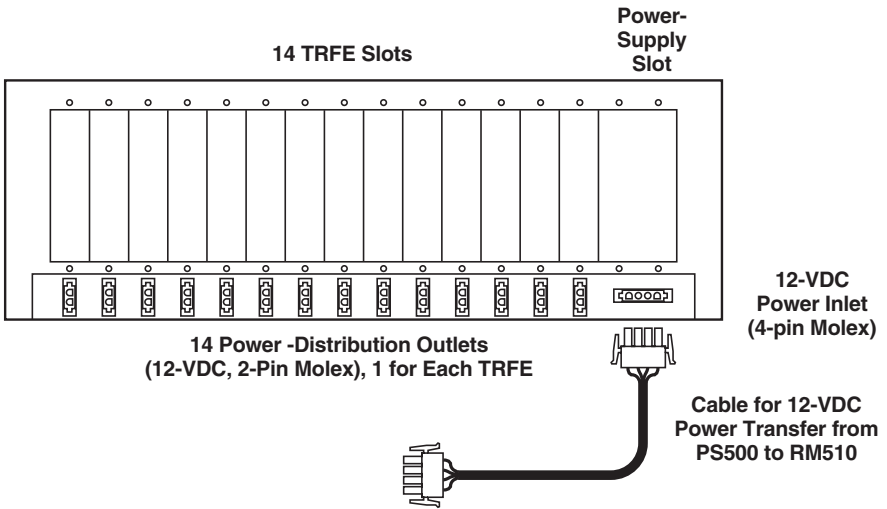


Figure 3-1. Rear view of the RM510A rackmount frame.

To mount the frame and power supply you will need a cage-nut insertion tool and a Phillips screwdriver. Until the frame, power supply, and TRFEs are fully installed, you will also need to shut off AC power to the outlet that you are going to plug the power supply into; if this involves anything more complicated than throwing a circuit breaker, we strongly recommend that you contact a qualified electrician.

WARNING!

Make sure an easily accessible utility (mains) AC-power outlet is near enough to the rack that the PS500's power cord will not be stretched. Also make sure that power to this outlet is turned off until you have finished installing the RM510A, PS500, and all local TRFEs.

When you plug the power cord into the PS500's IEC 320 power inlet, make sure that the plug is tightly secured, and that the weight of the plug and cable are adequately supported, so that power is not accidentally or spontaneously disconnected while the TRFEs are operating.

Be aware that the PS500 does not have an ON/OFF switch; to power it down, you must unplug its power cord at one end or the other.

The PS500 contains no user-serviceable parts. Do *not* attempt to open, dismantle, alter, or repair it. Contact Black Box if you have problems with the unit or if it appears to be defective or faulty (see Section 4.3).

Once everything is ready, take these steps:

1. Use the four M6 cage nuts and matching screws to attach the RM510A frame to the rack. (The frame should be oriented so that its fourteen 2-pin Molex DC-power distribution sockets face the *rear* of the rack and are next to the *bottom* of the frame.)
2. Use four of the M3 screws to mount the PS500 power supply in the “dual slot” at the end of the frame (the *left* end as viewed from the front of the rack).
3. Run an input-power cord from the IEC 320 male inlet on the side of the PS500—the *right* side as viewed from the front of the rack, see Figure 3-2 on the next page—to the turned-off utility AC outlet. (A cord designed for use in North America is included with the PS500; elsewhere, you might need to purchase a cord specific to your region separately.)

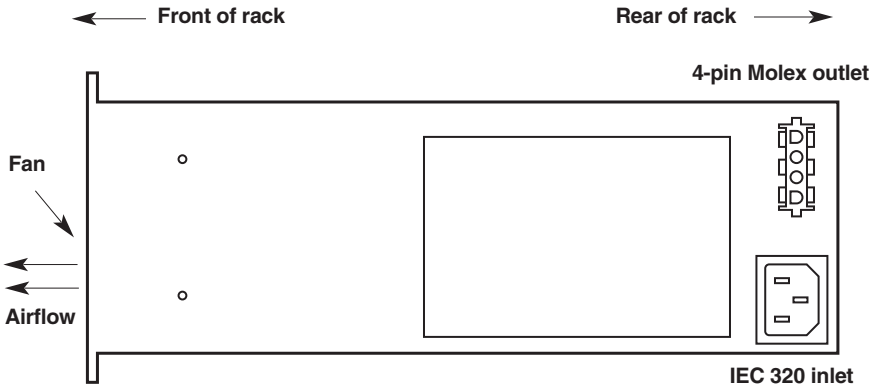


Figure 3-2. Side view of the PS500 rack-power supply.

