

CONTENTS

GETTING STARTED

1550 nm PRODUCTS

1550 nm RACK MOUNTED OPTICAL TRANSMITTER	1 - 4
1550 nm NARROWCAST TRANSMITTER	5 - 8
1550 nm NARROWCAST TRANSMITTER, RETURN	9 - 12
1550 nm ERBIUM DOPED FIBER AMPLIFIER	13 - 15

1550 nm TRANSPLEX TRANSPORT SYSTEM

TRANSPLEX TRANSPORT SYSTEM	17 - 19
----------------------------	---------

1310 nm DOWNSTREAM TRANSMITTERS

1310 nm MODULAR OPTICAL TRANSMITTERS	21 - 24
1310 nm RACK MOUNTED OPTICAL TRANSMITTERS	25 - 28

UPSTREAM TRANSMITTERS (MAINFRAME MOUNTED)

LLRT	29 - 31
------	---------

UPSTREAM AND DOWNSTREAM RECEIVERS (MAINFRAME MOUNTED)

LLFR	33 - 35
LLDR	37 - 39
ELLRR	41 - 43

HEADEND PRE-AMPLIFIERS

870 MHz DUAL AMPLIFIER	45 - 47
------------------------	---------

MAINFRAMES

MAINFRAME	49 - 51
-----------	---------

HEADEND RF MANAGEMENT

RF INTEGRATOR (ACTIVES)	53 - 56
RF INTEGRATOR (PASSIVES)	57 - 60
DATA BLANKER	61 - 62

OPTICAL NODES

LLRX 100	63 - 68
LLRX 200	69 - 76
LLRX 300	77 - 83
LLRX 400	85 - 91
870 MHz PEDESTAL NODE	93 - 97

CONTENTS

BLOCK CONVERSION PRODUCTS

MULTI-BAND CONVERTER (5-42 MHz)	99 - 105
MULTI-BAND CONVERTER (5-65 MHz)	107 - 113
LLRX 400 BLOCK CONVERTER	115 - 119

SWITCHES

OPTICAL SWITCH	121 - 123
RF SWITCH	125 - 128

FIBER RECEIVER SERVICE CABLE

FRSC	129 - 131
------	-----------

MODULAR OPTICAL TESTING SOLUTION

MOTS	133 - 134
------	-----------

ELEMENT MANAGEMENT SOFTWARE

TRACK LINK™	135 - 137
-------------	-----------

TERMS AND CONDITIONS

138 - 140

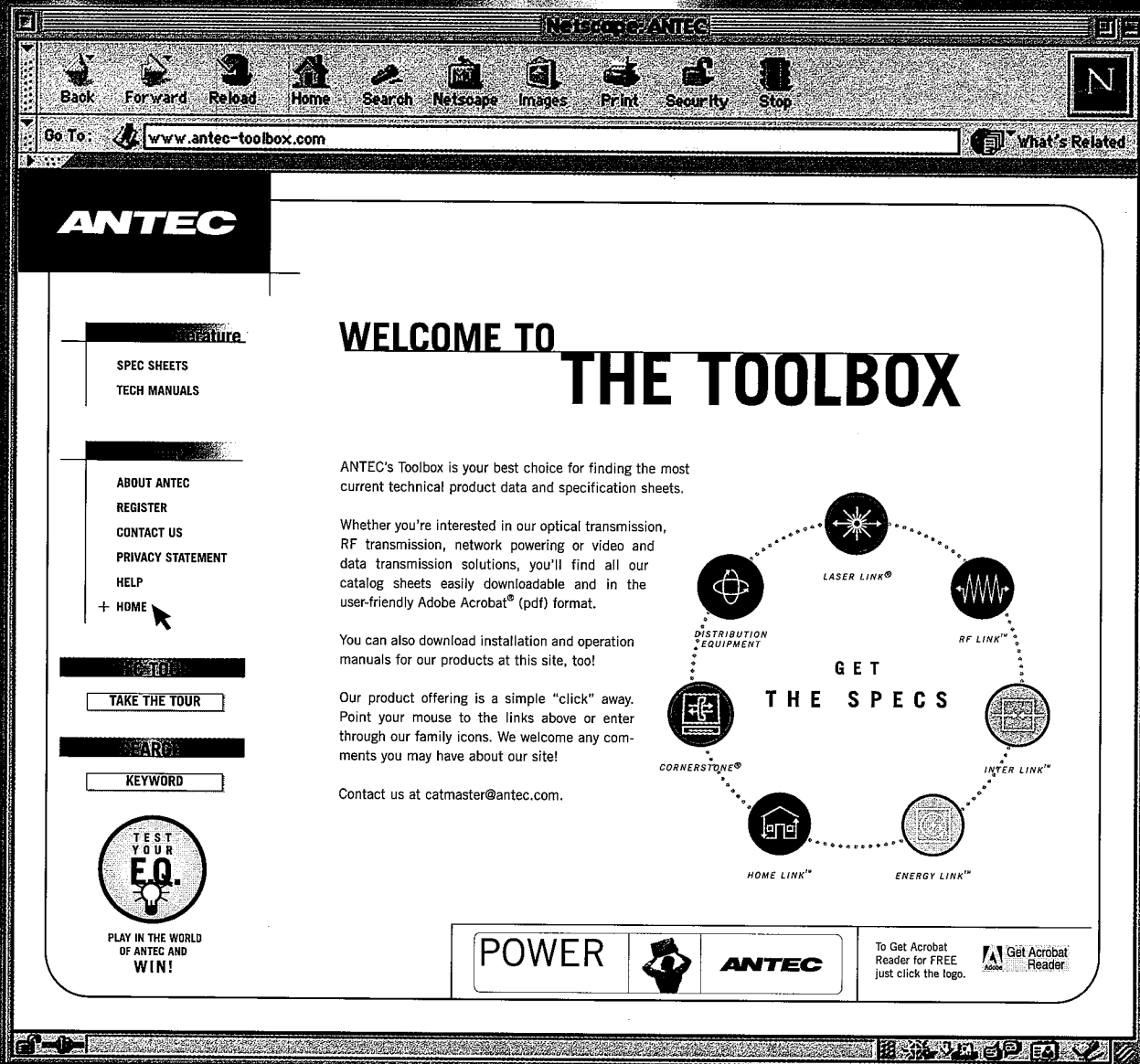
WARRANTY

141 - 142

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ANTEC Network Technologies
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GETTING STARTED

FIND EXACTLY WHAT YOU NEED...FAST!!

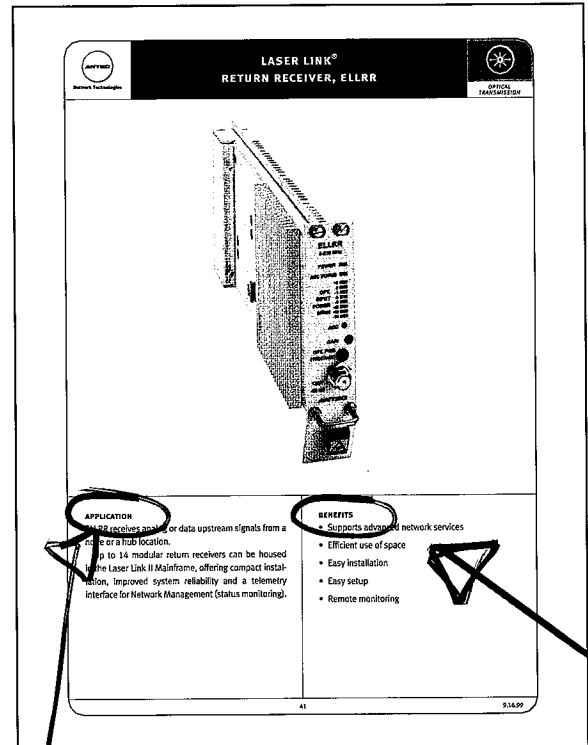
We've organized this catalog so you can easily access our technical product information. Our Laser Link® catalog has been divided into fourteen sections:

- 1550 nm Products
- 1550 nm Transplex Transport System
- 1310 nm Downstream Transmitters
- Upstream Transmitters (Mainframe Mounted)
- Upstream and Downstream Receivers (Mainframe Mounted)
- Headend Pre-amplifiers
- Mainframes
- Headend RF Management
- Optical Nodes
- Block Conversion Products
- Switches
- Fiber Receiver Service Cables
- Modular Optical Test Modules
- Element Management Software

Within each section, every product is outlined in the following categories:

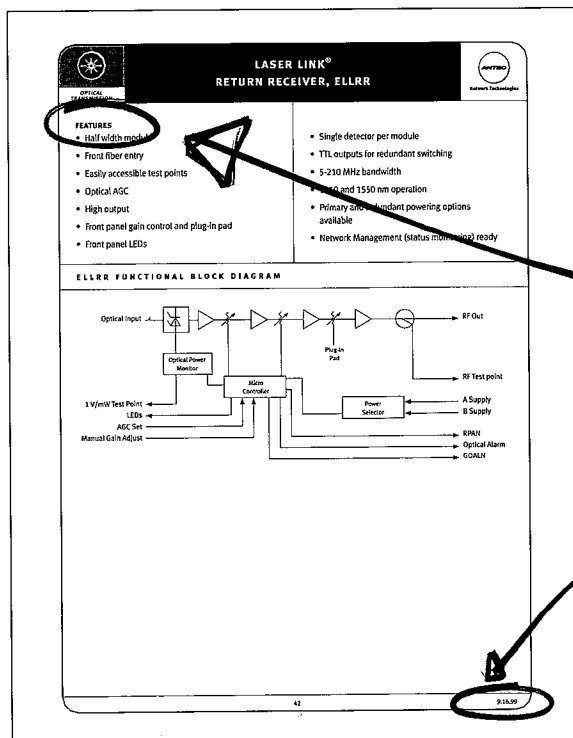
- Applications
- Benefits
- Features
- Specifications
- Ordering Information

Please take a moment and tour the selections we've included so you'll have a better idea of what to expect.



APPLICATION

What does it do? Does it fit into my network?



FEATURES

What features does it offer?

How does it differ from the competition?

Up-to-date product stamp!

LASER LINK® RETURN RECEIVER, ELLRR	
SPECIFICATIONS	
MODEL #	ELLRR
OPTICAL	
Optical Receive Power (dBm)	-17 to 3
Equivalent Input Noise Current (pA/√Hz)	7
Wavelength (nm)	1290-1600
RF	
Impedance (Ohms)	75
Return Loss (dB)	16
Output Level ¹ (dBmV)	39
Level Adjustment (dB)	25 without AGC, 19 with AGC, plus plus-in pad
AGC Range ² (dB)	+2
Frequency Response (MHz)	5-210
Ripple (Peak to Valley) (dB)	+0.75
Test Point Attenuation (dB)	-30 ±1.0
POWER	
Supply Voltage (V dc)	24
Supply Current (mA)	430
PHYSICAL	
Operating Temperature °F (°C)	32 to 122 (0 to 50)
Relative Humidity (Min-Max)	
(Non-condensing)	5-95%
Optical Connector	SC/LDPC, SC/APC, E2000
Mounting	Installs into Laser Link II Mainframe
Dimensions (H x W x D) in. (cm)	5.25 x 1.25 x 13.5 (13.33 x 2.66 x 34.29)
	1.75 (0.79)
ORDERING INFORMATION	
DESCRIPTION	PART #
Return Receiver, Laser Link II Mainframe Mounted, 5-210 MHz, Video and Data Applications, Half Width ³ , SC/LDPC	253657
Return Receiver, Laser Link II Mainframe Mounted, 5-210 MHz, Video and Data Applications, Half Width ³ , SC/APC	253658
Cable, Y Cable for use with ELLRR installed in Older Mainframes (132467, 132467-M, 252598, 880306, 252573, 252383)	252583

SPECIFICATIONS

What's the optical receive power?
How much does it weigh?

ORDERING INFORMATION

I love it! How do I order it?

BENEFITS

Why should I buy this product?

GET INSTANT PRODUCT UPDATES!

Go online for the latest, most up-to-the-minute product specification information. Our NEW online catalog — **www.antec-toolbox.com** — contains the latest versions of our product sheets in Adobe Acrobat® (PDF) format. Simply register to receive access to our always-current library of HFC equipment literature.





