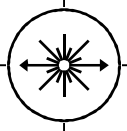
70312

Laser Link® ELLT Enhanced Fiber Optic Transmitter 1310nm, 45-870 MHz

INSTALLATION AND OPERATION MANUAL



ANTEC Network Technologies

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Laser Link® ELLT Enhanced Fiber Optic Transmitter 1310nm, 45-870 MHz

INSTALLATION AND OPERATION MANUAL

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When ordering parts from ANTEC Network Technologies, be sure to include the equipment model number, equipment serial number and a description of the part.

In all correspondence with ANTEC Network Technologies regarding this publication, please refer to:

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Table of Contents

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Chapter 1
General Information

Introduction

This manual describes the installation and operation of the Laser Link® Enhanced Transmitter (ELLT).

Manual Contents

This manual contains three chapters.

- Chapter 1 - General Information
- Chapter 2 - Installation
- Chapter 3 - Setup and Operation

How To Use This Manual

This manual is divided into the chapters listed above. Major topics in each chapter are listed at the beginning of the chapter. Use these lists to find the desired information.

In This Chapter

This chapter contains these major topics.

How To Contact ANTEC Network Technologies

Overview

ANTEC Network Technologies is ready to assist you as necessary.

How To Contact ANTEC Network Technologies

Here's how to contact us.

In The USA…	Outside The USA…
By phone call 1-800-FIBERME and follow the voice prompts. By mail, write to: ANTEC Network Technologies Attention: Technical Service 11450 Technology Circle Duluth, GA 30097	Contact your ANTEC Network Technologies sales office for assistance. Sales offices are listed on the back cover of this manual.

We Welcome Your Comments

Overview

We welcome your comments on this manual. User comments are an important source of ideas to improve our manuals.

How To Comment

You can contact us by mail or e-mail.

By Mail…	By E-mail…
Write to: ANTEC Network Technologies Attention: Technical Publications 11450 Technology Circle Duluth, GA 30097	Send a message to: **tech.pubs@antec.com**

Safety

Overview

Safety of personnel is the primary concern during all procedures.

This section describes typical safety considerations. All of them may not apply to you or your installation/operation environment.

Additional Requirements

Your organization may have additional safety requirements. These recommendations in no way supersede any safety requirements of your organization.

Admonishments

Dangers, warnings, cautions and notes appear in the text immediately before the procedure step or other text to which they apply. Observe all these admonishments. The table below describes each category of admonishment.

Admonishment Category	Description
DANGER	DANGER refers to a situation hazardous to personnel if the information in the DANGER is not observed. Possible consequences are injury or death.
WARNING	WARNING refers to a situation in which customer service may be interrupted if the WARNING is not observed.
CAUTION	CAUTION refers to a situation in which equipment may be damaged or operationally degraded if the CAUTION is not observed.
NOTE	NOTE highlights critical information about a procedure or description. A NOTE does not describe hazards to personnel, equipment or service.

Continued on next page

Safety, Continued

Admonishment Symbols

A graphic symbol and title to denote each type of admonishment. The table below lists typical admonishments, their graphic symbol and meaning. All of these admonishments may not be used in this manual.

Admonishment	Graphic Symbol	Meaning
DANGER		Electrical hazard.
DANGER		Laser light hazard.
DANGER		Lifting object hazard.
DANGER		Mechanical hazard.
DANGER		Chemical Hazard
WARNING		Possible interruption of customer service.
CAUTION		Possible damage to equipment.
NOTE	none	Highlights critical information. No personnel or equipment hazards.

Continued on next page

Safety, Continued

Emergency Plan

Have an emergency plan. Know the procedure for obtaining first-aid and fire fighting assistance. Plan your work and maintain good housekeeping. Your safety and the quality of the product depend on it.

Resuscitation

Personnel working with or near hazardous voltages or chemicals should be familiar with modern methods of resuscitation.

Electrical Safety Summary

These are general electrical safety precautions that are not related to any specific procedure. These are recommended precautions that personnel should understand and apply.

Electrical Danger

DANGER

Avoid shorting circuits when using metal tools. Some circuits have high current capability. When shorted, these circuits will flash and may cause burns or eye injury.

Remove all jewelry and exposed metal objects from body and clothing before performing maintenance, adjustments or troubleshooting. Before working inside the equipment, remove all power unless power is required to perform the procedure.

Failure to observe this admonishment may result in death or severe injury.

Continued on next page

Safety, Continued

Electrical Danger - continued

DANGER

Replacement of fuses or other parts must be with identical types and ratings. Substitution of non-identical parts may cause safety and fire hazards.

Servicing this equipment may require working with protective covers removed and ac power connected. Use extreme caution during these procedures.

Failure to observe this admonishment may result in death or severe injury.

Mechanical Safety Summary

These are general mechanical safety precautions that are not related to any specific procedure. These are recommended precautions that personnel should understand and apply.

DANGER

Overhead hazards, either because items may fall or because personnel may strike them unintentionally, are typical around industrial sites. Never stand underneath anything while it is hoisted. Always wear a hardhat, especially if someone is above you.

Failure to observe this admonishment may result in death or severe injury.

Continued on next page

Safety, Continued

Laser Safety Summary

These are general safety precautions associated with a class 1B laser. They are not related to any specific procedure. These are recommended precautions that personnel must apply and understand.

Radiation from semiconductor laser diodes feeding this detector may be sufficiently intensive to cause almost instantaneous damage to the eye. Consider each application hazardous until proven safe. Carefully consider power emitted, radiation angle of divergence or confinement of radiation within optical fibers or other physical constraints. Since the radiation is in the non visible (infra red) portion of the spectrum, take precautions to avoid the accidental viewing of the light source.

DANGER

Laser hazard. This product contains a class 1B laser with no safety interlocks. Under no circumstances should connectors be viewed with equipment enabled. Direct viewing of connectors can cause eye damage.

Failure to adhere to this admonishment may result in serious injury to the eye(s) or even blindness.

