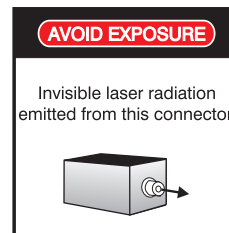
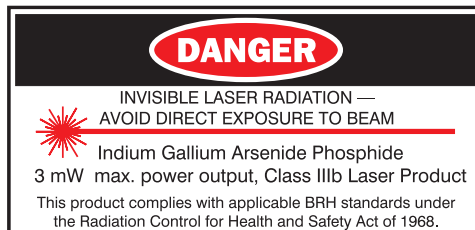




Preface

WARNING

The optical emissions from the chassis and connected optical fiber are laser-based and may present eye hazards. Follow all safety precautions



CAUTION

Caution — Use of controls or adjustments or performance procedures other than those specified herein may result in hazardous radiation exposure.

About this Manual

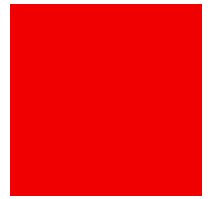
This manual explains how to configure and install the Model 2806 Limited Distance Solution (LDS) 77 Ch. Tx and its companion Model 2809 receiver. It is intended for engineers and technicians who will install the 2806T/2809R units (also see IOM2809). While this guide provides basic information on how to configure and install the units, it assumes that you as the user are familiar with:

- the installation and manipulation of electronic and fiber optic equipment
- the installation and manipulation of CATV video/audio equipment

This manual is divided into the following sections:

- Section 1, page 1: Describes the LDS transmitter, lists technical specifications, performance graphs, system applications, and ordering information.
- Section 2, page 7: Describes the installation of the LDS transmitter, connections, and safety precautions.
- Section 3, page 11: Describes the operation of the LDS CATV link, troubleshooting, and user maintenance.

A quick-reference index completes the user manual.



Related Documentation

- IOM2809: User Manual for Model 2809 LDS Receiver
- AN123: North American Television Frequencies
- AN128: Care and Feeding of Analog CATV Fiber Optic Links
- AN141: System Solutions for CATV HFC Networks
- *Fiber Optic Reference Guide, 3rd Edition.* by David R. Goff (Focal Press 2002): General theory and operation of fiber optic units.
- Web Site: Our web site, <http://www.forceinc.com> may be used to download the latest versions of this manual.

Technical Support

If you encounter any kind of problem after reading this manual, contact your local distributor or a Force, Inc. Applications Engineer. To reach technical support:

On the Web:	http://www.forceinc.com
By Phone (Monday through Friday 8:00 am to 5:00 pm EST):	USA (800) 732-5252 TEL (540) 382-0462
By Fax:	(540) 381-0392
By Email:	sales@forceinc.com

Warranty

Force, Incorporated standard products are warranted to be free from defects in materials and workmanship, meeting or exceeding factory specified performance standards for a period of three (3) years from date of purchase.

Force Obligations

Force will, at its discretion and expense, repair any defect in materials or workmanship or replace the product with a new product. Force will, upon receipt of the return, evaluate the product and communicate to the customer the nature of the problem, and determine if the claim falls under warranty coverage.

If during the warranty period, Force is unable to repair the product to the original warranted state within a reasonable time, or if subcomponents of the unit have been obsoleted or discontinued, then Force has the option to provide an equivalent unit.

Exclusions

This warranty does not extend to any product that has been damaged due to acts of God, accident, misuse, abuse, neglect, improper system design or application, improper installation, improper operation or maintenance, or connection to an improper voltage supply.

The Force warranty does not cover fuses, batteries, and lamps. Modifications or alterations of Force products (including but not limited to installation of non-Force equipment or computer programs), except as authorized by Force, will void this warranty. Removal or breaking of the seals on the product will also void the warranty. In addition, cost of repair by unauthorized persons within the warranty period of the product will not be covered by Force, Incorporated. Such repairs will void the warranty.

Force, Incorporated makes no other representation or warranty of any other kind, express or implied, with respect to the goods, whether as to merchantability, fitness for a particular purpose, or any other matter. Force, Incorporated's liability shall not include liability for any special, indirect or consequential damages, or for any damages arising from or attributable to loss of use, loss of data, loss of goodwill, or loss of anticipated or actual revenue or profit, or failure to realize expected savings, even if Force, Incorporated has been advised of the possibility of such damages. This warranty constitutes Force, Incorporated's entire liability and the customer's sole remedy for defects in material and workmanship.



