Laser Link® III 1310 nm Modular Optical Transmitter 45-870 MHz

Installation Booklet

Part Number 711970001

ANTEC

Please read this entire guide

Veuillez lire entièrement ce guide

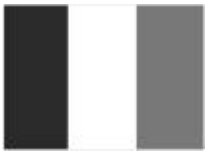
Bitte das gesamte Handbuch durchlesen

Sirvase leer completamente la presente guía

Si prega di leggere completamente questa guida

Important

Please read this entire guide before you install or operate this product. Give particular attention to all safety statements.



Important

Veuillez lire entièrement ce guide avant d'installer ou d'utiliser ce produit. Prêtez une attention particulière à toutes les règles de sécurité.

Zu beachten

Bitte lesen Sie vor Aufstellen oder Inbetriebnahme des Gerätes dieses Handbuch in seiner Gesamtheit durch. Achten Sie dabei besonders auf die Sicherheitshinweise.

Importante

Sírvase leer la presente guía antes de instalar o emplear este producto. Preste especial atención a todas los avisos de seguridad.

Importante

Prima di installare o usare questo prodotto si prega di leggere completamente questa guida, facendo particolare attenzione a tutte le dichiarazioni di sicurezza.

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Publication Date – May 19, 2000

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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 Corporation regarding this publication, refer to:

711970001
May 19, 2000

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Chapter 1
General Information

Overview

Introduction

This manual describes the installation and operation of the Laser Link® III 1310 nm Modular Optical Transmitter (1310 nm Transmitter).

Manual Contents

This manual contains three chapters.

- Chapter 1 – General Information
- Chapter 2 – Installation
- Chapter 3 – Activating the 1310 nm Transmitter

How to Contact ANTEC Network Technologies

ANTEC Network Technologies Customer Service and Technical Services are ready to assist you as necessary.

Customer Service and Technical Services are available by phone Monday through Friday from 8 a.m. to 6 p.m. eastern standard time. During non-business hours, leave a voice message to page an on-call Technical Services representative. Here's how to contact us.

In the USA…	**Outside the USA…**
by phone, call 1-800-FIBER-ME and follow the voice prompts. -or- by mail, write to: ANTEC Corporation Attention: Customer Service 11450 Technology Circle Duluth, GA 30097 -or- ANTEC Network Technologies Attention: Technical Services 11450 Technology Circle Duluth, GA 30097	contact your ANTEC Network Technologies sales office for assistance.

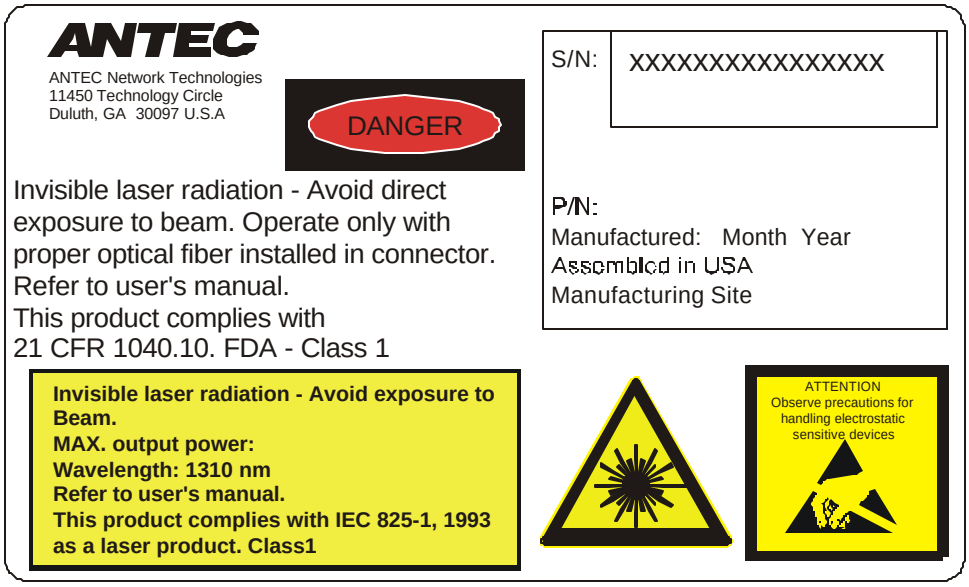
Safety

Overview

Safety of personnel is the primary concern during all procedures. Refer to the Laser Link III 1310 nm Modular Optical Transmitter Installation and Operation Manual for complete safety information.