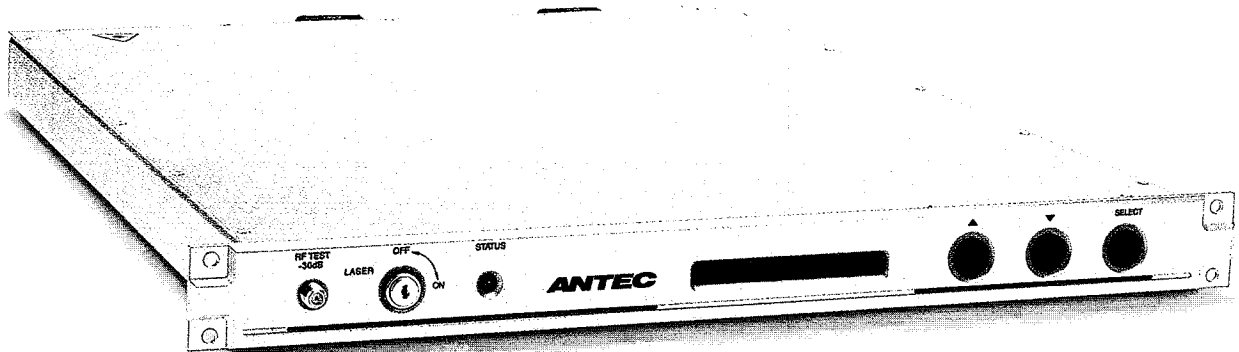
OPTICAL
TRANSMISSION

LASER LINK®

1550 nm RACK MOUNTED OPTICAL TRANSMITTER



Network Technologies



APPLICATION

Converts an RF input signal, 45-870 MHz, to an optical output at 1550 nm. Normally utilized in conjunction with ANTEC optical amplifiers to extend the fiber reach of the system.

Applications include supertrunking, hub interconnects, broadcast transmission portion of DWDM architecture and 1310/1550 nm overlays.

BENEFITS

- Drives optical signal further into the network
- Reduces capital and operating expenses
- Easy installation
- Simple optimization and configuration
- High performance
- Simplified maintenance
- Remote monitoring



Network Technologies

LASER LINK[®]

1550 nm RACK MOUNTED OPTICAL TRANSMITTER

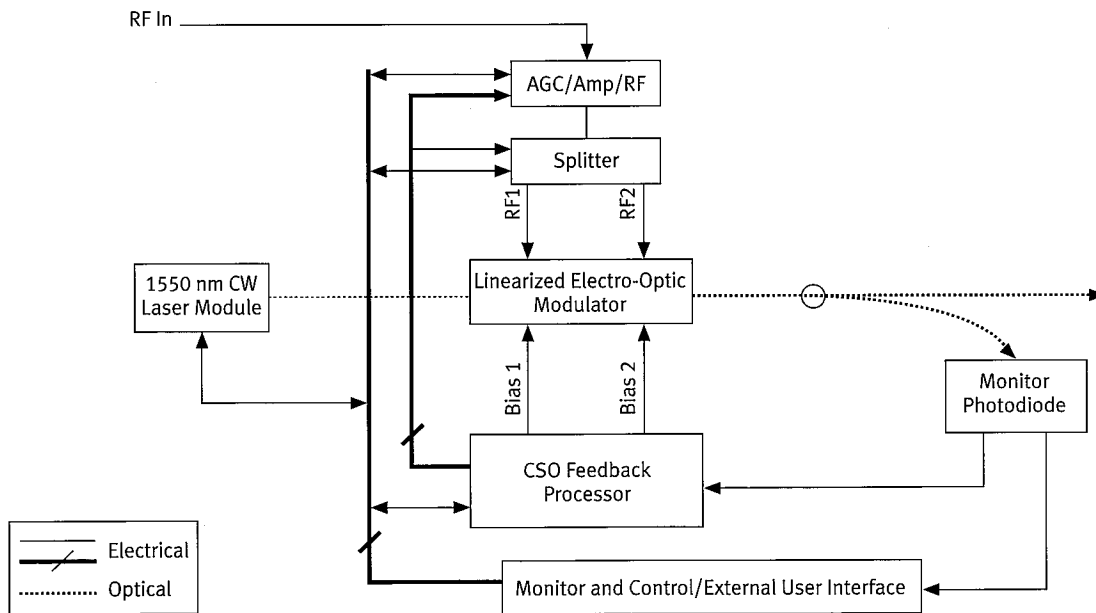


OPTICAL
TRANSMISSION

FEATURES

- Front panel LCD and LED display
- User adjustable RF input drive power and RF input test point
- Low RIN, high CNR
- Automatic gain control (AGC) available
- 750 or 870 MHz input bandwidth
- Powered by ac, dc or conditioned external dc source
- Network Management (status monitoring) ready
- Transmits within a low loss optical wavelength window

1550 nm TRANSMITTER FUNCTIONAL BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK®

1550 nm RACK MOUNTED OPTICAL TRANSMITTER



Network Technologies

SPECIFICATIONS

PART #	252952	252951	252946
OPTICAL			
Optical Power (dBm)	⋈6.0	⋈6.0	⋈6.0
Carrier to Noise Ratio¹ (dB)	53.75 in 4 MHz noise BW	53.75 in 5 MHz noise BW	61.75 in 1 MHz noise BW
Composite Second Order (dB)	⋈-65	⋈-65	⋈-65
Composite Triple Beat (dB)	⋈-65	⋈-65	⋈-65
Carrier to Noise Ratio (dB)	52 in 4 MHz noise BW²	52 in 5 MHz noise BW²	60 in 1 MHz noise BW³
Composite Second Order⁴ (dB)	⋈-65	⋈-65	⋈-65
Composite Triple Beat⁴ (dB)	⋈-65	⋈-65	⋈-65
Wavelength (nm)	1542-1546	1542-1546	1542-1546
RF			
Impedance (Ohms)	75	75	75
Return Loss			
(45-750/750-870 MHz) (Min) (dB)	16	16	16/14
Input Level (dBmV/ch.)	17-22	18-23	22-27
Frequency Response (MHz)	45-750	45-750	42-870
Ripple⁵ (dB)	±0.75	±0.75	±0.75
Test Point Attenuation (dB)	-30 ±0.5	-30 ±0.5	-30 ±0.5
RF Test Point Return Loss (Min.) (dB)	16	16	16
OMI Adjustment Range (dB)	0 to -3 in .5 increments	0 to -3 in .5 increments	0 to -3 in .5 increments
Reference Channel Loading	79 NTSC	60 PAL	42 Cenelec
POWER			
AC Input	85-264 V ac, 50-60 Hz		
DC Input (Optional)	21-60 V dc, Floating		
External Input	24 V dc Direct External Power		
Power Dissipation	⋈60 W		
PHYSICAL			
Operating Temperature °F (°C)	50 to 104 (10 to 40)		
Relative Humidity			
(Non-condensing)	5-90%		
Optical Connector⁶	SC/APC		
Mounting in. (cm)	Standard 19 (48.26) rack		
Dimensions (H x W x D) in. (cm)	1.75 x 19 x 20 (4.45 x 48.26 x 50.80)		
Weight lbs. (kg)	23 (10.35)		

Note 1: 0 dBm received power, 8 pA/sqrtHz receiver, passive attenuation. Transmitter only.

Note 2: 0 dBm received power, 8 pA/sqrtHz receiver, 5 dB NF EDFA, Min. 38.4 miles (64 km) fiber. Transmitter in a link.

Note 3: 0 dBm received power, 8 pA/sqrtHz receiver, 5 dB NF EDFA, Min. 24 miles (40 km) fiber. Transmitter in a link.

Note 4: Link condition.

Note 5: Maximum deviation from a straight line slope, 1 dB Max. up tilt.

Note 6: Additional connector options are available. Please contact a sales representative for more information.

Specifications subject to change without notice.



Network Technologies

LASER LINK®

1550 nm RACK MOUNTED OPTICAL TRANSMITTER



OPTICAL
TRANSMISSION

ORDERING INFORMATION

DESCRIPTION	PART #
Transmitter, Rack Mounted, 750 MHz, 1550 nm, Tuned for NTSC Channel Loading, Single Output Units, SC/APC	252952
Transmitter, Rack Mounted, 750 MHz, 1550 nm, Tuned for PAL Channel Loading, Single Output Units, SC/APC	252951
Transmitter, Rack Mounted, 870 MHz, 1550 nm, Tuned for CENELEC Channel Loading, Single Output Units, SC/APC	252946

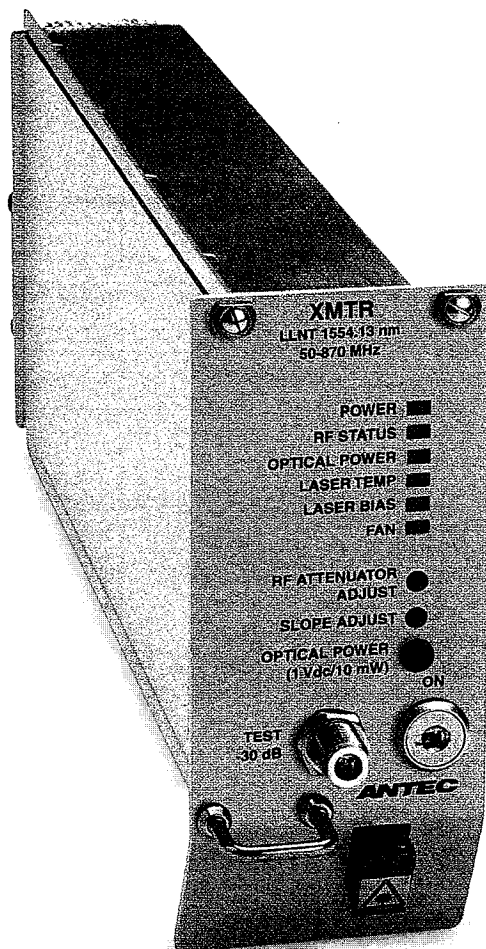


OPTICAL
TRANSMISSION

LASER LINK® 1550 nm NARROWCAST TRANSMITTER



Network Technologies



APPLICATION

Converts input RF narrowcast signal in the 50-870 MHz frequency range to an optical output with a discrete ITU grid wavelength. Multiple outputs of LLNT products (8 currently) may then be transmitted over a single fiber through utilization of wave division multiplexing.

BENEFITS

- Unparalleled link performance
- Cost effective targeted service solution
- Highly scalable
- Minimal hub space
- Reduced maintenance expense
- Simple implementation and operation



Network Technologies

LASER LINK® 1550 nm NARROWCAST TRANSMITTER

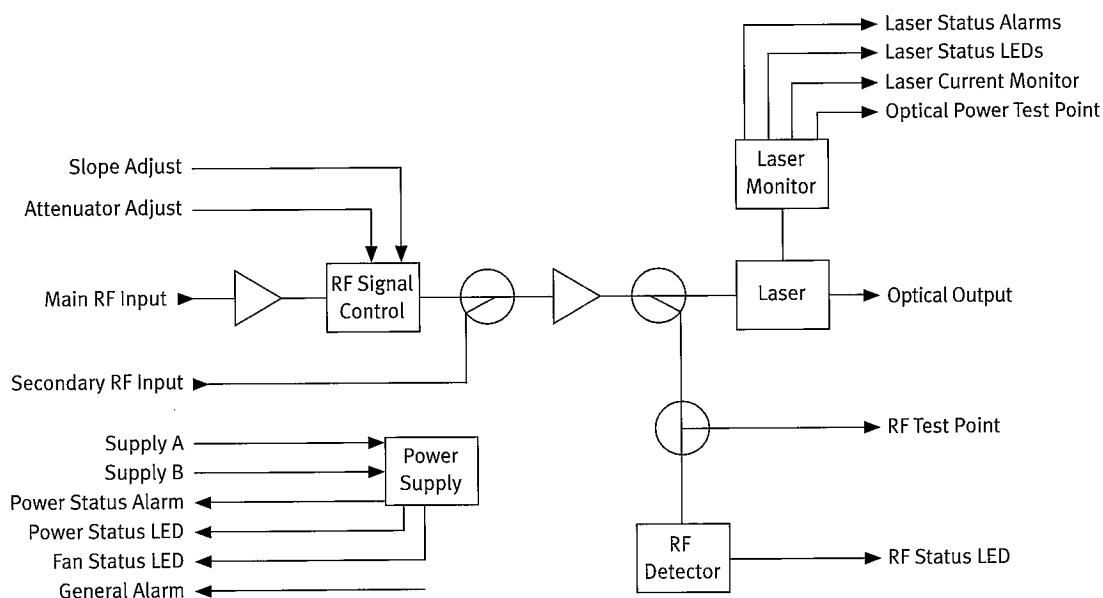


OPTICAL
TRANSMISSION

FEATURES

- Narrowcast services: Directly modulated DFB laser (DML) sources
- Wavelengths on ITU grid
- Front panel RF and optical test points
- Multiple wavelengths combined through DWDM
- Network Management (status monitoring) ready
- Front panel LEDs
- Front panel fiber interface

1550 nm NARROWCAST TRANSMITTER BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK®

1550 nm NARROWCAST TRANSMITTER



Network Technologies

SPECIFICATIONS

1550 nm NARROWCAST TRANSMITTER

OPTICAL

Optical Power (dBm)	9 ±1	
Return Loss (dB)	≥65	
Optical Cross-Talk ⁴ (dB)	≤-40	
Wavelength (nm)	1560.61 ±0.1	1541.35 ±0.1
	1558.98 ±0.1	1539.77 ±0.1
	1557.36 ±0.1	1538.19 ±0.1
	1555.75 ±0.1	1536.61 ±0.1
	1554.13 ±0.1	1535.04 ±0.1
	1552.52 ±0.1	1533.47 ±0.1
	1550.92 ±0.1	1531.90 ±0.1
	1549.32 ±0.1	1530.33 ±0.1

RF

Impedance (Ohms)	75	
Return Loss (dB) 550 MHz/550-870 MHz	≥16/≥14	
Input Level ¹ (dBmV/ch.)	17	
Level Adjustment (dB)	0 to -4	
Frequency Response (MHz)	45 to 870	
Flatness (dB)	±0.75	
Test Point Level (dB) (relative to laser drive level)		-30 ±1.0
Carrier to Noise Ratio ^{1,2} (dB)	≥48	
Composite Second Order ^{1,2,3} (dBc)	≤-50	
Composite Triple Beat ^{1,2,3} (dBc)	≤-59	

POWERING

Input Voltage (V dc)	24
Current Draw (mA)	833

PHYSICAL

Operating Temperature °F (°C)	32 to 122 (0 to 50)
Relative Humidity (Min-Max) (Non-condensing)	5-95%
Optical Connector	SC/APC; SC/UPC, E2000
Mounting	Installs into Laser Link II Mainframe
Dimensions (H x W x D) in. (cm)	5.25 x 2.17 x 13.5 (13.33 x 5.51 x 34.29)
Weight lbs. (kg)	2.9 (1.3)

Note 1: Optical modulation depth = 10% per channel.