4. Run the included output-power cord from the 4-pin Molex female socket outlet on the side of the PS500—the *right* side as viewed from the front of the rack, see Figure 3-2 above—to the 4-pin Molex female socket inlet on the power strip at the bottom rear of the RM510A frame (see Figure 3-1 on page 17).
5. Configure the TRFEs, install them in the RM510A frame, and attach them to RM510A power, all as described in the next section.
7. Turn the utility AC outlet back on. The green LED on the PS500's front panel should light, indicating that the unit is receiving power. If it doesn't, make sure that its input cord is securely attached at both ends. If it is, make sure that the utility AC outlet is really on by plugging a lamp or other device into it. If the outlet is operating, call Black Box for technical support. (When a TRFE powers up, which of its LEDs light—if any—will vary depending on your application and the status of the attached cable and equipment. See **Sections 4.1** and **4.2**.)

3.3 Installing the TRFEs

To install a pair of Token Ring Fiber Extenders, you'll need a screwdriver and an 850-nm fiberoptic loss set (source and power meter). (For each site where you plan to rackmount TRFEs, you'll also need a RM510 rackmount kit and a set of rackmount screws and cage nuts.) Take these steps:

1. Find your application in Figure 3-1 page 16 and see which number appears next to each TRFE in that application. Refer to the Table 3-1 on page 17 and set positions 1 through 3 of each TRFE's DIP switch accordingly.
2. Use the fiberoptic loss set to measure the loss of the fiber link (that is, the main fiber cabling running between the local and remote fiber patch panels to which you would normally connect TRFEs). Use the loss set to make sure that the link's loss is less than 15 dBm. If it isn't, check all the connections and splices along the way and make sure they are tight and properly done. Also make sure that the fiber isn't broken anywhere along its length. If the fiber and all connections and splices are OK, then in order to reliably use TRFEs you will have to either use a better link, or rework the existing one so that it (a) is shorter, (b) has fewer splices, and/or (c) uses lower-loss fiber.
3. *If you're rackmounting either TRFE*, slide the TRFE sideways into the RM510A frame, then use two of the M3 screws that came with the RM510A to secure the TRFE to the frame. *Otherwise*, place the TRFE on a clean, dry, flat surface and make sure to leave enough space around the unit for convection cooling.
4. Use fiberoptic patch cords with ST connectors to attach each TRFE to the local fiber patch panel. Make sure Tx on each TRFE is connected to Rx on the other TRFE.

Note: TRFEs–Dual may be connected either to each other, as shown in Figure 2-7 on page 15, or to two TRFEs–Single as shown in Figure 2-6 on page 15. When you connect TRFEs–Dual to each other, each unit's Port-A Tx must be connected to the other unit's Port-B Rx; likewise each one's Port-A Rx must be connected to the other's Port-B Tx. When you connect a TRFE–Dual to a pair of TRFE–Singles for main-ring extension, the Dual's Port-A Tx must be connected to Rx on the "Ring In" Single, and Port-A Rx must be connected to that Single's Tx. Likewise, the Dual's Port-B Tx must be connected to the "Ring Out" Single's Rx, and the Port-B Rx must be connected to that Single's Tx. Refer to Figure 2-6 on page 15.

5. *If you are rackmounting either TRFE*, run the rack-power cord included with each rackmounted TRFE (barrel plug to 2-pin Molex male) from the 12-VDC barrel jack on the rear panel of the TRFE to the corresponding 2-pin Molex female socket on the power strip at the bottom rear of the RM510A frame. *Otherwise*, power up each TRFE by (a) plugging the barrel plug of the included power supply into the 12-VDC barrel jack on the rear panel of the TRFE, (b) attaching an appropriate input cord to the IEC 320 male inlet on the transformer's pigtail, then (c) plugging the input cord into a working utility (mains) AC outlet. (NOTE: Which, if any, of its LEDs light when a TRFE powers up will vary depending on your application and the status of the attached cable and equipment. See Sections 4.1 and 4.2.)

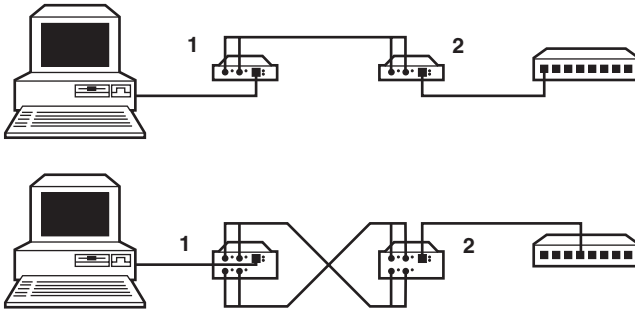
If, instead of using TRFEs on both sides of a fiberoptic link, you want to connect a TRFE to some other fiberoptic device, make sure that the TRFE's receive power is less than -12dBm . If its receive power is greater than -12dBm , use an optical attenuator to attenuate the received signal to $-18 \pm 3\text{dBm}$. Also make sure that the other device supports the 802.5J fiber standard.