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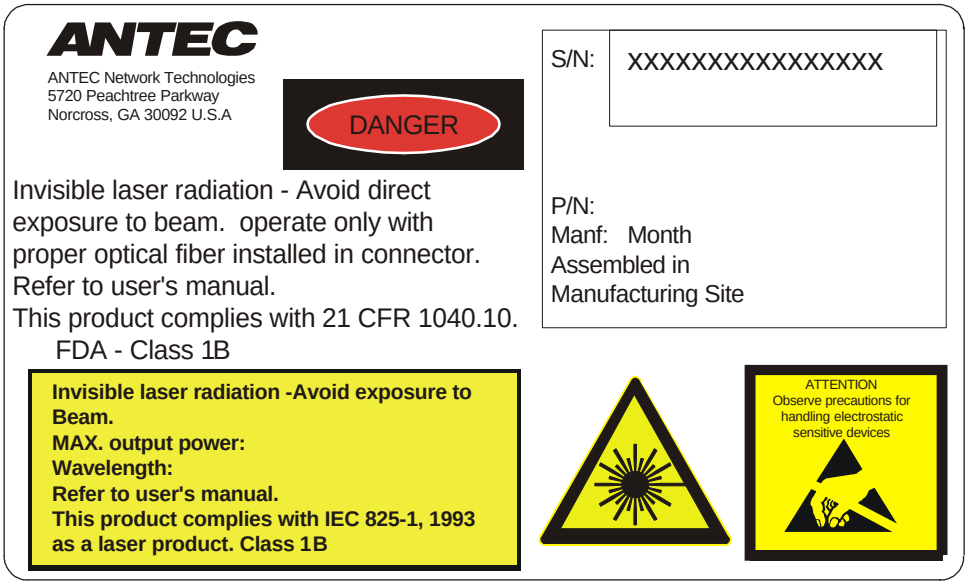
Safety, Continued

Labels

A safety label is affixed to this equipment in plain view. The safety label is shown below.



Equipment Description

Overview

The ELLT family is composed of a tiered series of 1310 nm fiber optic transmitters that allow for targeted carrier-to-noise and distortion performance over varied loss budgets. The low power versions of the product are designed for delivery of targeted services such as voice, data and video-on demand. A second RF input provides added versatility in these narrowcast applications.

The medium and high power product fits into broader area and longer link budget applications such as headend consolidations. The ELLT also has a second RF input port.

Product features are listed below:

• Front Panel Accessible Test Points	Optical Output Power (1VDC/1mW) Laser Drive Level (10 dBmV/channel at 110 channel NTSC input)
• Front Panel Accessible Controls	Power on/off key switch Slope adjust (0-5dB, 45-870 MHz) Attenuation Adjust (±2 dB min.)
• Front Panel Accessible Indicators	Green/Red power LED Green/Red RF status LED Green/Red optical power LED Green/Red laser temp LED Green/Red laser bias LED
• Front Panel Accessible SC/UPC or SC/APC optical connector	

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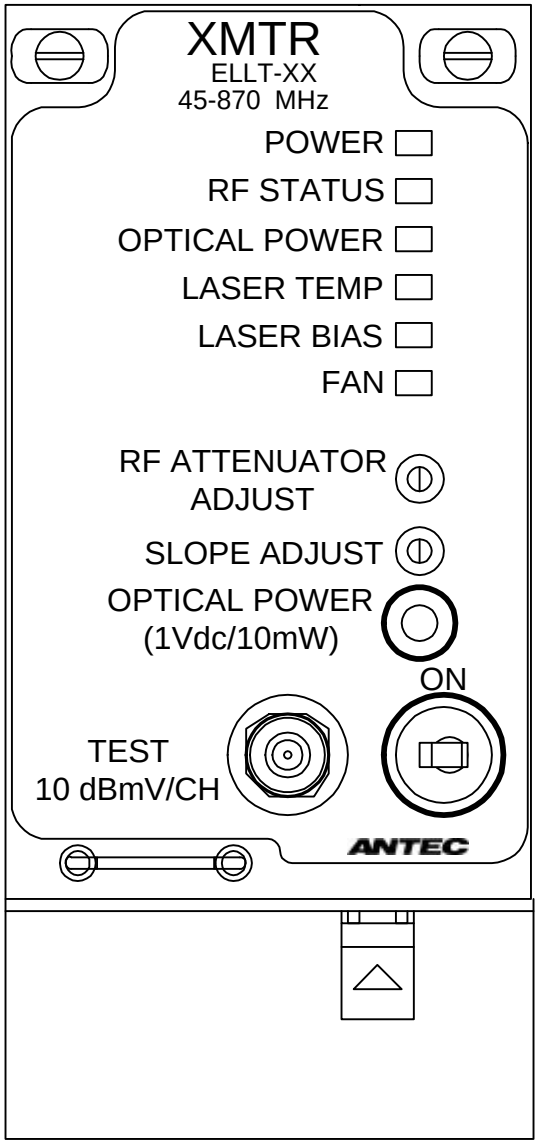
Equipment Description, Continued

Physical Description

The ELLT is a full-width module designed for the Laser Link II Mainframe. Refer to the diagram below for an identification view of the ELLT.