Note 2: Link budget of 18 dB: 4 passive 14 dB (60 km) standard fiber. Receiver: LL forward receiver.

Note 3: Eight channel CW measurement: channels 79 to 86.

Note 4: 8 optical channels launched into 40 km of fiber at a power of 7 dBm.

Specifications subject to change without notice.



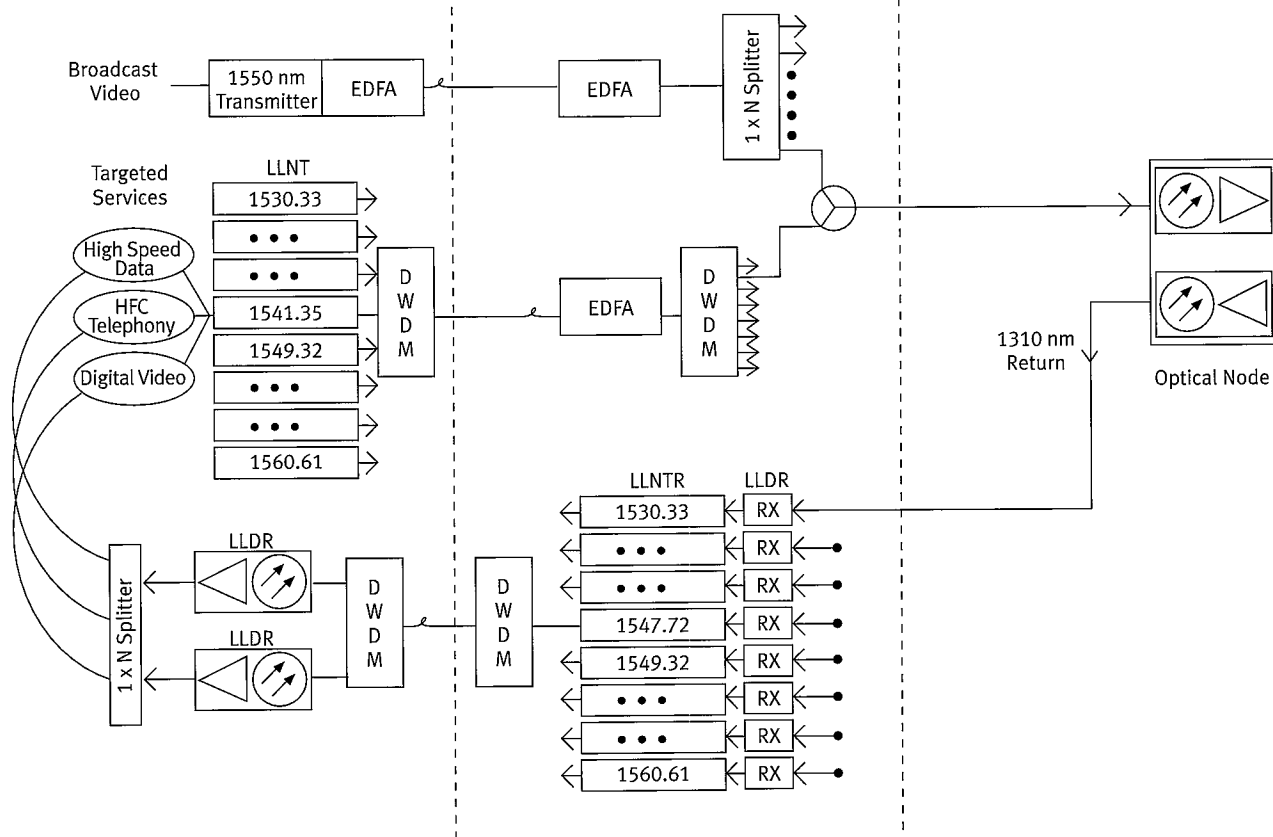
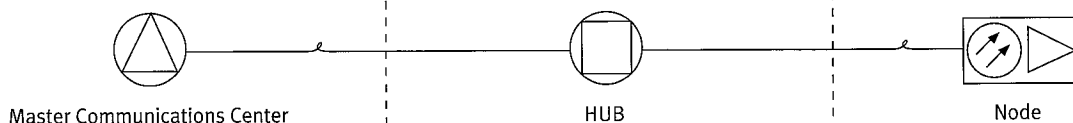
Network Technologies

LASER LINK® 1550 nm NARROWCAST TRANSMITTER



OPTICAL
TRANSMISSION

1550 nm NARROWCAST TRANSMITTER NETWORK DIAGRAM



ORDERING INFORMATION

MODEL #	POWER	PART #
LLNT	1560.61 nm	253263
LLNT	1558.98 nm	253262
LLNT	1557.36 nm	253261
LLNT	1555.75 nm	253260
LLNT	1554.13 nm	253259
LLNT	1552.52 nm	253258
LLNT	1550.92 nm	253257
LLNT	1549.52 nm	253256



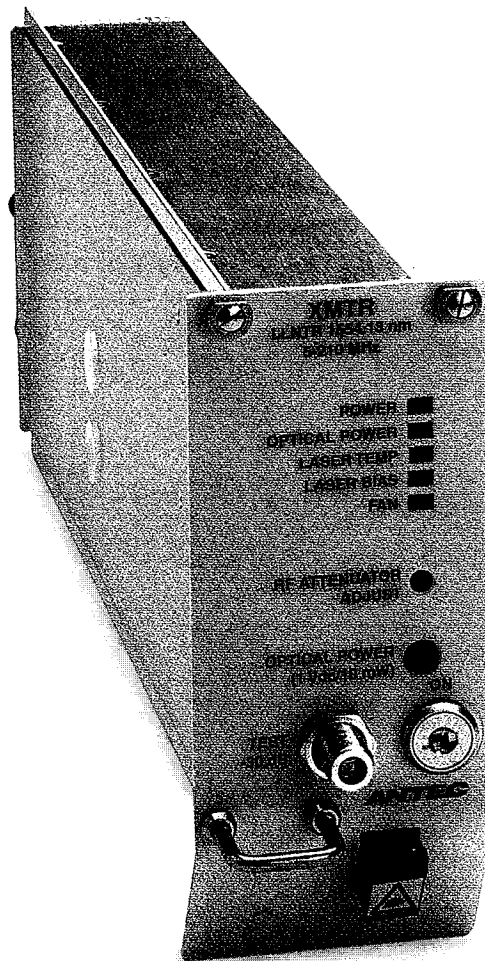
OPTICAL
TRANSMISSION

LASER LINK®

1550 nm NARROWCAST TRANSMITTER, RETURN



Network Technologies



APPLICATION

Converts RF signal inputs in the 5-210 MHz frequency range to an optical output of a discrete ITU grid wavelength. LLNTR outputs of differing wavelengths may then be combined for amplification and transport over a DWDM system.

BENEFITS

- Unparalleled link performance
- Cost effective targeted service solution
- Highly scalable
- Minimal hub space
- Reduced maintenance expense
- Simple to upgrade



Network Technologies

LASER LINK®

1550 nm NARROWCAST TRANSMITTER, RETURN

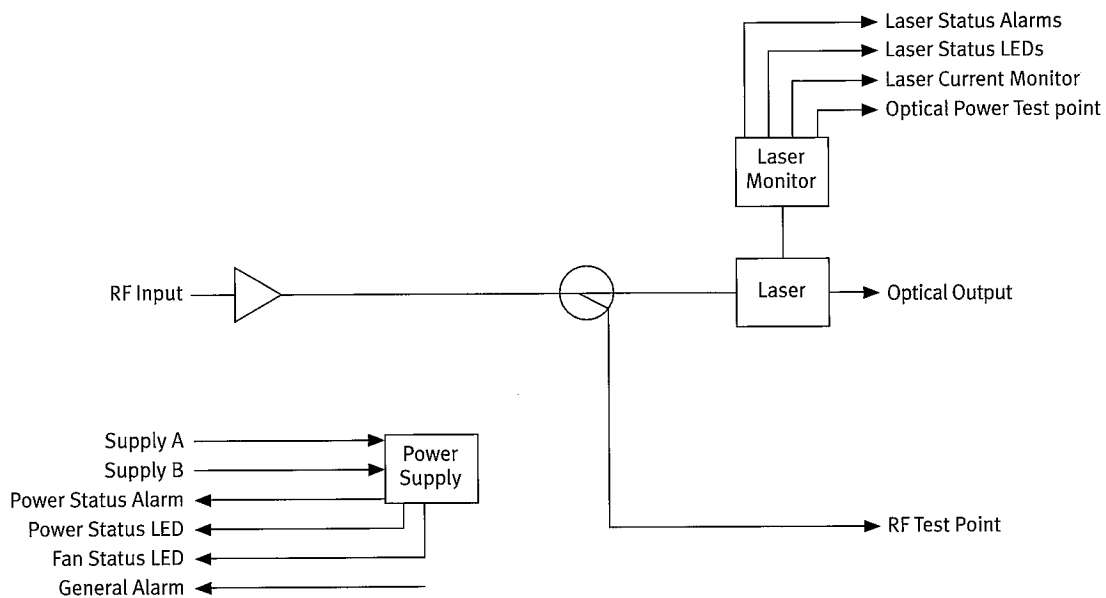


OPTICAL
TRANSMISSION

FEATURES

- Narrowcast services: directly modulated DFB laser (DML) sources
- Wavelengths on ITU grid
- Front panel RF and optical test points
- Multiple wavelengths combined through DWDM
- Network Management (status monitoring) ready
- Front panel LEDs
- Front panel fiber interface

1550 nm NARROWCAST TRANSMITTER, RETURN BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK®

1550 nm NARROWCAST TRANSMITTER, RETURN



Network Technologies

SPECIFICATIONS

1550 nm NARROWCAST TRANSMITTER, RETURN

OPTICAL

Optical Power (dBm)	9 ±1	
Return Loss (dB)	≥65	
Optical Cross-Talk ¹ (dB)	≤-40	
Wavelength (nm)	1560.61 ±0.1	1544.53 ±0.1
	1558.98 ±0.1	1542.94 ±0.1
	1557.36 ±0.1	1541.35 ±0.1
	1555.75 ±0.1	1539.77 ±0.1
	1554.13 ±0.1	1538.19 ±0.1
	1552.52 ±0.1	1536.61 ±0.1
	1550.92 ±0.1	1535.04 ±0.1
	1549.32 ±0.1	1533.47 ±0.1
	1547.72 ±0.1	1531.90 ±0.1
	1546.12 ±0.1	1530.33 ±0.1

RF

Impedance (Ohms)	75
Return Loss (dB)	≥18
Input Level ² (dBmV/ch.)	32
Frequency Response (MHz)	5-210
Flatness (dB)	±0.75
Test Point Level (dB) (relative to laser drive level)	-30 ±1.0
Carrier to Noise Ratio ^{2,3} (dB)	≥50
Composite Second Order ^{2,3} (dBc)	≤-49
Composite Triple Beat ^{2,3} (dBc)	≤-60
NPR Dynamic Range ^{3,4} (at 40 dB NPR) (dB)	15 for 35 MHz

POWERING

Input Voltage (V dc)	24
Current Draw (mA)	850

PHYSICAL

Operating Temperature °F (°C)	32 to 122 (0 to 50)
Relative Humidity (Min-Max) (Non-condensing)	5-95%
Optical Connector	SC/APC; SC/UPC, E2000
Mounting	Installs into Laser Link II Mainframe
Dimensions (H x W x D) in. (cm)	5.25 x 2.17 x 13.5 (13.33 x 5.51 x 34.29)
Weight lbs. (kg)	2.9 (1.3)

Note 1: 8 optical channels launched into 8 dB of fiber at a power of 7 dBm.