NOTE

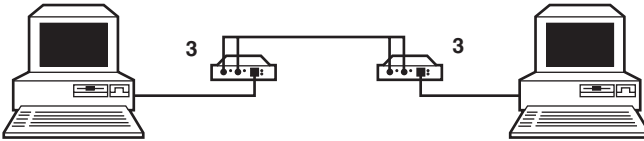
If you are using Dedicated Token Ring, or even normal Token Ring switches by certain manufacturers, you might not be able to use TRFEs in certain applications. For example, if your switches don't support NODE-to-NODE connections, it will not be possible (even with TRFEs) to make station-to-station links in which both stations are switches, as shown in Figure 2-4 on page 14 and in item #2 in Figure 3-1 on the next page. Consult your switch manual if you're not sure whether your switches will support a given application.

TOKEN RING FIBER EXTENDERS (SINGLE AND DUAL)

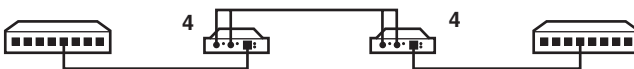
1. Station-to-Concentrator (Lobe Extension)—see Figure 2-3 on page 11 and Figure 2-7 on page 12



2. Station-to-Station—see Figure 2-4 on page 11



3. Concentrator--to-Concentrator—see Figure 2-5 on page 12



4. Redundant Main-Ring Extension—see Figure 2-6 on page 12

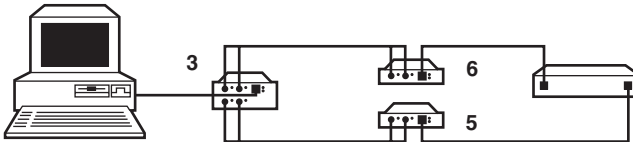


Figure 3-1. DIP-switch-setting numbers for TRFE applications.

Table 3-1. DIP-Switch Settings

Setting No. from Fig. 3-1	Cable Required (AT&T 258A Pairs 3&6, 4&5)	Switch-Position Settings*		
1	Straight-through†	1 UP	2 UP	3 UP
2	Crossover**	1 DOWN	2 UP	3 UP
3	Straight-through†	1 UP	2 DOWN	3 UP
4	Crossover**	1 DOWN	2 DOWN	3 UP
5	Crossover**	1 DOWN	2 DOWN	3 DOWN††
6	Straight-through†	1 UP	2 DOWN	3 DOWN††

*Switch position 1 determines station vs. concentrator; position 2 determines lobe vs. trunk; position 3 determines whether ACL (Automatic Copper Loopback) is ON or OFF; position 4 is reserved for future use.

†Pin 3 on one end connected to Pin 3 on the other; Pin 4 to Pin 4; 5 to 5; and 6 to 6.

**Pin 3 on one end connected to Pin 4 on the other; Pin 4 to Pin 3; 5 to 6; and 6 to 5.

††Down for MAUs with normal, passive RI/RO; up for MAUs by NHC Communications, Inc., with "smart" RI/RO.

TOKEN RING FIBER EXTENDERS (SINGLE AND DUAL)

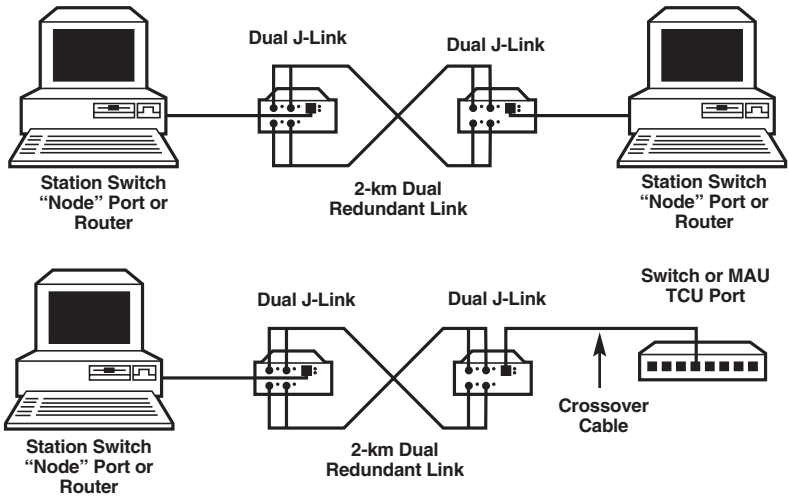


Figure 3-2. Dual J-link configuration.