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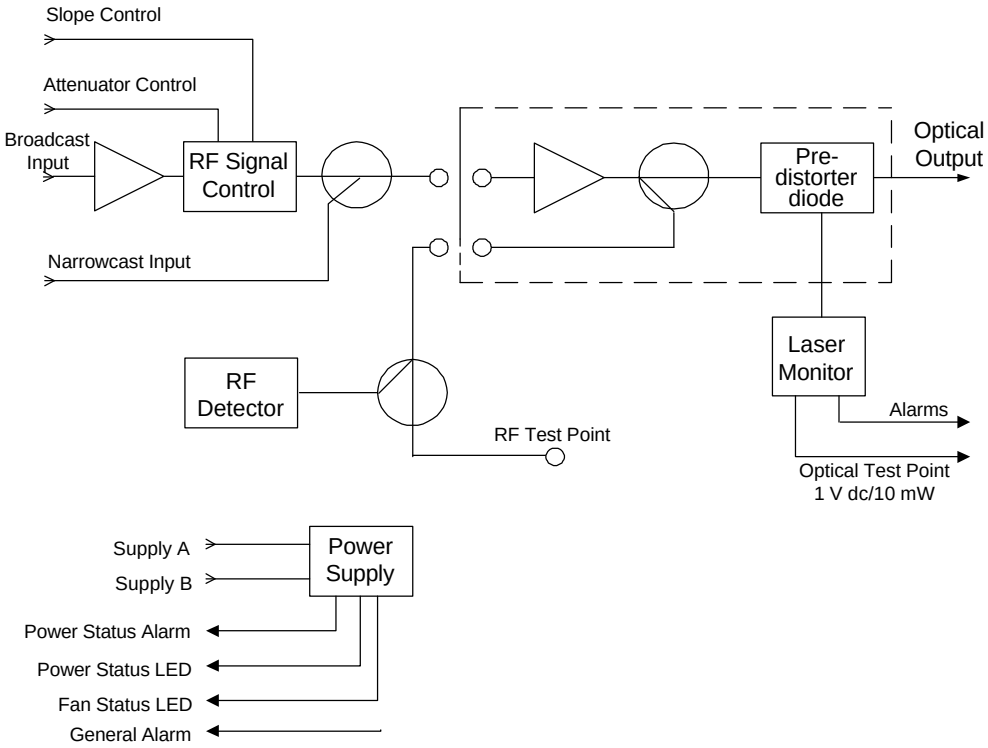
Equipment Description, Continued

Functional Description

The ELLT has two RF inputs. A block diagram of the ELLT is shown below.



There are twelve versions of the ELLT, designated with product codes ELLT-3 through ELLT-14. The product codes refer to different versions of the ELLT with different optical specifications. Refer to the specification tables for details. All are available with either an SC/APC or an SC/UPC connector.

Continued on next page

Equipment Description, Continued

Functional Description - continued

The main broadcast RF input of ELLT-3 through ELLT-14 requires a nominal 15 dBmV/channel signal for 78 channel loading. ELLT-13 and ELLT-14 require an additional 1.0 dB of RF input. In all ELLTs, the signal is amplified and then passed through a variable attenuator and slope adjust circuit. The variable attenuator has a range of ± 2 dB while the slope adjust circuit can adjust for 5 dB of cable. Both of these adjustments are controlled by front panel potentiometers.

Following this stage, the narrowcast RF input is coupled with the broadcast RF signal. The narrowcast RF input requires a nominal 42 dBmV/channel to match the level of the broadcast signal. The combined signals are routed to a second amplifier stage, which provides the gain necessary for proper signal level to the laser. A sample of this signal is applied to an RF detector circuit for monitoring and to the test point. The RF signal is applied to the laser board where it intensity modulates the light source for transmission over the output fiber.

Optimum RF drive level varies from diode to diode, even between identical products. To aid in ELLT optimization, the RF test point provides 10 dBmV/channel (at 110 channel NTSC input) in all versions of the ELLT. The optimization point for 77 NTSC channel loading is 11.5 dBmV/channel.

The laser board consists of a pre-distorter and DFB laser diode package. A laser monitor circuit provides constant temperature and output power control of the diode package over the full range of ambient temperature. This monitor circuit also provides a calibrated 1V dc/10 mW optical power test point to the front panel, controls the front-panel optical power, laser temperature, laser bias and status LEDs, and provides analog signals and alarms to the telemetry connections on the Laser Link II Mainframe.

The A/B power select circuit is an integral part of the ELLT. If an optional redundant power supply is installed, 24 V dc is supplied to the ELLT power input from both the primary and redundant supplies. The power select circuit automatically draws power from the redundant supply if the primary supply fails. The power indicator on the front panel displays the status. Green indicates normal operation and Red indicates the redundant supply is operating.

Continued on next page

Equipment Description, Continued

Functional Description - continued

The ELLT also provides power alarms and status indications to the Laser Link II user panel or the Element Management Interface Card (EMIC). The Laser Link EMIC collects the vital signs signals from the modules in a Laser Link II Mainframe. The EMIC is the communications link between Laser Link II Mainframes and the Track Link™ Element Management System.

The Laser Link II Mainframe user panel receives information from the ELLT through the mainframe general operational alarm (GOALN). The alarm LED on the mainframe turns red if any of the following occur: redundant power supply is selected, optical output power drops by 25%, laser temperature is out of range, laser bias is out of range or the fan has failed.

Part Numbers

The table below lists the ANTEC Network Technologies part numbers for all versions of the ELLT. All are 870 MHz, dual-input units.

ELLT Designation	Part Number with SC/APC Connector	Part Number with SC/UPC Connector
ELLT-3	253368	253380
ELLT-4	253369	253381
ELLT-5	253370	253382
ELLT-6	253371	253383
ELLT-7	253372	253384
ELLT-8	253373	253385
ELLT-9	253374	253386
ELLT-10	253375	253387
ELLT-11	253376	253388
ELLT-12	253377	253389
ELLT-13	253378	253390
ELLT-14	253379	253391

Equipment Specifications

Overview

This section describes specifications of the ELLT.

Optical Specifications

The tables below list optical specifications.

Characteristic	Specification
Output power	See table below
Connector return loss	≥65 dB SC/APC ≥55 dB SC/UPC
Wavelength	1310 ±10 nm

	Output Power	Total Optical Loss (dB)															
Model	dBm	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ELLT-3	2-4	55	54	53	52	51											
ELLT-4	3-5		55	54	53	52	51										
ELLT-5	4-6			55	54	53	52	51									
ELLT-6	5-7				55	54	53	52	51								
ELLT-7	6-8					55	54	53	52	51							
ELLT-8	7-9						55	54	53	52	51						
ELLT-9	8-10							54.5	53.5	52.5	51.5	50.5					
ELLT-10	9-11								54.5	53.5	52.5	51.5	50.5				
ELLT-11	10-12									54.5	53.5	52.5	51.5	50.5			
ELLT-12	11-13										54	53	52	51	50		
ELLT-13	12-14											54	53	52	51	50	
ELLT-14	12-15												54	53	52	51	50

Notes for table above:

- CTB -70 dBc
- CSO -65 dBc
- XMOD -65 dBc
- Total path loss equals 0.5 dB passive connector loss with the balance of all fiber loss at 0.35 dB/km
- Referenced load is 80 NTSC channels
- Performance measured in accordance with NCTA practices using unmodulated CW carriers.