Labels

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



Equipment Description

Overview

The 1310 nm Transmitter 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.

The medium and high power products fit into broader area and longer link budget applications such as headend consolidations.

Product features are provided in the following table.

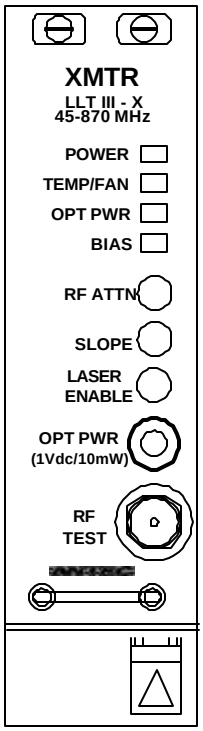
Product	Feature
Front Panel Accessible Test Points	• Optical Output Power 1 V dc/10 mW • Laser Drive Level (labeled RF Test) 10 dBmV/channel at 110 channel NTSC input
Front Panel Accessible Controls	• Power On/Off (Laser Enable) Latching type switch • Slope 0-5 dB, 45-870 MHz • Attenuation Adjust ±2 dB min.
Front Panel Accessible Indicators	• Green/Red POWER LED • Green/Red/(Amber, if applicable) TEMP/FAN LED • Green/Red OPT PWR LED • Green/Red BIAS LED
Front Panel Accessible Optical Interface	• SC/UPC • SC/APC • E2000
Monitoring and Control	• Compatible with either Laser Link Mainframe III or II

Continued on next page

Equipment Description, Continued

Physical Description

The 1310 nm Transmitter is a half-width module designed for Laser Link Mainframes. Refer to the diagram for an identification view of the 1310 nm Transmitter.



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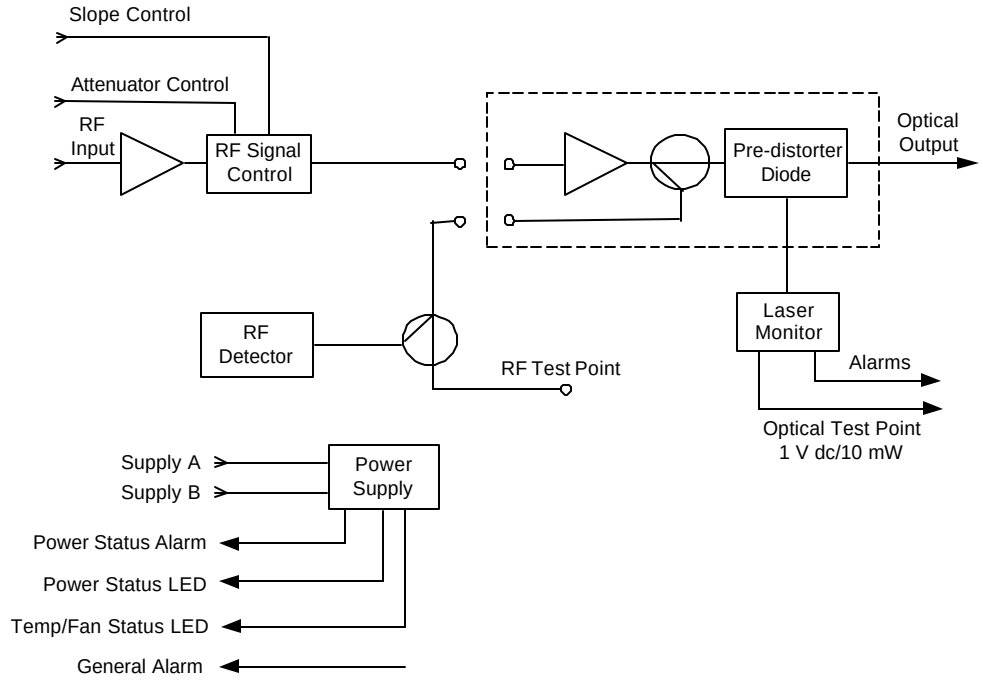
Equipment Description, Continued