Note 2: Six CW carriers, 7, 13, 19, 25, 31 and 37 MHz, 10% OMI/CIL.

Note 3: Optical path=40 km (fiber) 6 dB (passive). Receiver: LLDR.

Note 4: Estimate input dynamic range levels for 35 MHz noise load: -45 to -29 dBmV/Hz.

Specifications subject to change without notice.



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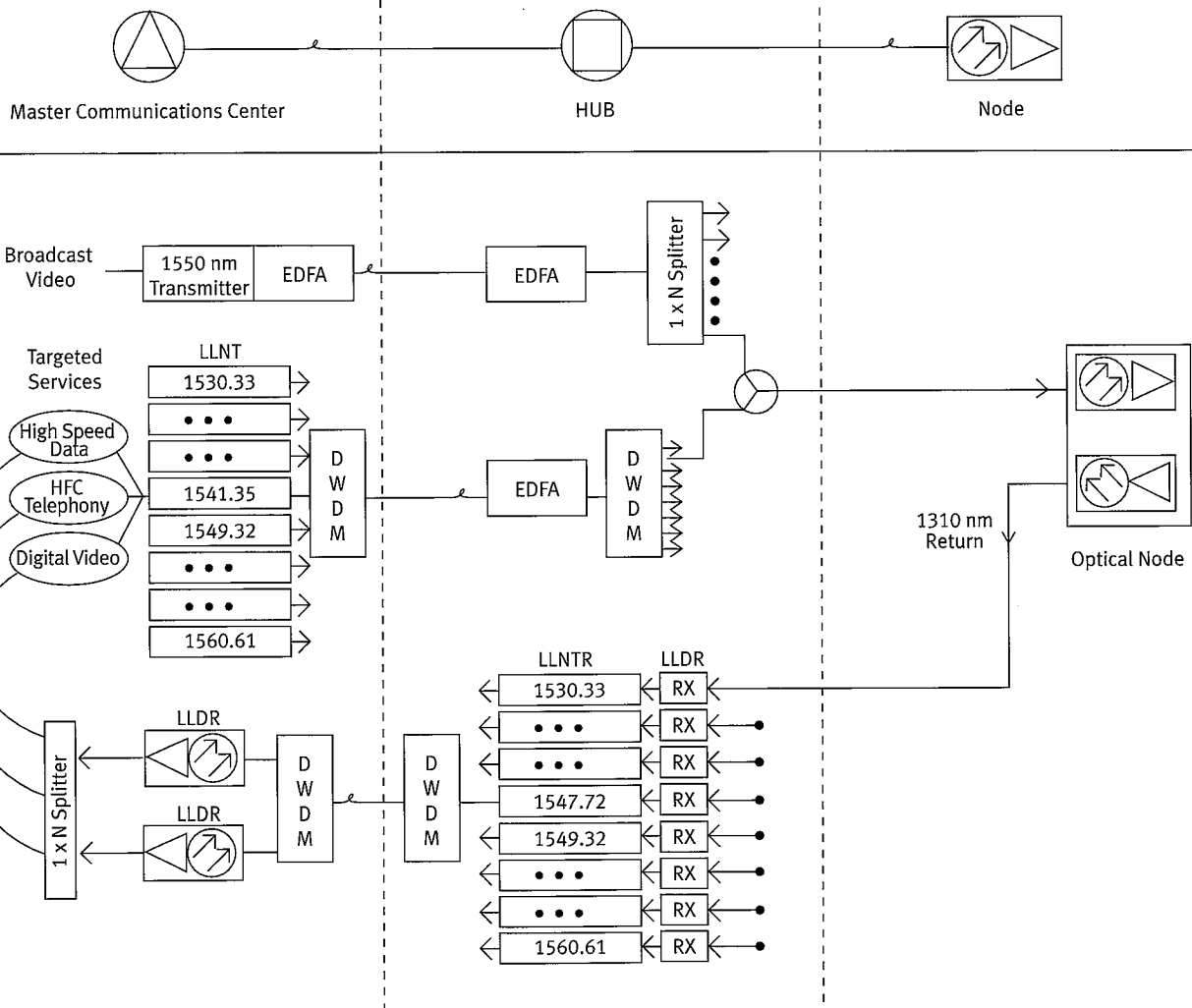
LASER LINK®

1550 nm NARROWCAST TRANSMITTER, RETURN



OPTICAL
TRANSMISSION

1550 nm NARROWCAST TRANSMITTER, RETURN NETWORK DIAGRAM



ORDERING INFORMATION

MODEL #	WAVELENGTH	PART #
LLNTR	1560.61 nm	253296
LLNTR	1558.98 nm	253297
LLNTR	1557.36 nm	253298
LLNTR	1555.75 nm	253299
LLNTR	1554.13 nm	253300
LLNTR	1552.52 nm	253301
LLNTR	1550.92 nm	253302
LLNTR	1549.32 nm	253303



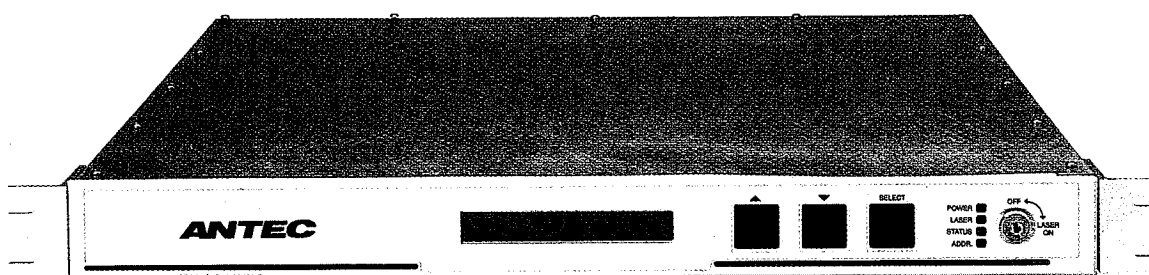
OPTICAL
TRANSMISSION

LASER LINK®

1550 nm ERBIUM DOPED FIBER AMPLIFIER



Network Technologies



APPLICATION

Amplifies 1550 nm optical signals to increase the optical transmission distance of the system. This product offering is flexible enough to perform in numerous upstream and downstream applications, including DWDM architectures, supertrunk transmission, hub interconnects and 1310/1550 nm overlays.

BENEFITS

- Drives optical signal further into the network
- Reduces capital and operating expenses
- High performance
- Allows for simple optimization and configuration
- Easy installation
- Adapts to numerous system architectures
- Remote monitoring



Network Technologies

LASER LINK[®]

1550 nm ERBIUM DOPED FIBER AMPLIFIER

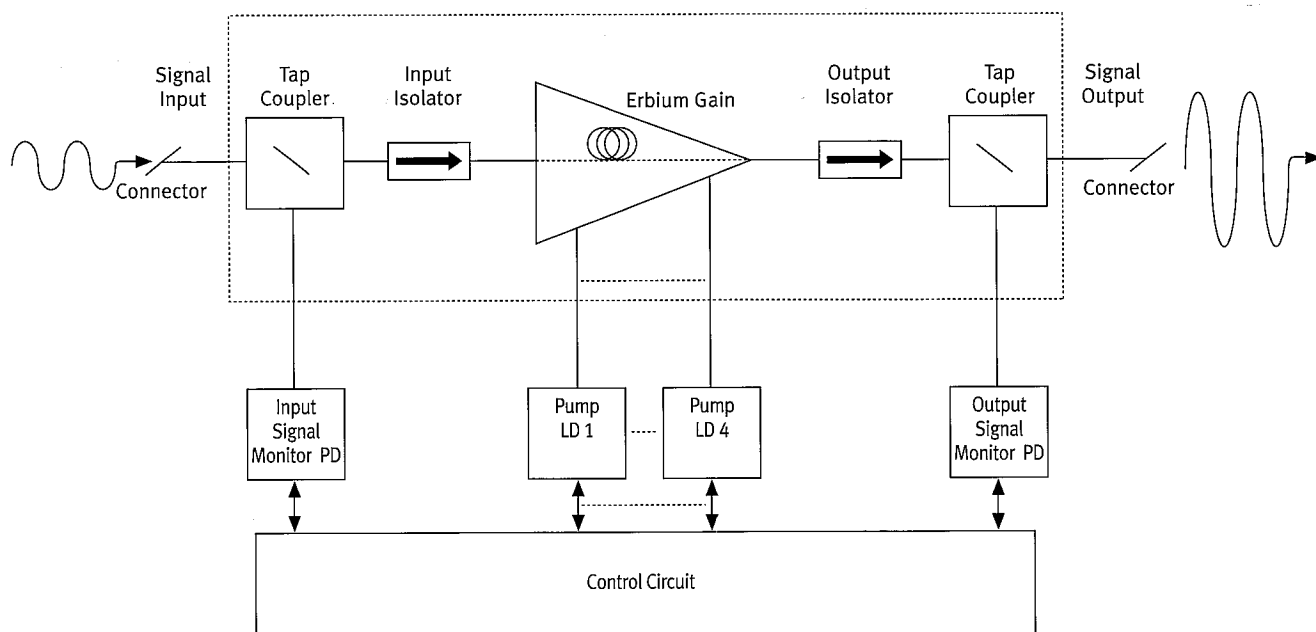


OPTICAL
TRANSMISSION

FEATURES

- Numerous optical output power options
- Front panel LCD and LED display
- User adjustable optical output power
- Low noise figure
- Powered by ac, dc or conditioned external dc source
- Network Management (status monitoring) ready
- Highly reliable, rugged design

EDFA FUNCTIONAL BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK®

1550 nm ERBIUM DOPED FIBER AMPLIFIER



Network Technologies

SPECIFICATIONS

MODEL #	LLOA14B	LLOA-17B	LLOA-20B	LLOA-22B	LLOA-24B
Noise Figure ¹ (Max) (dB)	5.0	5.0	5.3	5.3	5.8
Output Power (dBm)	14	17	20	22	24
Wavelength (nm)	1540-1560				
Polarization Sensitivity (Max) (dB)	0.2				

POWER

AC Input (V ac)	85-264, 47-440 Hz				
DC Input (V dc)	24, 21-60 Floating				
Power Consumption (Max) (watts)	20	20	39	57	75

PHYSICAL

Operating Temperature °F (°C)	32 to 122 (0 to 50)				
Relative Humidity (Non-condensing)	<95%				
Optical Connector	SC/APC, E2000				
Mounting in. (cm)	Standard 19 (48.26) rack				
Dimensions (H x W x D) in. (cm)	1.75 x 19 x 21 (4.45 x 48.26 x 53.34)				
Weight lbs. (kg)	8 (3.6)				

ORDERING INFORMATION

DESCRIPTION	PART #
Optical Amplifier, Rack Mounted, LLOA-24B with Input Isolator, SC/APC	253702
Optical Amplifier, Rack Mounted, LLOA-24B with Input Isolator, E2000	253703
Optical Amplifier, Rack Mounted, LLOA-22B with Input Isolator, E2000	253130
Optical Amplifier, Rack Mounted, LLOA-22B with Input Isolator, SC/APC	253131
Optical Amplifier, Rack Mounted, LLOA-20B with Input Isolator, E2000	253134
Optical Amplifier, Rack Mounted, LLOA-20B with Input Isolator, SC/APC	253135
Optical Amplifier, Rack Mounted, LLOA-17B with Input Isolator, E2000	253138
Optical Amplifier, Rack Mounted, LLOA-17B with Input Isolator, SC/APC	253139
Optical Amplifier, Rack Mounted, LLOA-14B with Input Isolator, E2000	253142
Optical Amplifier, Rack Mounted, LLOA-14B with Input Isolator, SC/APC	253143

Note 1: Measured at 6 dBm input power to the EDFA.

Specifications subject to change without notice.