Continued on next page

Equipment Specifications, Continued

RF Specifications

The table below lists RF specifications.

Characteristic	Specification
RF Bandwidth	45-870 MHz
RF Frequency Response	± 0.75 dB
RF Input Return Loss	≥16 dB
RF Input Impedance	75 Ohms
RF Input Level (broadcast signal requirement for 77 channel loading)	Series –3 through –12: 15 dBmV/channel Series –13 and –14: 16 dBmV/channel
RF Input Level (narrowcast)	44 dBmV
Isolation (narrowcast to broadcast)	50 min/55 typ dB
RF Input Connector	Type F, 75-Ohm

Power Specifications

The table below lists power specifications.

Characteristic	Specification
Input power	+24 V dc provided by Laser Link II Mainframe
Power Consumption	19.8 W maximum

Physical Specifications

The table below lists physical specifications.

Characteristic	Specification
Operating temperature	32 to 122 ºF (0 to 50 ºC)
Storage Temperature	-4 to +156°F (-20 to +70°C)
Relative humidity	5 to 95%, non-condensing
Mounting	Requires Laser Link II Mainframe
Dimensions	Height: 5.25 in (13.3 cm) Width: 2.17 in (5.5 cm) Depth 13.5 in (34.3 cm)

List Of Abbreviations

Overview

The table below lists abbreviations used in this publication.

Abbreviation	Definition
cm	centimeter
CNR	Carrier to noise ratio
CSO	composite second order
CTB	composite triple beat
dB	decibel
dBm	decibels - milliwatt
dBmV	Decibel-millivolt
DC	directional coupler
DSO	discrete second order
DVM	Digital Volt Meter
ELLT	Enhanced Laser Link Transmitter
EMIC	Element Management Interface Card
EQ	equalizer
GOALRM	Global Alarm
LED	Light Emitting Diode
LLDR	Laser Link Return Path Data Receiver
mA	milliamp
mW	milliwatt
MHz	Mega Hertz
nm	nano meter
nsec	nanosecond
NPR	Noise power ratio
NTSC	National Television Standards Committee
OPT PRW	Optical Power
RF	Radio Frequency
RR	return for repair
TTL	Transistor-Transistor Logic
V	Volt

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END OF CHAPTER

Chapter 2
Installation

Overview

Introduction This chapter describes installation of the Laser Link Enhanced Transmitter (ELLT)..

In this Chapter This chapter contains these sections.

Topic	See Section
Preparing for Installation	A
Installing the ELLT	B
Care and Cleaning of Optical Connectors	C

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Section A
Preparing for Installation

Overview

Introduction This section describes preparing to install the ELLT.

In this Section This section contains the following topics.

Unpacking

Overview

ANTEC Network Technologies thoroughly inspects and carefully packs all equipment before shipment. At the time of shipment, the carrier assumes responsibility for its safe delivery; therefore, do not return damaged units to ANTEC Network Technologies.

Procedure

Unpack the transmitter according to the procedure below.

Step	Action
1	Inspect shipping carton for visible damage.
2	Open the shipping carton. (Do not destroy shipping cartons until installation is complete.)
3	Remove all packing material.
4	Inspect unit for visible damage.
5	Using packing list, check for missing items (see "How To Inventory Equipment Received").

Inspection

What to do about Visible Loss or Damage

Report visible loss or damage as follows.

NOTE

Failure to adequately describe external evidence of loss or damage may result in the carrier refusing to honor a damage claim.

Step	Action
1	Obtain a claim form from the carrier.
2	Make a note of any loss or evidence of external damage on the freight bill or receipt.
3	Have freight bill or receipt signed by the carrier's agent

What to do about Concealed Damage

Concealed damage is not apparent until after unpacking. The contents may be damaged in transit due to rough handling even though the carton may not show external damage. The carrier is responsible for hidden damage caused in transit. If you follow these instructions carefully, ANTEC Network Technologies guarantees its full support of your claims to protect you against loss from concealed damage.

Step	Action
1	If you discover damage after unpacking, make a written request for inspection by the carrier's agent within 15 days of delivery date.
2	File any claims with the carrier, not ANTEC Network Technologies.

How to Inventory Equipment

Follow this procedure to inventory equipment.

Step	Action
1	Check off each item received against the list on the packing slip included with the shipment.
2	Verify this list matches the purchase order.
3	If any items are missing, please notify ANTEC Network Technologies immediately by calling 1-800-FIBERME (in the US) or calling your local sales office (outside of the US)..
4	Return a copy of the packing slip with the missing item(s) circled.

How to Return Equipment

Overview

ANTEC Network Technologies makes every effort to ensure parts and equipment arrive in working condition. Occasionally, it may be necessary to return parts or equipment that are not in working condition.

Procedure

Follow this procedure to return equipment.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Contact ANTEC Network Technologies . . .
<table>
<tr><th>In the US</th><th>Outside the US</th></tr>
<tr><td>By phone, call 1-800-FIBERME and follow the voice prompts.</td><td>Contact your sales office for assistance. Sales offices are listed on the back cover of this manual.</td></tr>
</table></td></tr>
<tr><td>2</td><td>Tag or otherwise identify the defective equipment. Be sure to write the RR number on the tag.</td></tr>
<tr><td>3</td><td>If possible, please reference the sales order, purchase order, and date the equipment was received.</td></tr>
<tr><td>4</td><td>  CAUTION
Do not use Styrofoam chips (peanuts). Use of Styrofoam chips (peanuts) will void the warranty.
Pack the equipment in the original container and protective packing material, if possible. If the original packing material is not available, use a sturdy corrugated box and appropriate protective packing material.</td></tr>
</table>

Continued on next page

How to Return Equipment, Continued

Procedure (continued)

Step	Action
5	Be sure to include this information: Your Name Company Name Street Address City, State, Country and Zip/Postal Code Telephone Number RR Number Problem Description
6	NOTE Ship equipment prepaid. ANTEC Network Technologies will not accept freight collect. Ship equipment to ANTEC Network Technologies as directed by Customer Service.