Functional Description

The 1310 nm Transmitter has one RF input and one optical output. A block diagram of the 1310 nm Transmitter is shown below.



There are thirteen versions of the 1310 nm Transmitter, designated with product codes LLT III-3 through LLT III-15. The product codes refer to different versions of the 1310 nm Transmitter with different optical specifications. The dash number refers to the loss of the optical link. For example, LLT III-7 is intended for a link with 7 dB of loss. Refer to the specification tables for details. All are available with either an SC/APC, an SC/UPC or an E2000 connector.

Continued on next page

Equipment Description, Continued

Functional Description (continued)

RF input levels vary according to model and channel loading.

Model	Channel Loading	RF Input
LLT III-3 through LLT III-12	79	13 to 17 dBmV/ch
	96	12.25 to 16.25 dBmV/ch
	112	11.5 to 15.5 dBmV/ch

Note: For models LLT III-13 and up, required power is increased by 1 dBmV/ch.

Optimum RF drive level varies from diode to diode, even between identical products. The RF test point is provided to enable the user to optimize the product performance. This test point is calibrated to provide 10 dBmV/ch when the input power is at the optimal level (110 NTSC channels). This level is 11.5 dBmV/channel with a reduced load of 79 NTSC channels.

The 1310 nm Transmitter also provides power alarms and status indications to the Laser Link user panel or the Element Management Interface Card (EMIC). In either case, the 1310 nm Transmitter provides information through the mainframe general operational alarm (GOALN). The ALARM LED on the user panel or EMIC will illuminate red if any of the following occur with the 1310 nm Transmitter:

- Redundant power supply is selected
- Optical output power drops by 25%
- Laser temperature is out of range
- Laser bias is out of range
- Fan has failed (if amber indicator exists, LED will illuminate amber)

If employed, the Laser Link EMIC collects the vital signs signals from the modules in the Laser Link Mainframe. The EMIC is the communications link between the Laser Link Mainframe and the Track Link™ Element Management System.

Equipment Specifications

Overview

This section describes specifications of the 1310 nm Transmitter.

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 ≥65 dB E2000
Wavelength	1310 ±20 nm

Model	Output Power dBm	Total Optical Loss (dB)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		CNR (dB)																
LLT III-3	2-4	55	54	53	52	51												
LLT III-4	3-5		55	54	53	52	51											
LLT III-5	4-6			55	54	53	52	51										
LLT III-6	5-7				55	54	53	52	51									
LLT III-7	6-8					55	54	53	52	51								
LLT III-8	7-9						55	54	53	52	51							
LLT III-9	8-10							54.5	53.5	52.5	51.5	50.5						
LLT III-10	9-11								54.5	53.5	52.5	51.5	50.5					
LLT III-11	10-12									54.5	53.5	52.5	51.5	50.5				
LLT III-12	11-13										54	53	52	51	50			
LLT III-13	12-14											54	53	52	51	50		
LLT III-14	12-15												54	53	52	51	50	
LLT III-15	13-16													54	53	52	51	50

Notes:

- CTB = -70 dBc
- CSO = -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 79 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	≥17 dB (45 to 550 MHz) ≥15 dB (550 to 870 MHz)
RF Input Impedance	75 Ohms
RF Input Level (signal requirement for 79-channel loading)	Series 3 through 12: 15 dBmV/channel Series 13 and up: 16 dBmV/channel
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 Mainframe
Power Consumption	24 W maximum

Physical Specifications

The table below lists physical specifications.