Table 3-2. Configurations

Dual J-Link No. Shown Above	Cable Required (AT&T 258A Pairs 3&6, 4&5)	Switch- Settings 1=Station/Conc. 2=Lobe/Trunk 3=ACL
1	Straight-through	1 UP 2 DOWN 3 UP
2	Crossover	1 DOWN 2 DOWN 3 UP

4. Operation and Troubleshooting

Once a set of TRFEs are installed and plugged into utility power, they should be ready for continuous operation. If they are, the units' Power, Fiber, and Copper LEDs will be ON and the Rx Alarm LEDs will be OFF (refer to **Section 4.1** for information about the LEDs). If the LEDs are in some other state, see **Sections 4.1** and **4.2**.

4.1 Descriptions of the LEDs

4.1.1 POWER

When this LED is lit, the TRFE is receiving power of the right type. If this LED is dark, make sure that the power supply is properly connected to both the TRFE and a utility-power (mains) outlet.

4.1.2 COPPER INSERTED

This LED will be lit when (a) the TRFE is powered up, (b) the unit is connected to another device through copper cabling attached to its RJ-45 port, and (c) any of several other conditions are met:

- ACL (Automatic Copper Loopback) is disabled (DIP-switch position 3 is OFF [down]) and the TRFE is linked to another TRFE or a similar device across fiberoptic cable. (The LED will be dark unless the fiber link is operating.)
- ACL is enabled (DIP-switch position 3 is ON [up]), DIP-switch position 1 is set to "NODE" (up), and a valid load is present at the other end of the copper cable.
- ACL is enabled (DIP-switch position 3 is ON [up]), DIP-switch position 1 is set to "CONC" (down), and a valid phantom source is present at the other end of the copper cable.

4.1.3 FIBER INSERTED AND RX ALARM

The Fiber Inserted LED should be lit and the Rx Alarm should be dark when the TRFE is receiving power and the fiberoptic cabling is properly connected to the Tx and Rx connectors on both the local TRFE and the remote TRFE (or other device). If the Fiber Inserted LED is dark but the Rx Alarm LED is lit, the TRFE isn't receiving anything at all across the fiberoptic link—check the remote device and the fiberoptic cable. If the Rx Alarm LED is also dark, there are several possible causes—see the appropriate entries in the next section.

4.2 Troubleshooting: Interpreting the LEDs

If your TRFE link doesn't seem to be operating correctly, check the LEDs of all of the involved TRFEs and match their states with the possible states and corresponding problems in this section. (In many cases, the problem can be caused by using the wrong DIP-switch settings on a TRFE; refer to Figure 3-1 on page 16 and Table 3-1 on page 17.)

LEDs:				TRFE Application/Location
Power	Copper	Fiber	Rx Alarm	(from Figure 3-1 on page 16)
OFF	OFF	OFF	OFF	Any

Probable Cause: The TRFE is not receiving power. Make sure that the external power supply is plugged into utility power and is correctly connected to the TRFE. If it is, the utility outlet might be bad; try plugging something else into that outlet. If the outlet is working, the TRFE's power supply might be bad; try swapping it out for a different one with the same specifications (call Black Box if you need one). If none of these measures helps, call Black Box for technical support.

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LEDs:				TRFE Application/Location
Power	Copper	Fiber	Rx Alarm	(from Figure 3-1 on page 16)
ON	OFF	OFF	ON	1

Probable Cause: The local TRFE cannot detect the presence of the remote unit. Either the remote TRFE is not receiving power (see above) or there is a problem somewhere along the TRFE-to-TRFE link. If the remote TRFE is getting power, make sure that receive power at the local TRFE is greater than -30 dBm. If it isn't, check all the connections and splices along the fiber link between the TRFEs and make sure they are tight and properly done. Also make sure that the fiber isn't broken anywhere along its length. If the fiber and all connections and splices are OK, then in order to reliably use TRFEs you will have to either use a better link, or rework the existing one so that it (a) is shorter, (b) has fewer splices, and/or (c) uses lower-loss fiber.