Recommended Tools and Equipment

Tools and Equipment

These recommended tools and equipment are required for installation.

Quantity	Description
1	1/4-inch flat-blade screwdriver
1	Optical connector cleaning supplies

Section B
Installing the ELLT

Installation

Introduction

This section describes installing the ELLT.

The ELLT is shipped assembled with the exception of the 15-pin male-to-female shielded cable assembly and keys for the ON/OFF switch.

Install the ELLT in any slot, one through seven, of the mainframe. After installation, refer to the procedures in Chapter 3, Setup and Operation, to activate the ELLT.

Procedure

Follow this procedure to install the ELLT.

Step	Action
1	**CAUTION** **Static sensitive devices. Always wear a properly grounded wrist strap when working on this equipment. The shelf has a grounding jack that may be used to plug the wrist strap into. Failure to observe this caution may result in equipment damage or premature equipment failure.** Open the front cover of the mainframe by turning the front panel latch handles counterclockwise.

Continued on next page

Installation, Continued

Procedure (continued)

Step	Action
2	**NOTE** **When installing in a mainframe bay that is equipped with 14 rails, remove the rail in the "B" position to accommodate the transmitter module.** Carefully insert the transmitter into an empty slot of the LaserLink II Mainframe. Align the flange on the top and bottom of the module with the top and bottom slide rail on the mainframe.
3	Locate the bulkhead optical connector on the front panel. Clean the connector as described in Care and Cleaning of Optical Connectors.
4	Secure the transmitter in the shelf with the two captive screws located on the top of the transmitter front faceplate. The screws are provided with the module.
5	Connect the 15-pin D-type shielded cable assembly: • one end to the connector labeled POWER on the rear of the module • other end to the connector on the power distribution board of the mainframe, J1- J7.
6	Secure both cable connectors with screws.
7	Verify mainframe power is on and turn the key switch of the ELLT to the ON position.
8	Verify that the POWER, OPTICAL POWER, LASER BIAS, LASER TEMP and FAN LEDs are green before proceeding. Note that while the ELLT is stabilizing during initial startup, the LEDs may be red. The RF STATUS LED remains red until an RF input is applied.
9	Turn the key switch to the OFF position.
10	Clean outgoing fiber connector as described in Care and Cleaning of Optical Connectors.
11	Connect the ELLT to the outgoing fiber connector.
12	Continue to Chapter 3 to activate the ELLT.

Section C
Care and Cleaning of Optical Connectors

Overview

Introduction

Fiber optic connectors are cleaned at assembly, but require recleaning when the equipment is installed. Both the connector attached to the bulkhead adapter in the equipment and the jumper connector that will be attached to the bulkhead adapter must be cleaned. This section describes recommended cleaning instructions for both halves of the connection.

Guidelines

Proper care and cleaning of optical connectors is critical to equipment operation. Follow these guidelines when working with optical connectors.

DANGER

Laser light hazard. Never look into the end of an optical fiber or connector. Use an indirect image-converting device such as the "Find-R-Scope." Failure to observe this danger can result in eye damage or blindness.

- The working surfaces of optical connectors are highly-polished and designed for precision alignment. Keep them microscopically-clean and free of scratches.
- Optical power readings and signal quality can seriously degrade if optical connectors or bulkheads are mishandled or allowed to become dirty.
- Optical bulkheads on transmitters and receivers and the connector faces of optical cables are shipped with protective caps. Do not remove caps until ready to make connections.
- Do not touch unprotected optical connector faces. Do not allow dirt to touch the connector to the bulkheads. Small scratches, minute traces of dirt or skin oils can degrade signal quality.

Continued on next page

Overview, Continued

Consumable Materials

These consumable materials are required for the cleaning procedure.

- Lint Free Wipes (tissues)
- Ethyl or Isopropyl Alcohol, >91% purity (Do not use a lesser grade. Do not use common rubbing alcohol.)
- Filtered Canned Air
- Lint Free Swabs

Cleaning

Overview

This section describes cleaning two types of optical connectors:

- Connectors installed in a bulkhead adapter
- Connectors not installed in a bulkhead adapter

Cleaning of Connectors in a Bulkhead Adapter

Follow this procedure to clean optical connectors installed in an equipment bulkhead adapter.

Step	Action
1	Remove protective cap from bulkhead connector.
2	Blow dust particles from the interior surface of the bulkhead adapter using filtered canned air as follows: **CAUTION** **Be sure to hold air can in upright position so that liquid from the can cannot enter the air tube. Do not shake the can. Do not blow air directly on the fiber. Failure to observe this caution may damage the connector or cause contaminates to be placed on the surface being cleaned.**

Step	Action
1	Hold air can upright. Position the can extension tube approximately 6 in (15.3 cm) from the surface to be cleaned.
2	Gently blow into the adapter.

Continued on next page

Cleaning, Continued

Cleaning of Connectors in a Bulkhead Adapter (continued)

Step	Action
3	Swab the bulkhead adapter using a lint-free swab as follows: **CAUTION** **Do not use alcohol less than 91% pure. Do not use common rubbing alcohol. Failure to observe this caution will deposit contaminates on the fiber surface.**

Step	Action
1	Moisten a lint-free swab with >91% pure ethyl or isopropyl alcohol.
2	Insert the moistened swab into the bulkhead adapter until it touches the interior connector face.
3	Apply light pressure and rotate the swab approximately eight to ten turns.
4	Remove the swab.
5	Insert a dry lint-free swab and gently turn several times.