Characteristic	Specification
Operating Temperature	-4 to 150 ºF (-20 to 65 ºC)
Storage Temperature	-6.2 to +156°F (-40 to +70°C)
Relative Humidity	5 to 95%, noncondensing
Mounting	Requires Laser Link Mainframe
Dimensions Height Width Depth	 5.25 in (13.3 cm) 1.07 in (2.72 cm) 13.5 in (34.3 cm)

****END OF CHAPTER****

Chapter 2
Installation

Overview

Introduction

This chapter describes installation of the Laser Link® III 1310 nm Modular Optical Transmitter (1310 nm Transmitter).

Unpacking

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. Retain shipping carton(s) until installation is complete.
3	Remove all packing material.
4	Inspect unit for visible damage.
5	Using packing list, check for missing items.

Overview, Continued

Inspection

Follow this procedure to inspect the 1310 nm Transmitter.

What to do about Visible Damage

Report visible damage as follows.

NOTE

Failure to adequately describe visible damage may result in the carrier refusing to honor a damage claim. The carrier will supply the required form for filing such a claim.

Step	Action
1	Obtain a claim form from the carrier.
2	Make a note of any visible 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 Corporation (ANTEC) 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' s agent, **not** ANTEC Network Technologies.

Continued on next page

Overview, Continued

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, contact ANTEC Network Technologies. **In the USA…**: Call 1-800-FIBER-ME and follow the voice prompts. **Outside the USA**: Contact your ANTEC Network Technologies sales office for assistance.
4	Return a copy of the packing slip with the missing item(s) circled.

How to Return Equipment

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.

Step	Action
1	Contact ANTEC Network Technologies Technical Services to request a Return for Repair (RR) number. **In the USA…**: call 1-800-FIBER-ME and follow the voice prompts. **Outside the USA…**: contact your ANTEC Network Technologies sales office for assistance.
2	Tag or otherwise identify the defective equipment. Be sure to write the RR number on the tag.
3	If possible, reference the sales order, purchase order, and the date the equipment was received.

Continued on next page

Overview, Continued

Procedure (continued)

Step	Action
4	**CAUTION** **Do not use Styrofoam chips (peanuts). Use of Styrofoam chips 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 packing material.
5	Include the following information: Your Name Company Name Street Address City, State, Country and Zip/Postal Code Telephone Number RR Number Problem Description
6	Ship equipment as directed by ANTEC Network Technologies Technical Services. **NOTE** ANTEC Network Technologies will not accept freight that is shipped collect. Be sure to ship all items prepaid.

Installation

Overview

This section describes installing the 1310 nm Transmitter.

The 1310 nm Transmitter is shipped assembled. The applicable shielded cable assembly is included.

Install the 1310 nm Transmitter in any slot, 1 through 14, of the mainframe. After installation, refer to the procedures in Chapter 3, Activating the 1310 nm Transmitter, to activate the 1310 nm Transmitter.

Procedure

Follow this procedure to install the 1310 nm Transmitter. Note that the RF input cable is not installed in this procedure. Do not install the RF input cable until you perform the setup procedure in chapter 3.

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 in the wrist strap. 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.
2	Carefully insert the transmitter into an empty slot of the Laser Link Mainframe. Align the flange on the top and bottom of the module with the top and bottom slide rail on the mainframe.
3	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.
4	Locate the bulkhead optical connector on the front panel. Clean the connector.