Contents

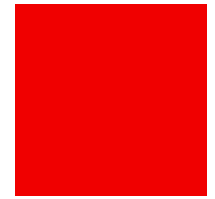
Preface	ii
Section 1 Product Technical Bulletin	1
1.1 Product Overview.....	1
1.2 FCC Notice	1
1.3 Optical, Video, Electrical Characteristics	1
1.4 Environmental and Physical Characteristics	2
1.5 Specification Notes	2
Figure 1.1 In-Band Frequency Response	2
Figure 1.2 Expanded Frequency Response	3
Figure 1.3 CNR vs. Receiver Optical Input and Channel Loading	3
Figure 1.4 Transmitter Level per Channel vs. Number of Channels	4
Figure 1.5 Transmitter Level/Channel vs. Log 10 (Number of Channels).....	4
Figure 1.6 End-to-end Link Gain.....	5
1.6 Applications.....	6
Figure 1.7 Private Network Configuration	6
1.7 Ordering Information.....	6
Section 2 Installation Instructions	7
2.1 General Installation Requirements.....	7
2.2 Standard Items Provided	7
2.3 Additional Items Required.....	7
2.4 Inspection.....	8
2.5 Module Placement.....	8
2.6 Connections	8
2.7 Unit Outline Drawing	9
Figure 2.1 CATVLinx [®] Model 2806 LDS transmitter	9



- 2.8 Safety Precautions 9
 - 2.8.1 Laser Safety Procedures 10
- 2.9 Shipping and Handling Precautions 10
- 2.10 Storing the Unit 10

- Section 3 Operating Instructions 11**
 - 3.1 Power-up and Operation 11
 - 3.2 Measuring RF Input Levels 11
 - 3.3 Performance Verification 12
 - 3.4 Cleaning 12
 - 3.4.1 Connector Cleaning 13
 - 3.4.2 Connector Handling 13
 - 3.5 Troubleshooting 14
 - 3.6 Repair Service 14

- Index 15**



Section 1 Product Technical Bulletin

1.1 Product Overview

The Force, Incorporated **CATV^{Linx}** Model 2806 Limited Distance Solution (LDS) 77 Ch. Tx is part of a low-cost system for transferring up to 77 channels of VSB/AM modulated signals over a single-mode optical fiber. The system provides 40-870 MHz of usable bandwidth for video signals stacked at 6 MHz intervals. A low loss single-mode optical fiber allows full channel loading to beyond 10 km while maintaining a good carrier-to-noise ratio. Because of its relatively small size, the Model 2806 can be mounted almost anywhere, and it is a true plug-and-play system when used with its companion receiver, the Model 2809 (see IOM2809). Together, this link provides excellent performance for many demanding applications such as broadband LANs, distance learning, and multiple data services.

1.2 FCC Notice

The Model 2806 has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions in this manual, may cause harmful interference, in which case the user must correct the interference at the user's own expense. Compliance with applicable regulations depends on the use of shielded I/O cables. The user is responsible for procuring the appropriate cables.

1.3 Optical, Video, Electrical Characteristics: @ 25 °C, SM Fiber (Note 12)

	Min.	Typ.	Max.	Units	Notes See Section 1.5
Operating Wavelength	1290	1310	1330	nm	
Optical Output Power		+4.5		dBm	
Channel Loading			77	Channels	
Bandwidth (77 Ch.)	40		870	MHz	1
Required Fiber Bandwidth	2,000			MHz	2
Input Impedance		75		Ohms	
Carrier-to-Noise Ratio (CNR)	See Figure 1.3.				3, 4,
Composite Second Order (CSO)		-57		dB	



	Min.	Typ.	Max.	Units	Notes
Composite Triple Beat (CTB)		-65		dB	See Section 1.5
Side Mode Suppression Ratio (SMSR)	30	40		dB	
Input Signal Range (per ch.)	See Figures 1.4 and 1.5				5
Backreflection Tolerance			-50	dB	6
Power Supply Voltage	120		240	V _{AC}	7
Power Supply Frequency	50		60	Hz	7
Power Supply Current		75		mA	

1.4 Environmental and Physical Characteristics

	Min.	Typ.	Max.	Units	Notes
Operating Temperature Range	0		+45	°C	8
Storage Temperature Range	-20		+70	°C	
Humidity	0		90	%	9
Weight		1.0		lbs.	
		0.45		kg	
Physical Dimensions	8.45 x 2.95 x 1.12			in.	
	215 x 75 x 29			mm	

1.5 Specification Notes

- Figure 1.1 shows the typical frequency response of a 2806T/2809R link over the specified frequency range. The gain flatness is ± 1.5 dB over this range. The flatness is typically less than ± 0.1 dB over a standard 6 MHz channel bandwidth. See Application Note AN123 for additional information on North American Television Frequencies.