Continued on next page

Cleaning, Continued

Cleaning of Connectors in a Bulkhead Adapter(continued)

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>Blow dust particles from the interior surface of the bulkhead adapter using filtered canned air as follows:

CAUTION

Be sure to hold air can in upright position so that liquid from the can cannot enter the air tube. Do not shake the can. Do not blow air directly on the fiber. Failure to observe this caution may damage the connector or cause contaminates to be placed on the surface being cleaned.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Hold air can upright. Position the can extension tube approximately 6 in (15.3 cm) from the surface to be cleaned.</td></tr>
<tr><td>2</td><td>Gently blow air into the adapter.</td></tr>
</table>
</td></tr>
<tr><td>5</td><td>Insert a recently cleaned connector into the bulkhead adapter.</td></tr>
</table>

Cleaning, Continued

Cleaning of Connectors Not in a Bulkhead Adapter

Follow this procedure to clean optical connectors not installed in an equipment bulkhead adapter.

Step	Action
1	NOTE Do not reinstall protective cap after cleaning procedure. Protective caps are designed to protect the connector ferrule from damage, not to keep the connector clean. Remove protective cap from bulkhead connector.
2	**CAUTION** **Avoid contamination of lint-free wipes. Handle wipes by the edges. Discard each wipe immediately after use. Failure to observe this caution may result in contaminates on the surface being cleaned.** Place a dry lint-free wipe on a solid surface.
3	Place another dry lint-free wipe on top of the first wipe.
4	**CAUTION** **Do not use alcohol less than 91% pure. Do not use common rubbing alcohol. Failure to observe this caution will deposit contaminates on the fiber surface.** Moisten the top wipe with >91% pure ethyl or isopropyl alcohol.

Continued on next page

Cleaning, Continued

Cleaning of Connectors Not in a Bulkhead Adapter (continued)

Step	Action
5	Gently wipe the connector ferrule and endface. For APC connectors only, wipe with one continuous motion in the direction of the angle.
6	Discard the wipes.
7	Place a dry lint-free wipe on a solid surface and gently slide the connector endface across the wipe. For APC connectors only, wipe with one continuous motion in the direction of the angle.
8	Blow dust particles from connector using filtered canned air as follows: **CAUTION** **Be sure to hold air can in upright position so that liquid from the can cannot enter the air tube. Do not shake the can. Do not blow air directly on the fiber. Failure to observe this caution may damage the connector or cause contaminates to be placed on the surface being cleaned.**
9	Promptly insert connector into cleaned bulkhead adapter.

Step	Action
1	Hold air can upright. Position the can extension tube approximately 6 in (15.3 cm) from the surface to be cleaned.
2	Gently blow air across the connector end or surface to be cleaned.

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END OF CHAPTER

Chapter 3
Setup and Operation

Overview

Introduction

This chapter describes how to set up and operate the Laser Link Enhanced Transmitter (ELLT).. These procedures assume the ELLT is installed according to the procedures in Chapter 2 of this manual.

In this Chapter

This chapter contains the following sections.

Topic	See Section
Activating the ELLT	A
Controls and Indicators	B
Status Monitoring	C
Troubleshooting	D

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Section A
Activating the ELLT

Overview

Introduction

This section describes activating the ELLT. Activation consists of connecting the RF input signal to the ELLT. When the input signal is connected, the ELLT automatically produces an optical output.

In this Section

This section contains the following topics.

Broadcast RF Signal Input Check

Broadcast RF Signal Input Check

Check the broadcast RF input signal with a spectrum analyzer prior to connecting the cable to the RF IN 1 jack of the module. In the case of a 77 NTSC channel load, the laser drive level has been optimized during manufacture to achieve the specified link performance of the module with an RF input level of:

- 15 dBmV/channel (ELLT-3 through ELLT-12)
- 16 dBmV/channel (ELLT-13 and ELLT-14)

The optimized RF test port output value is 11.5 dBmV/channel for 77 channel loading and 10 dBmV/channel for 110 channel loading.

After verifying the correct RF level, connect the 75-Ohm cable to the RF input port on the rear of the ELLT.

Narrowcast RF Signal Input Check

Narrowcast RF Signal Input Check

Check the narrowcast RF input signal with a spectrum analyzer prior to connecting the cable to the RF IN 2 jack of the module

Use the front-panel test point and the spectrum analyzer to compare the narrowcast RF input level to the broadcast RF input level. If the broadcast and narrowcast signals are operated at equal carrier levels, a general guideline is that the RF input on RF IN 2 should be 27 dB above the level of the RF input on RF IN 1.

If the narrowcast input is not used, terminate it with a 75-Ohm terminator.

RF Signal Input Slope

Description

Due to the characteristic attenuation of the cable normally used between the headend combiner network and the optical transmission equipment, a sloped RF input is often obtained. The ELLT module is designed to compensate for 5 dB of cable loss (approximately 100 feet).

If a tilt is present, adjust the highest utilized frequency's RF level to the proper level shown in the RF signal input diagram and connect the 75-Ohm cable to the input port on the rear of the ELLT. Do not over tighten the cable onto the connector.

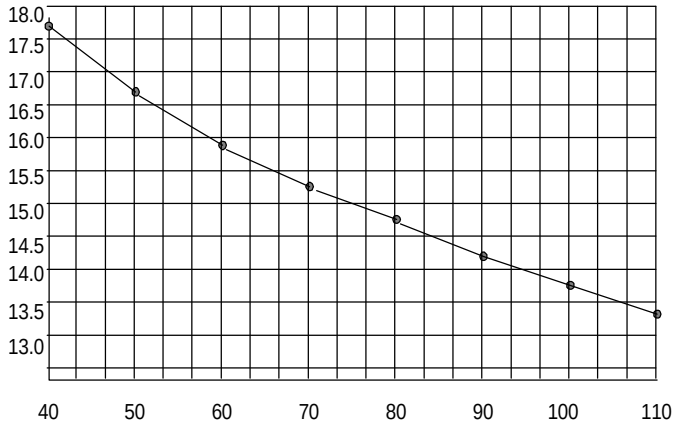
Connect the spectrum analyzer to the -30 dB RF test point on the front of the laser. Calibrate the spectrum analyzer display to establish a reference on the highest frequency carrier, set as shown in the RF signal input diagram. With the reference level established, adjust the front panel slope and gain controls to obtain a flat response at that level. Record the RF test point level for future reference and routine maintenance.