Continued on next page

Installation, Continued

Procedure (continued)

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>5</td><td>Determine in which mainframe the 1310 nm Transmitter is being installed.
<table>
<tr><th>If…</th><th>Then…</th></tr>
<tr><td>Laser Link II Mainframe</td><td>go to Step 6.</td></tr>
<tr><td>Laser Link III Mainframe</td><td>go to Step 7.</td></tr>
</table></td></tr>
<tr><td>6</td><td>For a Laser Link II Mainframe, connect a 26 to 15-pin D-type shielded cable adapter assembly by following the steps below.
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>On the rear of the module connect the 26-pin end to the connector labeled POWER by depressing the side tabs of the quick release latch mechanism.</td></tr>
<tr><td>2</td><td>Connect the 15-pin end to the connector on the power distribution board of the mainframe that corresponds to the module slot J1A-J7B (half-width modular bays). Secure the connector with screws.</td></tr>
</table></td></tr>
<tr><td>7</td><td>For a Laser Link III Mainframe, connect a 26 to 26-pin D-type shielded cable adapter assembly by following the steps below.
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>On the rear of the module connect the smaller 26-pin end to the connector labeled POWER by depressing the side tabs of the quick release latch mechanism.</td></tr>
<tr><td>2</td><td>Connect the other 26-pin end to the connector on the power distribution board of the mainframe that corresponds to the module slot, J1A-J7B (half-width modular bays). Secure the connector with screws.</td></tr>
</table></td></tr>
</table>

Continued on next page

Installation, Continued

Procedure (continued)

Step	Action
8	Verify mainframe power is on and press recessed latching switch (LASER ENABLE) to activate the 1310 nm Transmitter.
9	Verify that the POWER, TEMP/FAN, OPT PWR and BIAS LEDs are green before proceeding. Note that while the 1310 nm Transmitter is stabilizing during initial startup, the LEDs may be red.
10	Press recessed latching switch (LASER ENABLE) to deactivate the 1310 nm Transmitter.
11	Clean outgoing fiber connector.
12	**NOTE** Do not connect the RF input cable yet. Connect the 1310 nm Transmitter to the outgoing fiber connector.
13	Continue to chapter 3 to activate the 1310 nm Transmitter.

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****END OF CHAPTER****

Chapter 3
Activating the 1310 nm Transmitter

Overview

Introduction

This chapter describes how to activate the Laser Link ® III 1310 nm Modular Optical Transmitter (1310 nm Transmitter). Activation consists of connecting the RF input signal to the 1310 nm Transmitter. These procedures assume the 1310 nm Transmitter is installed according to the procedures in chapter 2 of this manual.

RF Signal Input Check

Check the RF input signal with a spectrum analyzer prior to connecting the cable to the RF input connector of the module. In the case of a 79 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 (LLT III-3 through LLT III-12)
- 16 dBmV/channel (LLT III-13 through LLT III-15)

The optimized RF test port output value is 11.5 dBmV/channel for 79-channel loading and 10 dBmV/channel for 110-channel loading.

Procedure

Connect the cable according to the following procedure.

Step	Action
1	Verify the correct RF level.
2	Connect the 75-Ohm cable to the RF input port on the rear of the 1310 nm Transmitter.

Continued on next page

Overview, Continued

RF Signal Input Slope

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 1310 nm Transmitter module is designed to compensate for 5 dB of cable loss (approximately 100 feet).

Procedure

If a tilt is present, adjust the highest utilized frequency 's RF level to the proper level shown in the RF signal input diagram.

Connect the spectrum analyzer according to the following procedure.

Step	Action
1	Connect the spectrum analyzer to the RF test point on the front of the laser.
2	Using a spectrum analyzer, set a display line to establish a reference on the highest frequency carrier.
3	Adjust the front panel gain control in order that the highest frequency carrier is at the proper level (11.5 dBmV for 79 NTSC channels).
4	Adjust the slope control to obtain a flat response at the desired level across the channel bandwith.
5	Record the RF test point level for future reference and routine maintenance.

Continued on next page

Overview, Continued

Operation with Reduced Channel Load

The RF input level to the 1310 nm Transmitter 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 (79/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 1310 nm Transmitter.