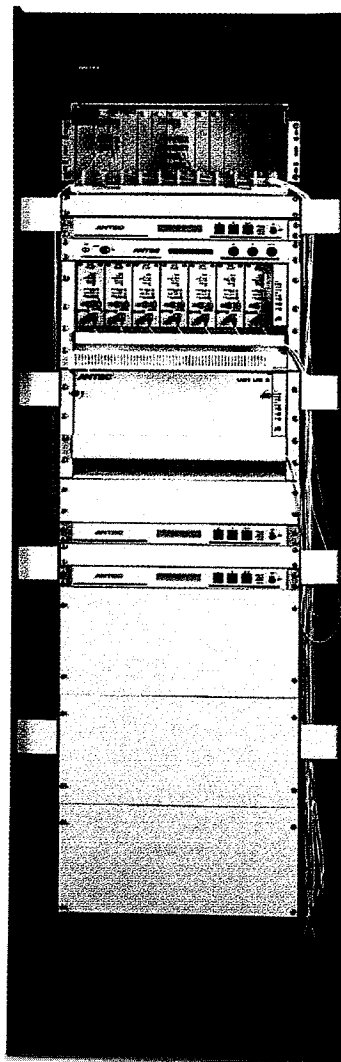


OPTICAL
TRANSMISSION

LASER LINK[®] TRANSPLEX[™] TRANSPORT SYSTEM



Network Technologies



APPLICATION

Transmits multiple digitally modulated narrowcast signals directly from master headend to a hub, then optically combines with analog broadcast signals to feed a targeted service area.

Comprised of 1550 nm externally modulated broadcast transmitters, directly modulated narrowcast transmitters, EDFA's and dense wavelength division multiplexing/demultiplexing (DWDM) filters, this Transplex Transport System provides a scalable and transparent (passive optical) network.

BENEFITS

- Unparalleled link performance
- Cost effective targeted service solution
- Highly scalable
- Minimal hub space
- Reduced maintenance expense



Network Technologies

LASER LINK[®] TRANSPLEX[™] TRANSPORT SYSTEM

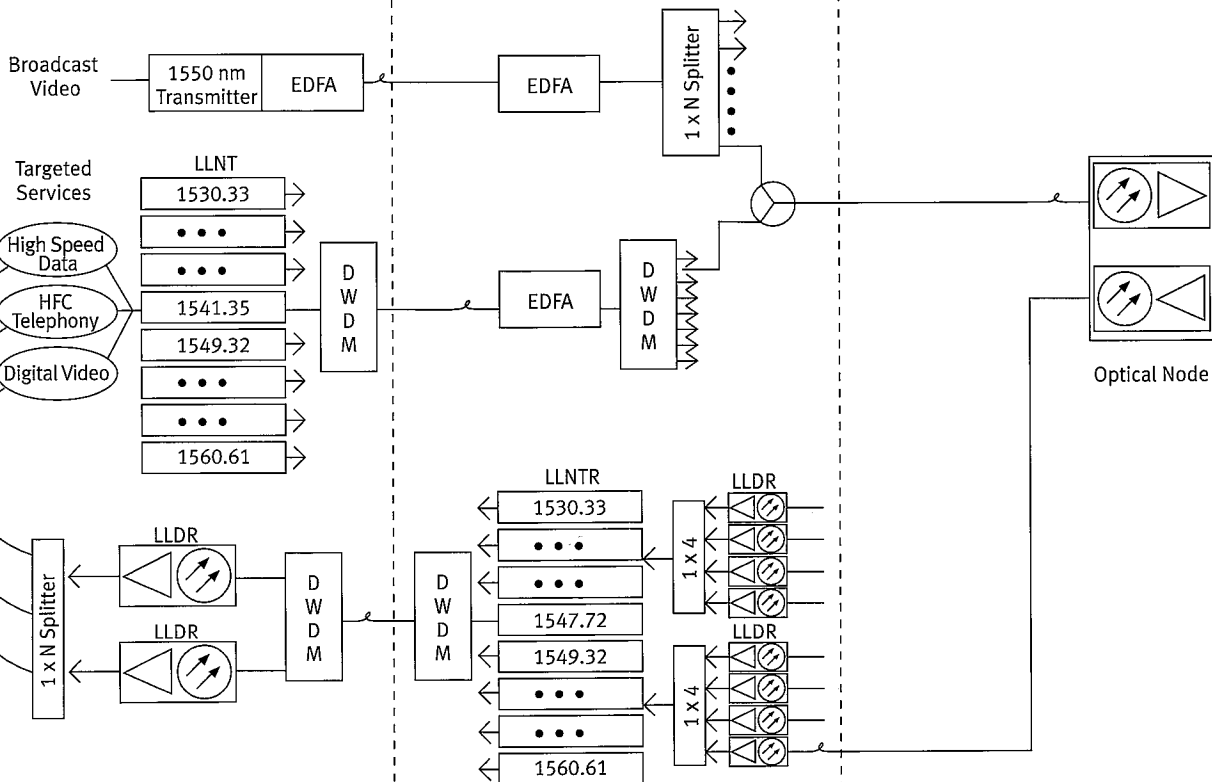
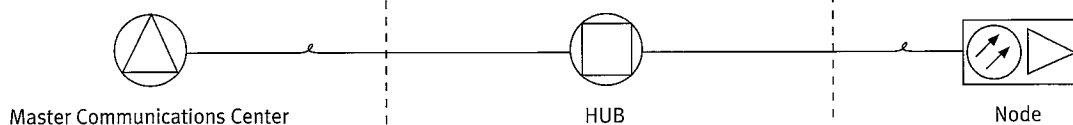


OPTICAL
TRANSMISSION

FEATURES

- Broadcast services: externally modulated transmitter (EMT)
- Narrowcast services: directly modulated DFB laser (DML) sources
- Wavelengths on ITU grid
- Temperature stable MUX/DEMUX optical filters
- Low noise EDFAs
- Single receiver
- Forward and return services use DWDM technology
- Network Management (status monitoring) ready

TRANSPLEX NETWORK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK® TRANSPLEX™ TRANSPORT SYSTEM



Network Technologies

SPECIFICATIONS

TRANSPLEX TRANSPORT SYSTEM

BROADCAST BAND LINK PERFORMANCE^{1,2}

Carrier to Noise Ratio (dB)	>51.5
Composite Second Order (dBc)	≤63
Composite Triple Beat (dBc)	≤65

NARROWCAST BAND LINK PERFORMANCE^{1,3,4}

Carrier to Noise Ratio (dB)	>43
Carrier to Interference Noise Ratio (dBc)	-40 In-band -50 Out-of-band
Optical Cross-Talk (dBc)	<-40

Note 1: Combined broadcast and narrowcast performance. Broadcast and narrowcast optical signal beams mixed on single receiver:

Broadcast received power = 1.5 dBm, narrowcast received power = -8.5 dBm.

Broadcast to narrowcast RF difference = 10 dB.

Note 2: 80 Channel NTSC CW.

Note 3: 8 QAM video channels.

Note 4: Loss budget=13 dB (fiber) 10 dB (passive).

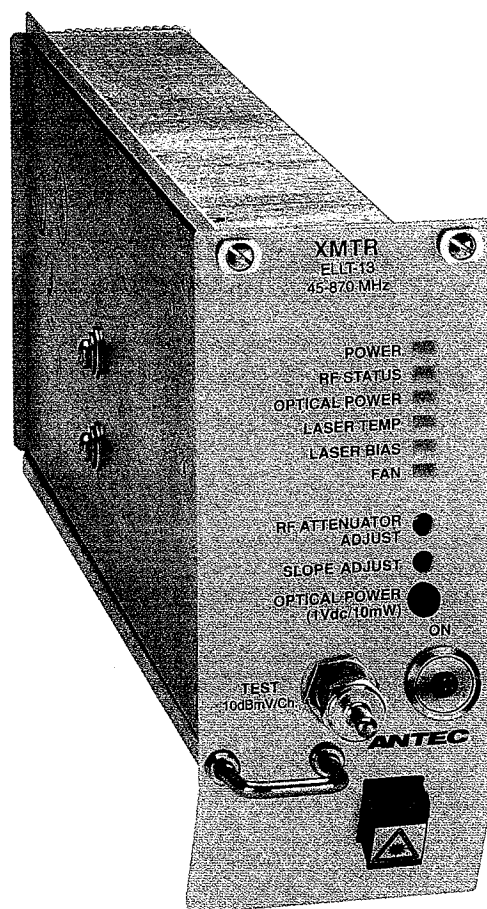


OPTICAL
TRANSMISSION

LASER LINK® 1310 nm MODULAR OPTICAL TRANSMITTERS



Network Technologies



APPLICATION

Transmits analog or digital downstream signals directly to a node or a hub location.

Up to seven modular transmitters can be housed in the Laser Link II Mainframe, offering compact installation, improved system reliability and a telemetry interface for Network Management (status monitoring).

BENEFITS

- Unsurpassed performance
- Cost effective
- Flexible configurations
- Efficient use of space
- Remote monitoring



Network Technologies

LASER LINK®

1310 nm MODULAR OPTICAL TRANSMITTERS

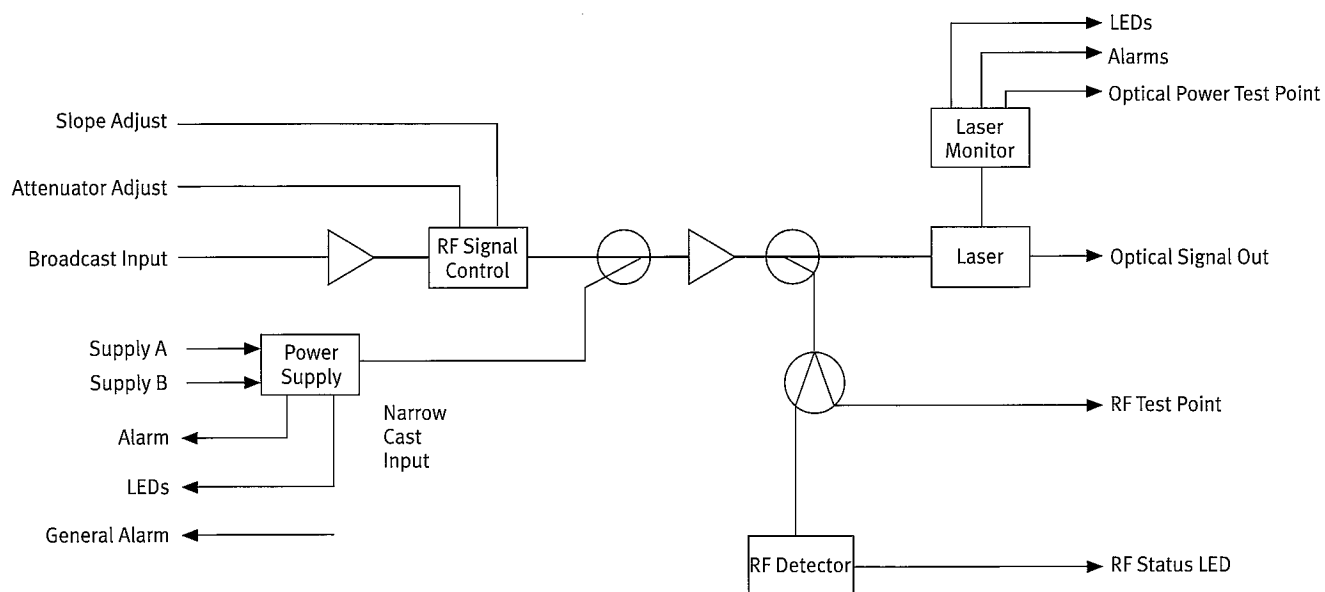


OPTICAL
TRANSMISSION

FEATURES

- Tiered performance offering – allows for selection of desired performance
- Front fiber entry connector
- Easily accessible test points
- Front panel gain and slope controls
- Front panel LEDs
- Dual RF inputs
- Transmits NTSC, PAL or digital signals
- 870 MHz input bandwidth
- 55 dB typical, narrowcast to broadcast isolation
- Primary and redundant powering options available
- Network Management (status monitoring) ready

TRANSMITTER FUNCTIONAL BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK®

1310 nm MODULAR OPTICAL TRANSMITTERS



Network Technologies

SPECIFICATIONS

DUAL INPUT 870 MHz

OPTICAL^{1,2,3}

MODEL #	OUTPUT POWER	TOTAL OPTICAL LOSS (dB)													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
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
ELLT-14	12-15												54	53	52

Composite Triple Beat (dBc)

-70

Composite Second Order (dBc)

-65

Wavelength (nm)

1310 ±10

RF

Impedance (Ohms)

75

Return Loss

(45-870 MHz) (dB)

17

Input Level

(Broadcast) (dBmV/ch.)