Operation with Reduced Channel Load

Description

The RF input level to the ELLT can be increased with a reduced channel load to take advantage of an improved carrier-to-noise ratio (CNR). This is often desirable in supertrunk applications using split band operation. The drive level is increased by 10 log (78/x) where x is equal to the desired channel load. The CNR is improved by approximately the same factor. Refer to the RF signal input diagram to help determine the appropriate input level to the ELLT.

RF Signal Input Diagram



Operation with Increased Channel Load

Description

For operation above 78 channels, it is necessary to reduce the input level to the ELLT to maintain the appropriate headroom below the clipping point of the laser. The reduction in level is again derived from 10 log (78/x) where x is equal to the desired channel load. Refer to the RF signal input diagram.

Section B
Controls and Indicators

Overview

Introduction This section describes the controls and indicators of the ELLT

In this Section This section contains the following topics.

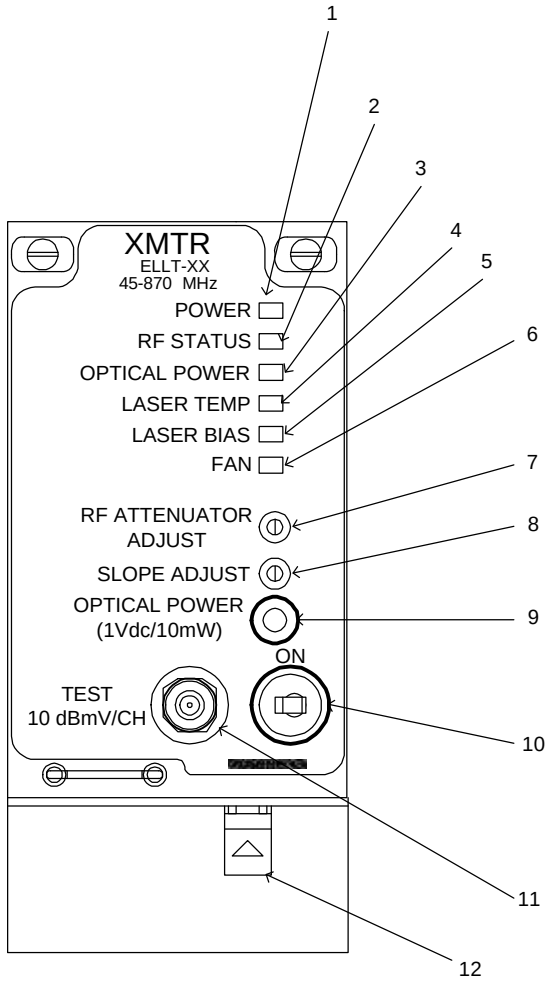
Front Panel Controls and Indicators

Overview

The front panel of the ELLT provides access to the optical and RF test points, RF attenuator and slope adjustment, LED diagnostic indicators and the optical output conector.

Diagram

This diagram shows the front panel of the ELLT.



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Front Panel Controls and Indicators, Continued

Description

The table below describes the front panel controls and indicators.

Reference	Control/Indicator	Description
1	POWER LED	Displays status of power to the ELLT: • Green indicates normal operation of the +24 V dc primary power supply • Red indicates the ELLT is powered by the +24 V dc backup supply • Off (not lit) indicates no power to the ELLT.
2	RF STATUS LED	Loss of RF alarm: • Green indicates RF level is within approximately 15 dB of the factory set level • Red indicates RF level has dropped approximately 15 dB below the factory set level.
3	OPTICAL POWER LED	• Green indicates normal operation • Red indicates optical power has dropped by >25% of initial value.
4	LASER TEMP LED	• Green indicates normal operation • Red indicates laser temperature is out of range
5	LASER BIAS LED	• Green indicates normal operation • Red indicates laser bias current is out of range
6	FAN LED	• Green indicates normal operation • Red indicates fan failure
7	RF ATTEN ADJUST	Provides ±2 dB level adjustment to the laser RF drive level
8	SLOPE ADJUST	Provides slope adjustment for up to 5 dB of cable tilt

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Front Panel Controls and Indicators, Continued

Description (continued)

Reference	Control/Indicator	Description
9	OPTICAL POWER 1 V dc/10 mW	Optical power test point. Provides a scaled dc voltage of the transmitter's optical output power. 1 V dc represents 10 mW of optical power at 1310 nm
10	OFF/ON Key Switch	Key switch turns power on and off to activate and deactivate the ELLT.
11	SC Adapter	Optical output SC/APC connector
12	TEST 10 dBmV/CH	RF test point. Provides 10 dBmV/channel at optimum drive level for 110 NTSC channel loading and 11.5 dBmV/channel at 77 NTSC channel loading.

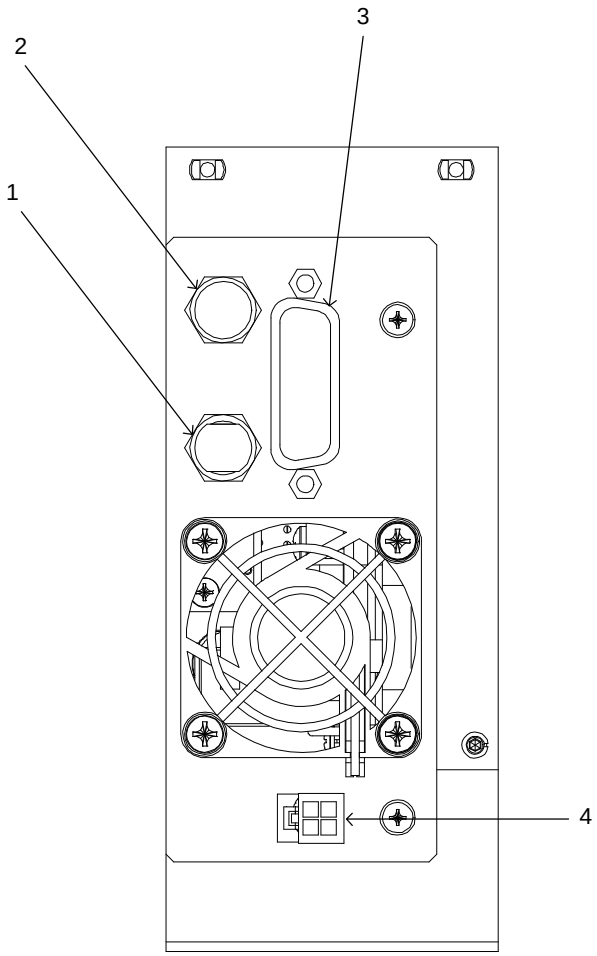
Rear Panel Connectors

Overview

The rear panel of the ELLT provides access to the RF input connector and the power interface.