RF Signal Input Diagram

Operation with Increased Channel Load

For operation above 79 channels, it is necessary to reduce the input level to the 1310 nm Transmitter to maintain the appropriate headroom below the clipping point of the laser. The reduction in level is again derived from 10 log (79/x) where x is equal to the desired channel load. Refer to the RF signal input diagram.

Controls and Indicators

Introduction

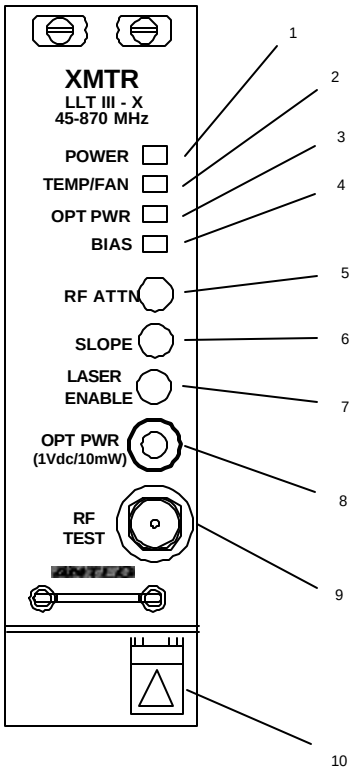
This section describes the controls and indicators of the 1310 nm Transmitter.

Front Panel Controls and Indicators

The front panel of the 1310 nm Transmitter provides access to the optical and RF test points, the RF attenuator and slope adjustment, the LED diagnostic indicators, the laser enable switch and the optical output connector.

Diagram

This diagram shows the front panel of the 1310 nm Transmitter.



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Controls and Indicators, Continued

Description This table describes the front panel controls and indicators.

<table>
<tr><th>Reference</th><th>Control/ Indicator</th><th>Description</th></tr>
<tr><td>1</td><td>POWER LED</td><td>Displays status of power to the 1310 nm Transmitter:
Green indicates normal operation of the +24 V dc primary power supply.
Red indicates the 1310 nm Transmitter is powered by the +24 V dc backup supply.
Off (not lit) indicates no power to the 1310 nm Transmitter.</td></tr>
<tr><td>2</td><td>TEMP/FAN LED</td><td>Green indicates normal operation.<table><tr><th>If…</th><th>Then…</th></tr><tr><td>no amber indicator exists,</td><td>red indicates either out of range temperature or fan failure.</td></tr><tr><td>amber indicator exists,</td><td>red indicates out of range temperature
amber indicates fan failure.</td></tr></table></td></tr>
<tr><td>3</td><td>OPT PWR LED</td><td>Green indicates normal operation.
Red indicates optical power has dropped by >25% of initial value.</td></tr>
<tr><td>4</td><td>BIAS LED</td><td>Green indicates normal operation.
Red indicates laser bias current is out of range.</td></tr>
<tr><td>5</td><td>RF ATTN</td><td>Provides ±2 dB level adjustment to the laser RF drive level.</td></tr>
<tr><td>6</td><td>SLOPE</td><td>Provides slope adjustment for up to 5 dB of cable tilt.</td></tr>
<tr><td>7</td><td>LASER ENABLE</td><td>Recessed latching switch is used to activate and deactivate the 1310 nm Transmitter.</td></tr>
<tr><td>8</td><td>OPT PWR (1 Vdc/10 mW)</td><td>Optical power test point. Provides a dc voltage scaled to the transmitter’s optical output power. 1 V dc represents 10 mW of optical power at 1310 nm.</td></tr>
<tr><td>9</td><td>RF TEST</td><td>RF test point. Provides 10 dBmV per channel at optimum drive level for 110 NTSC channel loading and 11.5 dBmV per channel at 79 NTSC channel loading.</td></tr>
<tr><td>10</td><td>Optical Interface</td><td>SC/UPC, SC/APC or E2000</td></tr>
</table>