NTSC 79 Channel

15 (16 for Series -13 and Series -14)

NTSC 110 Channel

13.5 (14.5 for Series -13 and Series -14)

Input Level⁴

(Narrowcast) (dBmV/ch.)

NTSC 79 Channel

42 (43 for Series -13 and Series -14)

NTSC 110 Channel

40.5 (41.5 for Series 13 and Series 14)

Frequency Response (MHz)

45-870

Isolation: Narrowcast

to Broadcast

55 dB Min, 60 dB typical

(referenced to analog video levels)

Ripple (Peak to Valley) (dB)

±0.5

45-870 MHz

Test Point (dBmV/ch) (110 NTSC ch input)

10 ±0.5

Note 1: Total path loss equals 0.5 dB passive connector loss with balance of all fiber loss at 0.35 dB/km.

Note 2: Referenced load is 80 NTSC channels 200 MHz of digital loading.

Note 3: Performance measured in accordance with NCTA practices using unmodulated CW carriers.

Note 4: Referenced to analog video levels, produces level equal to broadcast level at laser module input.

Specifications subject to change without notice.



Network Technologies

LASER LINK®**1310 nm MODULAR OPTICAL TRANSMITTERS**OPTICAL
TRANSMISSION**SPECIFICATIONS****POWER**

Supply Voltage (V dc)	24
Supply Current (mA)	825

PHYSICAL

Operating Temperature °F (°C)	32 to 122 (0 to 50)
Relative Humidity (Min-Max) (Non-condensing)	15-95%
Optical Connector	SC/UPC, SC/APC
Mounting	Installs into Laser Link II Mainframe
Dimensions (H x W x D) in. (cm)	5.25 x 2.17 x 13.5 (13.33 x 5.51 x 34.29)
Weight lbs. (kg)	3.4 (1.54)

ORDERING INFORMATION

MODEL #	OPTICAL POWER	PART # SC/APC	PART # SC/UPC
Transmitter, Enhanced, Laser Link II Mainframe Mounted, 870 MHz, 1310 nm, Full Width Module			
ELLT-3	2-4	253368	253380
ELLT-4	3-5	253369	253381
ELLT-5	4-6	253370	253382
ELLT-6	5-7	253371	253383
ELLT-7	6-8	253372	253384
ELLT-8	7-9	253373	253385
ELLT-9	8-10	253374	253386
ELLT-10	9-11	253375	253387
ELLT-11	10-12	253376	253388
ELLT-12	11-13	253377	253389
ELLT-13	12-14	253378	253390
ELLT-14	12-15	253379	253391

Specifications subject to change without notice.



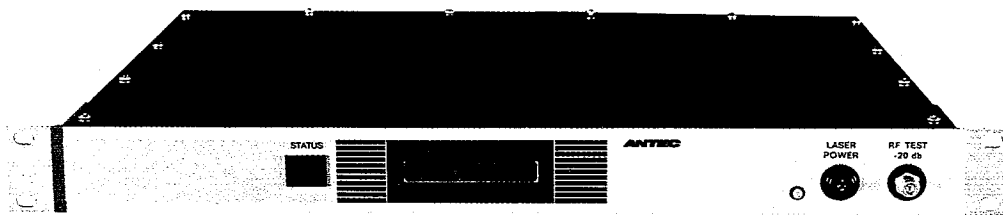
OPTICAL
TRANSMISSION

LASER LINK[®]

1310 nm RACK MOUNTED OPTICAL TRANSMITTERS



Network Technologies



APPLICATION

Transmits analog or digital downstream signals directly to a node or a hub location.

Low cost one rack unit packaging ideal for low density applications.

BENEFITS

- Low cost
- Easy installation
- Easy setup
- Simplified maintenance



Network Technologies

LASER LINK[®]

1310 nm RACK MOUNTED OPTICAL TRANSMITTERS

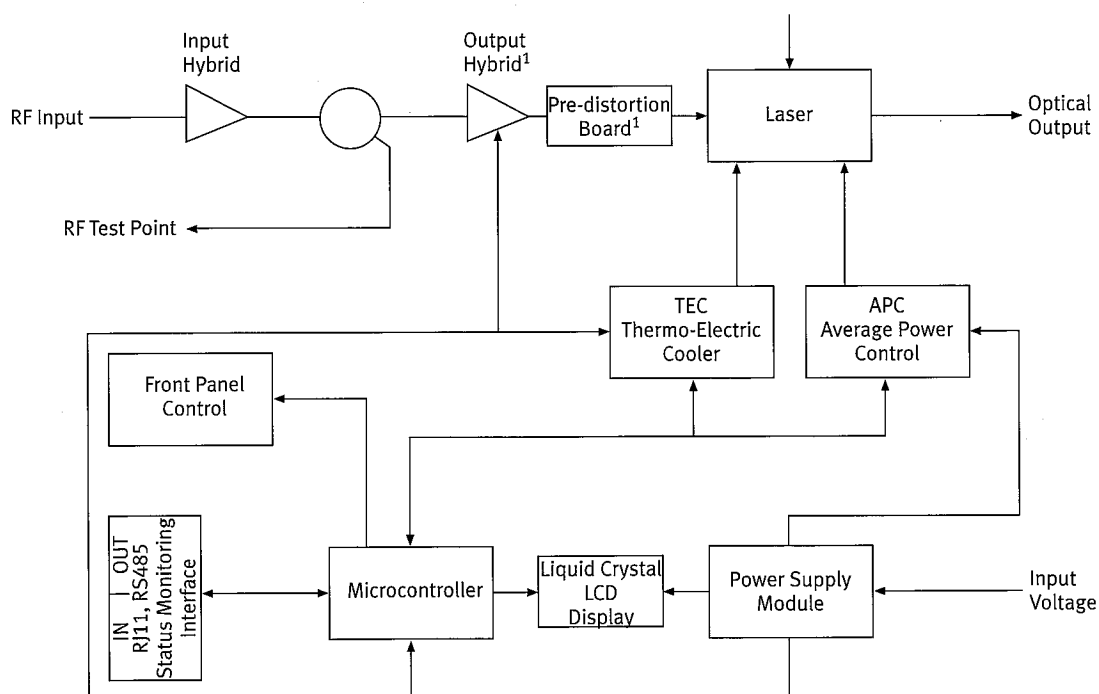


OPTICAL
TRANSMISSION

FEATURES

- Various output powers available
- Front LCD display
- Transmits NTSC, PAL or digital signals
- 750 MHz input bandwidth
- Primary and redundant powering options available
- Network Management (status monitoring) ready

TRANSMITTER FUNCTIONAL BLOCK DIAGRAM



Note 1: Not used in model # TLT-7507



OPTICAL
TRANSMISSION

LASER LINK®

1310 nm RACK MOUNTED OPTICAL TRANSMITTERS



Network Technologies

SPECIFICATIONS

MODEL #	TLT-7507	TLT-7510	TLT-7512
OPTICAL			
Optical Power (Min) (dBm)	3	8	8.5
Total Optical Loss (dB)	7	10	12
Carrier to Noise Ratio ¹ (dB)	See CNR chart	See CNR chart	See CNR chart
Composite Second Order ¹ (dBc)	62	60	60
Composite Triple Beat ¹ (dBc)	66	65	65
Wavelength (nm)	1310 ±20	1310 ±20	1310 ±20
RF			
Impedance (Ohms)	75	75	75
Return Loss (dB)	16	16	16
Input Level ² (dBmV/ch.)	15	10	10
Frequency Response (MHz)	47-750	47-750	47-750
Ripple (dB)	±.75	±.75	±.75
Test Point Attenuation (dB)	-20 ±1.0	-20 ±1.0	-20 ±1.0
Alarm Relay Contact Rating	1 amp @ 28 V dc Resistive		
POWER			
Powering ³	85-254 V ac, 50/60 Hz	85-254 V ac, 50/60 Hz	85-254 V ac, 50/60 Hz
Power Consumption @ 25° C (W)	12	24	24
PHYSICAL			
Operating Temperature Range °F (°C)	32 to 113 (0 to 45)		
Relative Humidity (Min-Max) (Non-condensing)	0-85%		
Optical Connector ⁴	SC/UPC		
Mounting in. (cm)	Standard 19 (48.26) Rack		
Dimensions (H x W x D) in. (cm)	1.75 x 19 x 14 (4.40 x 48.26 x 35.56)		
Weight lbs. (kg)	6.7 (3.0)		

CARRIER TO NOISE PERFORMANCE (dB)

OPTICAL LOSS (dB)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TLT-7507	53.4	53.0	52.6	52.2	51.8	51.4	51.0	50.5	49.8	48.9						
TLT-7510	54.7	54.7	54.7	54.4	54.1	53.7	53.2	52.6	51.9	51.1	50.2	49.2	48.0	46.8	45.4	44.0
TLT-7512	56.6	56.6	56.6	56.4	56.0	55.6	55.1	54.5	53.8	53.0	52.1	51.2	49.9	48.7	47.3	45.9

Note 1: Specifications are measured using unmodulated CW carriers NCTA recommended procedures.

Note 2: For less than 77 channels add (10 log 77/N) to RF drive input level; examples: add 2.6 dB for 42-channel operation (at same distortion levels). Variations on the RF drive level in the transmitter will be reflected in the detected RF level on a one-to-one basis.

Note 3: An optional 48 V dc input is available; the allowed range is 36 to 70 V dc.

Note 4: SC/UPC connector is standard. SC/APC and FC/APC connectors are available please contact a sales representative for more information.

Specifications subject to change without notice.



Network Technologies

LASER LINK[®]

1310 nm RACK MOUNTED OPTICAL TRANSMITTERS



OPTICAL
TRANSMISSION

ORDERING INFORMATION

DESCRIPTION	MODEL #
Transmitter, Rack Mounted, 750 MHz, 1310 nm	TLT-7507
Transmitter, Rack Mounted, 750 MHz, 1310 nm	TLT-7510
Transmitter, Rack Mounted, 750 MHz, 1310 nm	TLT-7512

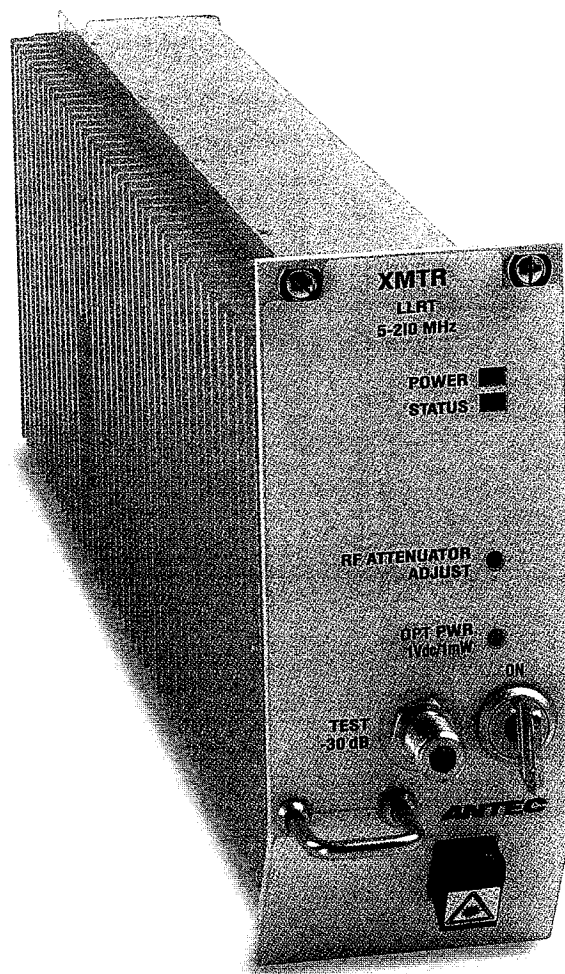


OPTICAL
TRANSMISSION

LASER LINK® RETURN TRANSMITTER, LLRT



Network Technologies



APPLICATION

Converts 5-210 MHz RF input to an optical output signal for fiber optic transmission. Up to four 5-40 MHz return bands are transmitted when used in conjunction with a Laser Link Block Converter module.

Housed in a Laser Link II Mainframe, the return transmitter can be deployed in a hub location along with forward receivers, downstream transmitters, return receivers and block converters. Other applications include video and mid- or high-split institutional network transport. It also offers compact installation, improved system reliability and a telemetry interface for Network Management (status monitoring).