Diagram

This diagram shows the rear panel of the ELLT.



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Rear Panel Connectors Continued

Description The table below describes the rear panel connectors.

Reference	Control/Indicator	Description
1	RF IN 2	Narrowcast RF input F-type connector
2	RF IN 1	Broadcast RF input F-type connector
3	POWER	15-pin D-type connector. Provides power and alarm connector to the LaserLink II mainframe power distribution board. • Pin 1 - GND • Pin 2 - NC • Pin 3 - NC • Pin 4 - GOALN (general alarm) • Pin 5 - Redundant power alarm • Pin 6 - +24 V dc supply A • Pin 7 - +24 V dc supply B • Pin 8 - GND • Pin 9 - NC • Pin 10 - NC • Pin 11 - Optical output power calibrated 1 V/10 mW • Pin 12 - Laser bias current calibrated 1 V/50 mA • Pin 13 - LIM current limit alarm • Pin 14 - +24 V dc supply A • Pin 15 - GND
4	FAN	4-pin connector. Allows fan removal.

Section C
Status Monitoring

Overview

Introduction

This section describes status monitoring for the ELLT.

In addition to the front-panel LEDs, the ELLT's vital parameters are also provided to the mainframe EMIC or user panel and to the mainframe telemetry port. Depending on the configuration purchased, the mainframe is shipped with either the EMIC or the user panel installed. An EMIC upgrade kit is available. Refer to the LaserLink II Mainframe manual.

In this Section

This section contains the following topics.

User Panel

Description

The LaserLink user panel receives information from the ELLT through the mainframe's general operation alarm, GOALN. The ALARM LED on the panel will be illuminated red to signal an alarm condition for any of the modules housed in the unit (transmitters, receivers, and amplifiers).

Conditions of the ELLT that would trip this alarm include: operation by redundant power supply, laser temperature out of range, laser bias out of range, optical power output out of range (drop by 25%), and/or a fan failure.

EMIC

Description

The optional Element Management Interface Card (EMIC)

- collects the vital signs signals of the modules in a Laser Link II Mainframe
- provides the communications interface between the mainframe and the Track Link system (if used)

Parameters monitored by this system include: power supply status, +5 V dc status, optical output power, laser bias current, and laser temperature (via GOALN signal). The actual optical output power and laser bias values are provided to the user through a graphical interface.

Third Party

Description

For use with third-party network management systems, such as AM Communications and Superior Electronics products, the ELLT may be monitored via the telemetry port on the Laser Link II Mainframe. The 25-pin connector interface is located on the power distribution board and provides non-proprietary network management signals (see mainframe user manual). The telemetry alarm parameters, vital sign designation, and DB-15 connector pin numbers are provided in the table below.

Alarm Vital Sign (VS #/Pin #)	Description	Logic
#1 / 5	Redundant power alarm (RPAN)	+5 V = alarm 0 V = normal
#2 / 11	Optical output power	Analog 1 V/10 mW
#3 / 12	Laser bias current	Analog 1 V/50 mA
#4 / 4	GOALN general alarm, ±5 V dc fault, RPAN, laser temp out of range, laser bias out of range, optical power out of range, or fan alarm	+24 V = normal 0 V = alarm

Section D
Troubleshooting

Troubleshooting

Overview

The ELLT is designed for continual reliable service in a communications network. There is no recommended maintenance required to be performed on the ELLT. Routine network preventative maintenance such as monitoring performance can be achieved from the front panel diagnostics or through element management systems such as Track Link or third party providers.

Chart

Use this chart as an aid in the trouble analysis of the ELLT. If you require assistance, call ANTEC Technical Services at 1-800-FIBER ME. Technical Service is available between 8 am and 6 pm est. Twenty-four hour emergency service is available on a callback basis within 30 minutes.

Indicator	Trouble Condition	Recommended Action
Power LED red or extinguished	Power failure	Check the +24 V A and B LED status on the user panel. • If red, replace the appropriate power supply and contact Technical Services for an RR#. • If extinguished, check the 15-pin cable from the ELLT to the mainframe power distribution board for +24 V. Replace as needed. • If the cable is normal and +24 V is present, replace the ELLT and contact Technical Services for an RR#.
OPTICAL POWER LED red	Optical output power is out of range	Replace the ELLT and contact Technical Services for an RR#

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Troubleshooting, Continued

Chart (continued)

Indicator	Trouble Condition	Recommended Action
RF STATUS LED red	RF input level to the laser is out of range	Check the RF test point and verify that the RF level has dropped approximately 15 dB below the original factory set level. • If level is normal, replace the ELLT and contact Technical Services for an RR#. • If the test point verifies the RF level is low, disconnect the main RF input to the ELLT and measure the signal level. The level should match the level in the RF Signal Input diagram for the channel load applied. Correct the problem and reconnect the cable to the ELLT.
LASER TEMP LED red	Laser temperature is out of range	If the operating environment is within normal range, replace the ELLT and contact Technical Services for an RR#
LASER BIAS LED red	Laser bias current is out of range	Replace the ELLT and contact Technical Services for an RR#
FAN LED red	Fan failure	The ELLT will continue to operate properly up to 50 ºC. Replace or repair as necessary. Disconnect fan by removing fan screw and power adapter. Contact Technical Services for an RR# or replacement fan.

END OF CHAPTER

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