LEDs:				TRFE Application/Location
Power	Copper	Fiber	Rx Alarm	(from Figure 3-1 on page 16)
ON	OFF	OFF	OFF	1
		or		
ON	OFF	ON	OFF	3

Probable Cause: First make sure that all involved TRFEs are powered up and that their DIP switches are set to the correct settings for the application. If they are, the station attached to the local TRFE is probably unplugged or turned off or doesn't have the proper network drivers loaded. If this is not the case, make sure that the cable attaching the local station to the local TRFE is pinned straight-through and is properly attached at both ends. If it is, try swapping in a known-good straight-through cable. If this doesn't work, call Black Box for technical support.

LEDs:				TRFE Application/Location
Power	Copper	Fiber	Rx Alarm	(from Figure 3-1 on page 16)
ON	OFF	OFF	OFF	2

Probable Cause: First make sure that all involved TRFEs are powered up and that their DIP switches are set to the correct settings for the application. If they are, and if the device at the other end of the fiber link is not a TRFE, make sure that it supports IEEE 802.5J; if it doesn't, you won't be able to use it. If this isn't the problem, the station attached to the remote TRFE or other device is probably unplugged or turned off or doesn't have the proper network drivers loaded. If this is not the case, make sure that the cable

TOKEN RING FIBER EXTENDERS (SINGLE AND DUAL)

attaching the local station to the local TRFE is properly cross-pinned and is properly attached at both ends. If it is, try swapping in a known-good crossover cable. If this doesn't work, call Black Box for technical support.

LEDs:				TRFE Application/Location
Power	Copper	Fiber	Rx Alarm	(from Figure 3-1 on page 16)
ON	N/A	OFF	OFF	3, 4, 5, or 6

Probable Cause: First make sure that all involved TRFEs are powered up and that their DIP switches are set to the correct settings for the application. If they are, and if the device at the other end of the fiber link is not a TRFE, make sure that it supports IEEE 802.5J; if it doesn't, you won't be able to use it. If this isn't the problem, the trouble is somewhere on the fiber link between the TRFEs. Make sure that the fiber cabling is properly attached to the Tx and Rx connectors on both ends. If it is, try swapping in known-good fiber cable. If this doesn't work, call Black Box for technical support.

LEDs:				TRFE Application/Location
Power	Copper	Fiber	Rx Alarm	(from Figure 3-1 on page 16)
ON	OFF	ON	OFF	4

Probable Cause: There is a problem somewhere on the copper link between the TRFE and the MAU. Make sure the MAU is operating properly. If it is, make sure that the cable attaching the MAU to the TRFE is properly cross-pinned and is properly attached at both ends. If it is, try swapping in a known-good crossover cable. If this doesn't work, call Black Box for technical support.

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LEDs:				TRFE Application/Location
Power	Copper	Fiber	Rx Alarm	(from Figure 3-1 on page 16)
ON	OFF	ON	OFF	5 or 6

Probable Cause: Make sure that position 3 of the TRFE's DIP switch is set to OFF (down) if you are using a normal passive MAU without a "smart" Ring In/Ring Out phantom mechanism. If a mis-setting of position 3 is not the problem, make sure that the cable to the MAU's Ring In port is straight-through-pinned and that the cable to the Ring Out port is properly cross-pinned. If the cables are properly pinned, call Black Box for technical support.

LEDs:				TRFE Application/Location
Power	Copper	Fiber	Rx Alarm	(from Figure 3-1 on page 16)
ON	ON	ON	OFF	1, 2, 3, or 4

Probable Cause: This is how the LEDs should look under normal circumstances. If the link through the TRFEs is nevertheless not operating properly, call Black Box for technical support.

LEDs:				TRFE Application/Location
Power	Copper	Fiber	Rx Alarm	(from Figure 3-1 on page 16)
ON	ON	ON	OFF	5 or 6

Probable Cause: This is how the LEDs should look under normal circumstances. If the Token Ring is nevertheless not operating properly, check the cables between the TRFEs and the MAU: The cable to the MAU's Ring In port must be straight-through-pinned and the cable to the Ring Out port must be properly cross-pinned. If the cables are properly pinned, call Black Box for technical support.

4.3 Calling Black Box

If you determine that a Token Ring Fiber Extender is malfunctioning, *do not attempt to alter or repair the unit*. It is not user-serviceable. Contact Black Box Technical Support at (724) 746-5500; the problem might be solvable over the phone.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the unit's product code and serial number.
- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.
- the results of any tests you might already have performed.

4.4 Shipping and Packaging

If you need to transport or ship your Token Ring Fiber Extender:

- Package it carefully. We recommend that you use the original container.
- Before you ship the TRFE for repair or return, contact Black Box to get a Return Materials Authorization (RMA) number.

Legal Notices

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