BENEFITS

- Supports advanced network services
- Excellent performance
- Efficient use of space
- Easy installation
- Simple setup
- Remote monitoring



Network Technologies

LASER LINK[®]

RETURN TRANSMITTER, LLRT

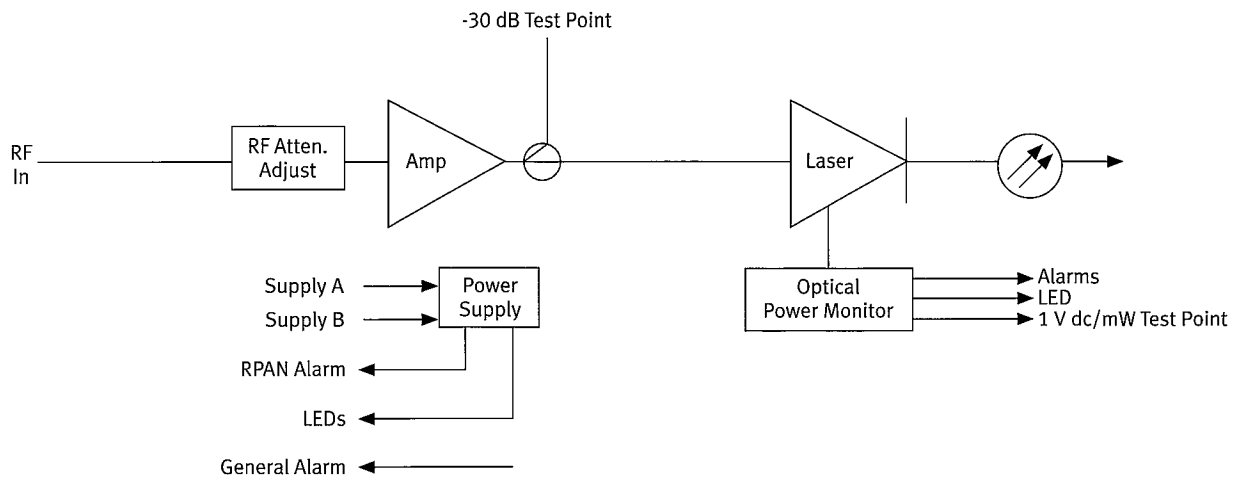


OPTICAL
TRANSMISSION

FEATURES

- Front fiber entry
- Easily accessible test points
- Front panel gain control
- Front panel LEDs
- Cooled DFB laser with 5 mW output
- 5-210 MHz bandwidth
- SC/UPC, SC/APC or FC/APC connectors
- Primary and redundant powering options available
- Network Management (status monitoring) ready

RETURN TRANSMITTER FUNCTIONAL BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK® RETURN TRANSMITTER, LLRT



Network Technologies

SPECIFICATIONS

OPTICAL

Optical Power (mW)	5.0 ±0.5
Optical Connector Return Loss (dB)	
SC/UPC	≥55
SC/APC	≥65
Wavelength (nm)	1290-1330

RF

Impedance (Ohms)	75
Return Loss (dB)	16
Input Level ¹ (dBmV/ch.)	32
Modulation Adjustment (dB)	2/-8
Frequency Response (MHz)	5-210
Ripple (dB)	±0.5
Test Point Attenuation ² (dB)	30 ±1.0
Carrier to Noise Ratio ³ (dB)	52
Composite Second Order ³ (dBc)	-62
Composite Triple Beat ³ (dBc)	-64

POWER

Supply Voltage (Vdc)	24
Supply Current (mA)	600

PHYSICAL

Operating Temperature °F (°C)	32 to 122 (0 to 50)
Relative Humidity (Min-Max)	
(Non-condensing)	5-95%
Dimensions (H x W x D) in. (cm)	5.25 x 2.25 x 11.5 (13.34 x 5.72 x 29.21)
Weight lbs. (kg)	3.4 (1.53)

ORDERING INFORMATION

DESCRIPTION	PART #
Return Transmitter, Laser Link II Mainframe Mounted, 5-210 MHz, Full Width Module, SC/UPC	253237
Return Transmitter, Laser Link II Mainframe Mounted, 5-210 MHz, Full Width Module, SC/APC	253238
Return Transmitter, Laser Link II Mainframe Mounted, 5-210 MHz, Full Width Module, FC/APC	253239

Note 1: Transmitter input 6 channels at 32 dBmV/ch, 10% OMI.

Note 2: Related to laser drive level.

Note 3: LLRT-LLDR link, 9 dB optical loss, output of LLDR 45 dBmV/ch, six video channels.

Specifications subject to change without notice.

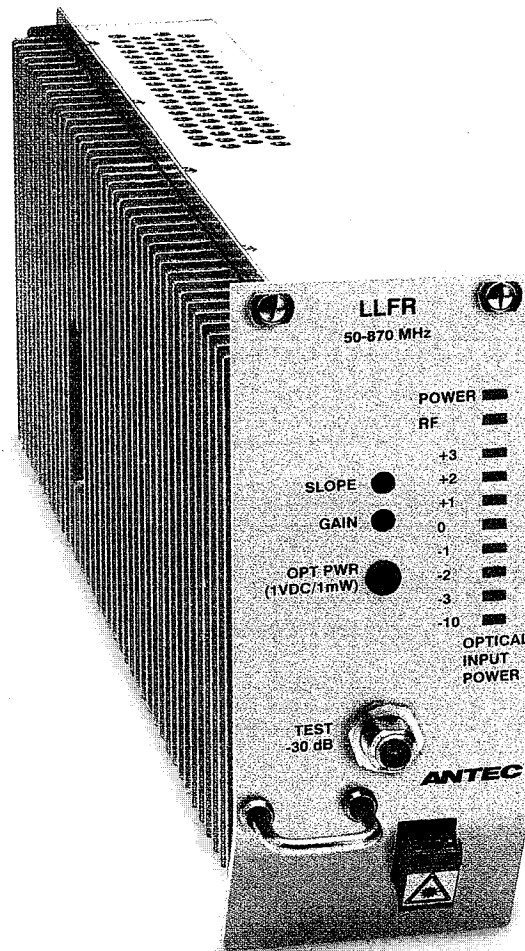


OPTICAL
TRANSMISSION

LASER LINK® FORWARD RECEIVER, LLFR



Network Technologies



APPLICATION

Receives optical signals, converts to RF and transmits it into the network.

Up to seven modular forward path receivers can be housed in the Laser Link II Mainframe, offering compact installation, improved system reliability and a telemetry interface for Network Management (status monitoring).

BENEFITS

- Efficient use of space
- Easy installation
- Easy setup
- Remote monitoring



Network Technologies

LASER LINK[®]

FORWARD RECEIVER, LLFR

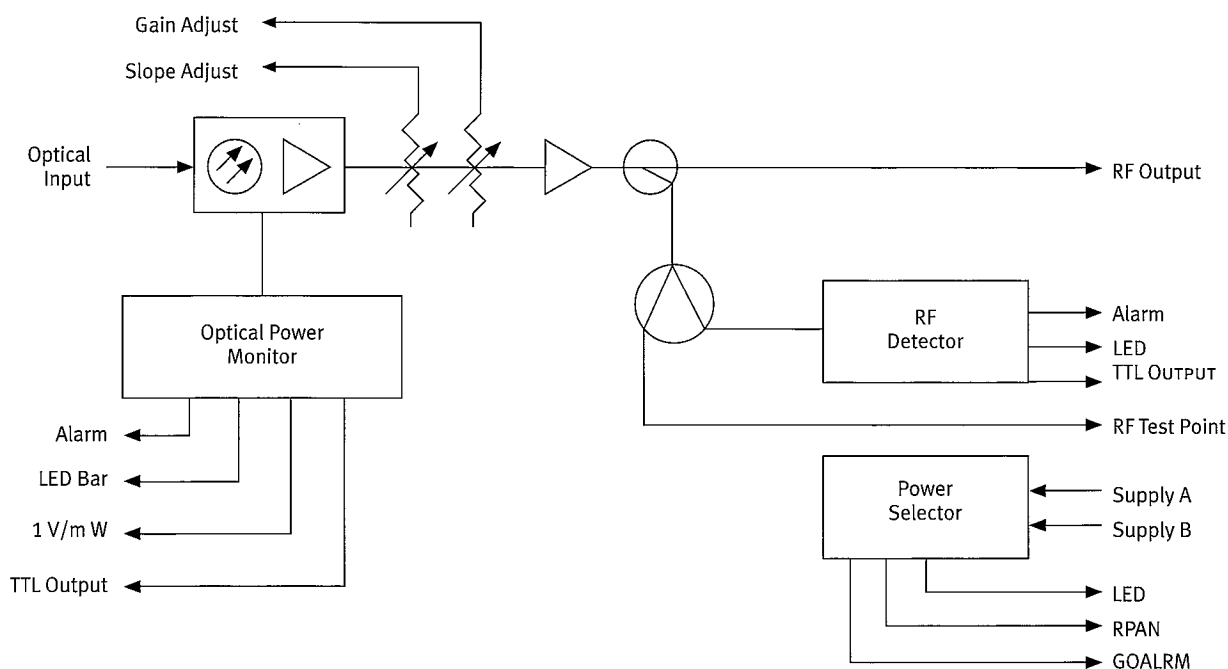


OPTICAL
TRANSMISSION

FEATURES

- Front fiber entry connector
- Easily accessible test points
- Front panel gain and slope controls
- Front panel LEDs
- 870 MHz RF bandwidth
- 1310 or 1550 nm optical input operation
- SC/UPC or SC/APC connectors
- Primary and redundant powering options available
- Network Management (status monitoring) ready

FORWARD RECEIVER FUNCTIONAL BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK® FORWARD RECEIVER, LLFR



Network Technologies

SPECIFICATIONS

PART #	252871	252872
OPTICAL		
Receive Power (Max) (dBm)	3	3
Return Loss (dB)	≥40	≥40
Equivalent Input Noise Current (pA/sqrtHz)	≤7	≤7
Wavelength (nm)	1290-1600	1290-1600
RF		
Impedance (Ohms)	75	75
Return Loss (45-550 MHz/550-870 MHz) (dB)	16/14	16/14
Output Level ¹ (dBmV)	35	35
Level Adjustment ² (dB)	6	6
Slope Adjustment (dB)	2 to -3	2 to -3
Frequency Response (MHz)	45-870	45-870
Ripple (dB)	±1.0	±1.0
Test Point Attenuation (dB)	-30 ±1.0	-30 ±1.0
POWER		
Supply Voltage (V dc)	24	
Supply Current (mA)	600	
PHYSICAL		
Operating Temperature °F (°C)	32 to 122 (0 to 50)	
Relative Humidity (Min-Max) (Non-condensing)	15-95%	
Optical Connector	SC/UPC, SC/APC	
Mounting	Installs into Laser Link II Mainframe	
Dimensions (H x W x D) in. (cm)	5.25 x 2.25 x 13.5 (13.34 x 5.72 x 34.29)	
Weight lbs. (kg)	3 (1.35)	

ORDERING INFORMATION

DESCRIPTION	PART #
Receiver, Laser Link II Mainframe Mounted, 50-870 MHz, Full Width Module, SC/UPC	252871
Receiver, Laser Link II Mainframe Mounted, 50-870 MHz, Full Width Module, SC/APC	252872

Note 1: Maximum gain, 0 dBm optical incident at 3.5% index of modulation.

Note 2: Electrically variable. Additional plug-in pad for coarse adjustment.

Assumes no contribution from the transmitter.

Specifications subject to change without notice.

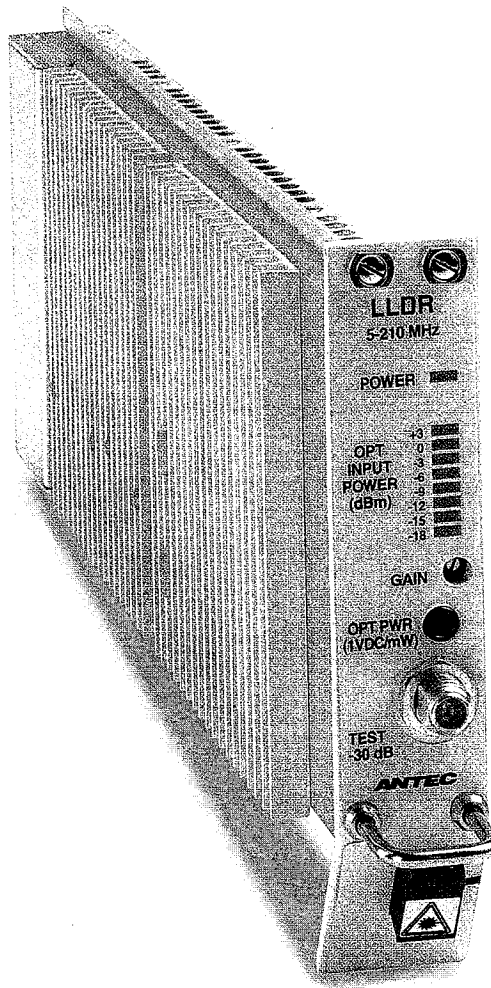


OPTICAL
TRANSMISSION

LASER LINK® RETURN RECEIVER, LLDR



Network Technologies



APPLICATION

Receives analog or data upstream signals from a node or a hub location. High gain RF amplifier stage allows LLDR to provide a high level output. Ideal for headends or hubs requiring multiple combining and splitting stages between the receiver and terminal device. The LLDR alleviates the need for additional amplifiers to overcome the headend passive network's insertion loss.