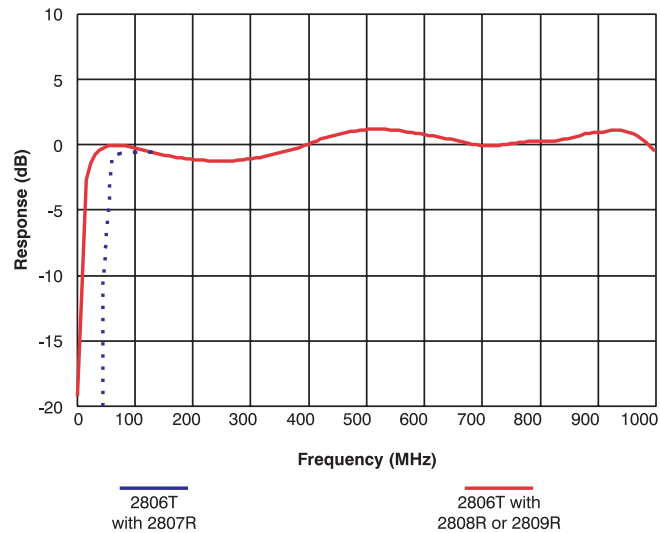


Figure 1.1 In-Band Frequency Response



Figure 1.2 shows an expanded view of the frequency response of a typical 2806T/2809R link.

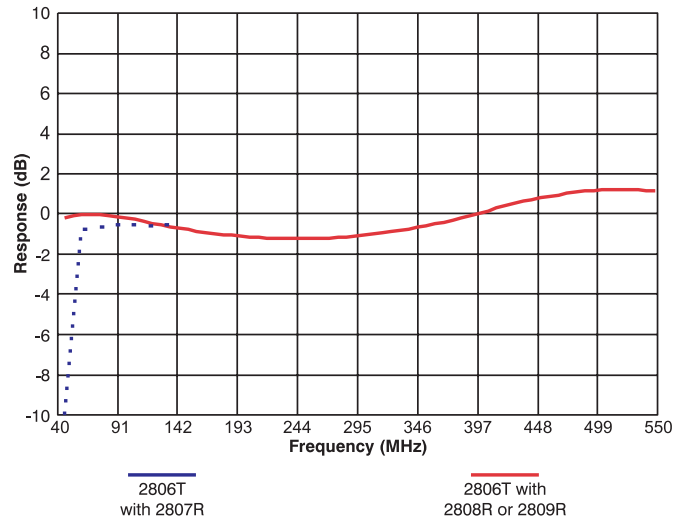


Figure 1.2 Expanded Frequency Response

- 2) Be sure to compute your fiber bandwidth (end-to-end) as well as attenuation.
- 3) The link CNR is usually specified for a received optical power of -3 dBm or more. Thus, a 2806 transmitter, with an optical output of +4.5 dBm, will provide optimal performance with up to +7.5 dB of optical loss at full channel loading. If lower channel loading is used, then the link can operate at higher optical losses and still provide exceptional CNR.
- 4) Figure 1.3 show the CNR versus received optical input power and number of channels. The horizontal axis is the amount of optical light that reaches the receiver. (It is not the loss between the transmitter and receiver.) The vertical axis shows the CNR.

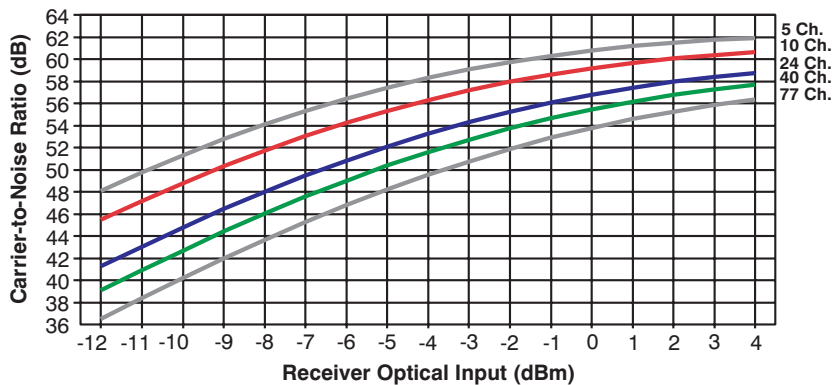


Figure 1.3 CNR vs. Receiver Optical Input and Channel Loading

Typical transmitter output is +4.5 dBm, so a received optical power of +2 dBm corresponds to an optical loss of 2.5 dB. Five curves are plotted; the top curve is the typical result when only 5 channels are transmitted through the link. It can be seen that very high CNR results and in fact the output is quite usable with receiver optical inputs as low as -12 dBm, corresponding to 16.5 dB of optical loss! As the channel loading gets higher, the maximum achievable CNR drops.