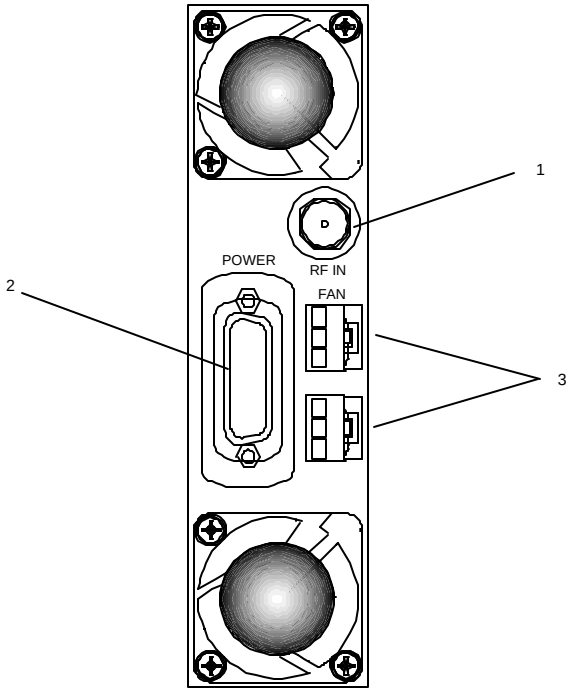
Controls and Indicators, Continued

Rear Panel Connectors

The rear panel of the 1310 nm Transmitter provides access to the RF input connector and the power interface.

Diagram

This diagram shows the rear panel of the 1310 nm Transmitter.



Description

This table describes the rear panel connectors.

Reference	Control/Indicator	Description
1	RF IN	RF input F-type connector
2	POWER	26-pin connector. Provides electrical connections to mainframe. See **Connector Pinout** for details.
3	FAN	3-pin power connector. Allows fan removal.

Continued on next page

Controls and Indicators, Continued

Connector Pinout

- Use the 26- to 26-pin cable on the Laser Link III Mainframe.
- Use the 26- to 15-pin cable on the Laser Link II Mainframe.

Module 26-Pin Mini D Ribbon		Laser Link III Mainframe 26-Pin Dense D		Laser Link II Mainframe 15-Pin Regular D	
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
P1-1	GND	P2-1	GND	P2-1	GND
P1-2	GND	P2-9	GND	P2-8	GND
P1-3	+24 V dc, A	P2-8	+24 V dc, A	P2-6	+24 V dc, A
P1-4	+24 V dc, A	P2-17	+24 V dc, A	P2-14	+24 V dc, A
P1-5	Global Alarm	P2-7	Global Alarm	P2-4	Global Alarm
P1-6	Spare 1	P2-3	Spare 1	P2-2	Spare 1
P1-7	Laser Bias Current	P2-6	Laser Bias Current	P2-12	Laser Bias Current
P1-8	Spare 2	P2-4	Spare 2	P2-3	Spare 2
P1-9	Optl output power	P2-5	Optl output power	P2-11	Optl output power
P1-10	+24 V dc, B	P2-2	+24 V dc, B	P2-7	+24 V dc, B
P1-11	+24 V dc, B	P2-11	+24 V dc, B		
P1-12	GND	P2-10	GND	P2-15	GND
P1-13	GND	P2-18	GND		
P1-14	LIM resistor	P2-13	LIM resistor	P2-13	LIM resistor
P1-15	Spare 3	P2-12	Spare 3	P2-9	Spare 3
P1-16	Address 5	P2-21	Address 5		
P1-17	Address 4	P2-22	Address 4		
P1-18	Address 3	P2-23	Address 3		
P1-19	Address 2	P2-24	Address 2		
P1-20	Address 1	P2-25	Address 1		
P1-21	Address 0	P2-26	Address 0		
P1-22	Spare 4	P2-14	Spare 4	P2-10	Spare 4
P1-23	Spare 5	P2-16	Spare 5		
P1-24	Spare 6	P2-19	Spare 6		
P1-25	Fan Return	P2-20	Fan Return		
P1-26	RPAN	P2-15	RPAN	P2-5	RPAN

****END OF CHAPTER****

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