Up to 14 modular return receivers can be housed in the Laser Link II Mainframe, offering compact installation, improved system reliability and a telemetry interface for Network Management (status monitoring).

BENEFITS

- Supports advanced network services
- Efficient use of space
- Easy installation
- Easy setup
- Remote monitoring



Network Technologies

LASER LINK[®] RETURN RECEIVER, LLDR

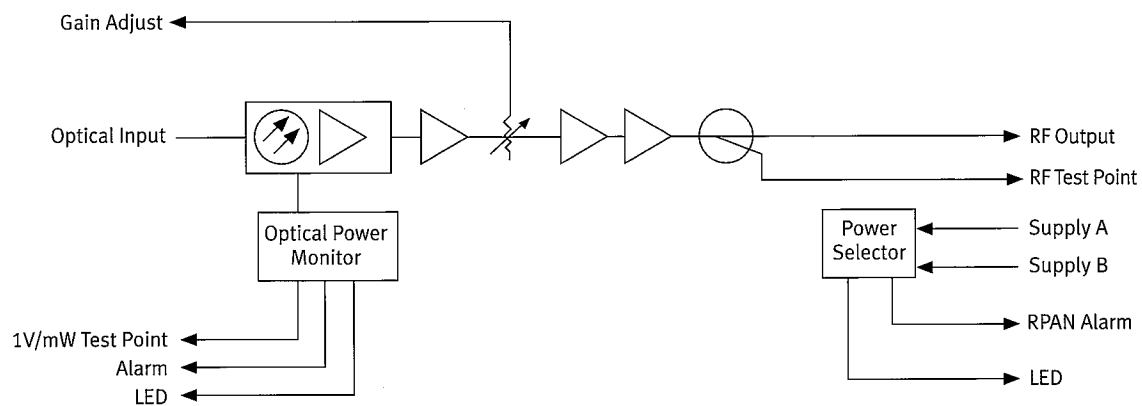


OPTICAL
TRANSMISSION

FEATURES

- Half width module
- Front fiber entry
- Easily accessible test points
- Front panel gain control
- Front panel LEDs
- Single detector per module
- High RF output level
- TTL outputs for redundant switching
- 5-210 MHz bandwidth
- 1310 and 1550 nm operation
- Primary and redundant powering options available
- Network Management (status monitoring) ready

LLDR FUNCTIONAL BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK® RETURN RECEIVER, LLDR



Network Technologies

SPECIFICATIONS

MODEL

LLDR

OPTICAL

Optical Receive Power (dBm)	-17 to 3
Optical Return Loss (dB)	≥40
Wavelength (nm)	1290-1600

RF

Impedance (Ohms)	75
Return Loss (dB)	16
Output Level ¹ (dBmV)	48
Level Adjustment (dB)	25
Frequency Response (MHz)	5-210
Ripple (Peak to Valley) (dB)	±0.5
Test Point Attenuation (dB)	-30 ±1.0
RF Gain ² (dB)	52

POWER

Supply Voltage (V dc)	24
Supply Current (mA)	500

PHYSICAL

Operating Temperature °F (°C)	32 to 122 (0 to 50)
Relative Humidity (Min-Max) (Non-condensing)	5-95%
Optical Connector	SC/UPC, SC/APC
Mounting	Installs into Laser Link II Mainframe
Dimensions (H x W x D) in. (cm)	5.25 x 1.05 x 13.5 (13.33 x 2.66 x 34.29)
Weight lbs. (kg)	1.75 (0.79)

ORDERING INFORMATION

DESCRIPTION

PART

Return Receiver, Laser Link II Mainframe Mounted, 5-210 MHz, Half Width, SC/UPC	252631
Return Receiver, Laser Link II Mainframe Mounted, 5-210 MHz, Half Width, SC/APC	252632
Cable, Y Cable for use with LLRR and LLDR Installed in older Mainframe (132467, 132467-M, 252598, 880306, 252373, 252383)	252583

Note 1: Maximum gain, -10 dB optical incident at 10% index of modulation.

Note 2: Measured from input of first gain stage to output of module with minimum attenuation.

Specifications subject to change without notice.



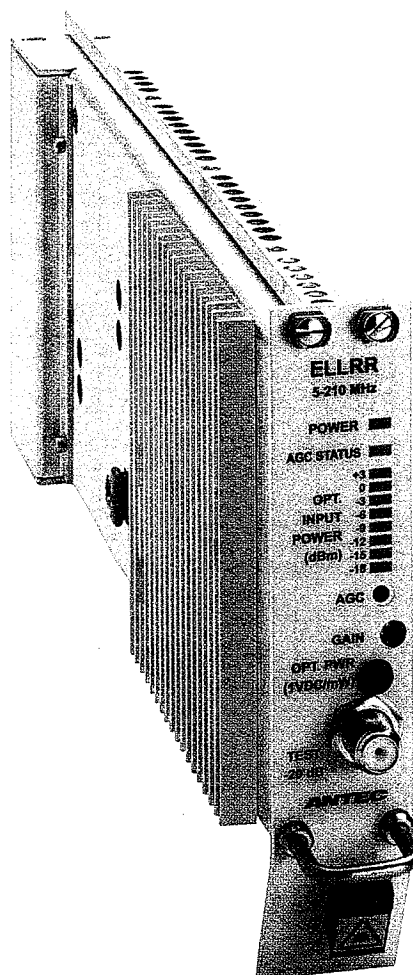


OPTICAL
TRANSMISSION

LASER LINK® RETURN RECEIVER, ELLRR



Network Technologies



APPLICATION

ELLRR receives analog or data upstream signals from a node or a hub location.

Up to 14 modular return receivers can be housed in the Laser Link II Mainframe, offering compact installation, improved system reliability and a telemetry interface for Network Management (status monitoring).

BENEFITS

- Supports advanced network services
- Efficient use of space
- Easy installation
- Easy setup
- Remote monitoring



Network Technologies

LASER LINK[®] RETURN RECEIVER, ELLRR

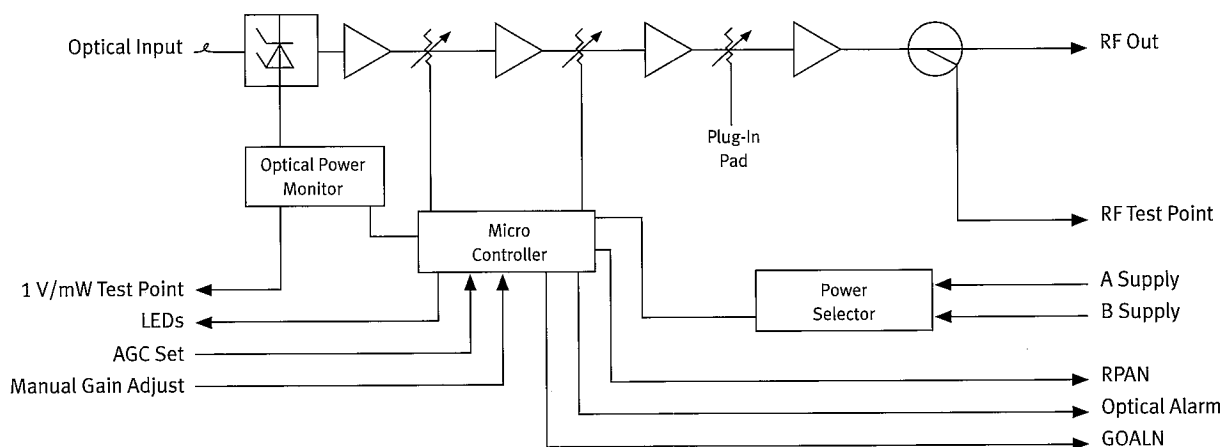


OPTICAL
TRANSMISSION

FEATURES

- Half width module
- Front fiber entry
- Easily accessible test points
- Optical AGC
- High output
- Front panel gain control and plug-in pad
- Front panel LEDs
- Single detector per module
- TTL outputs for redundant switching
- 5-210 MHz bandwidth
- 1310 and 1550 nm operation
- Primary and redundant powering options available
- Network Management (status monitoring) ready

ELLRR FUNCTIONAL BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK® RETURN RECEIVER, ELLRR



Network Technologies

SPECIFICATIONS

MODEL

ELLRR

OPTICAL

Optical Receive Power (dBm)	-17 to 3
Equivalent Input Noise Current (pA/sqrtHz)	7
Wavelength (nm)	1290-1600

RF

Impedance (Ohms)	75
Return Loss (dB)	16
Output Level ¹ (dBmV)	48
Level Adjustment (dB)	25 without AGC, 19 with AGC, plus plug-in pad
AGC Range ² (dB)	±2
Frequency Response (MHz)	5-210
Ripple (Peak to Valley) (dB)	±0.75
Test Point Attenuation (dB)	-30 ±1.0

POWER

Supply Voltage (V dc)	24
Supply Current (mA)	430

PHYSICAL

Operating Temperature °F (°C)	32 to 122 (0 to 50)
Relative Humidity (Min-Max) (Non-condensing)	5-95%
Optical Connector	SC/UPC, SC/APC, E2000
Mounting	Installs into Laser Link II Mainframe
Dimensions (H x W x D) in. (cm)	5.25 x 1.05 x 13.5 (13.33 x 2.66 x 34.29)
Weight lbs. (kg)	1.75 (0.79)

ORDERING INFORMATION

DESCRIPTION

PART

Return Receiver, Laser Link II Mainframe Mounted, 5-210 MHz, Video and Data Applications, Half Width ³ , SC/UPC	253657
Return Receiver, Laser Link II Mainframe Mounted, 5-210 MHz, Video and Data Applications, Half Width ³ , SC/APC	253658
Cable, Y Cable for use with ELLRR Installed in Older Mainframes (132467, 132467-M, 252598, 880306, 252373, 252383)	252583

Note 1: Maximum gain, -10 dB optical incident at 10% index of modulation. Responsivity of 0.85 mA.mW with AGC.

Note 2: Based on a change in received optical power of up to ±1 dB.

Note 3: Half the width of a standard size Laser Link module.

Specifications subject to change without notice.

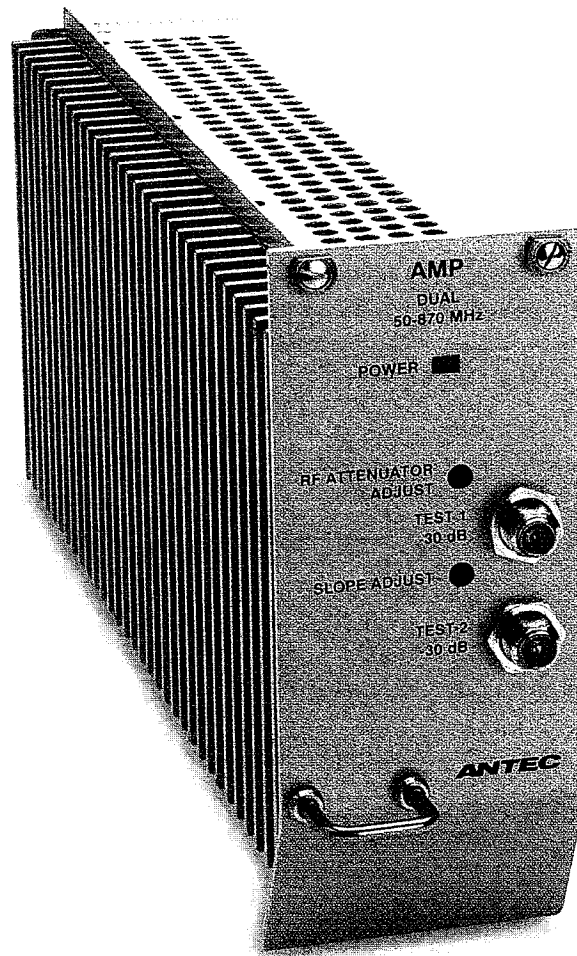


OPTICAL
TRANSMISSION

LASER LINK® 870 MHz DUAL AMPLIFIER



Network Technologies



APPLICATION

Provides RF amplification function in dual output Laser Link modules.

May be utilized to feed Laser Link Transmitters directly or in RF combining networks for additional gain requirements.

BENEFITS

- Efficient use of space
- Easy installation
- Easy setup
- Flexible headend solution
- Remote monitoring



Network Technologies

LASER LINK[®] 870 MHz DUAL AMPLIFIER

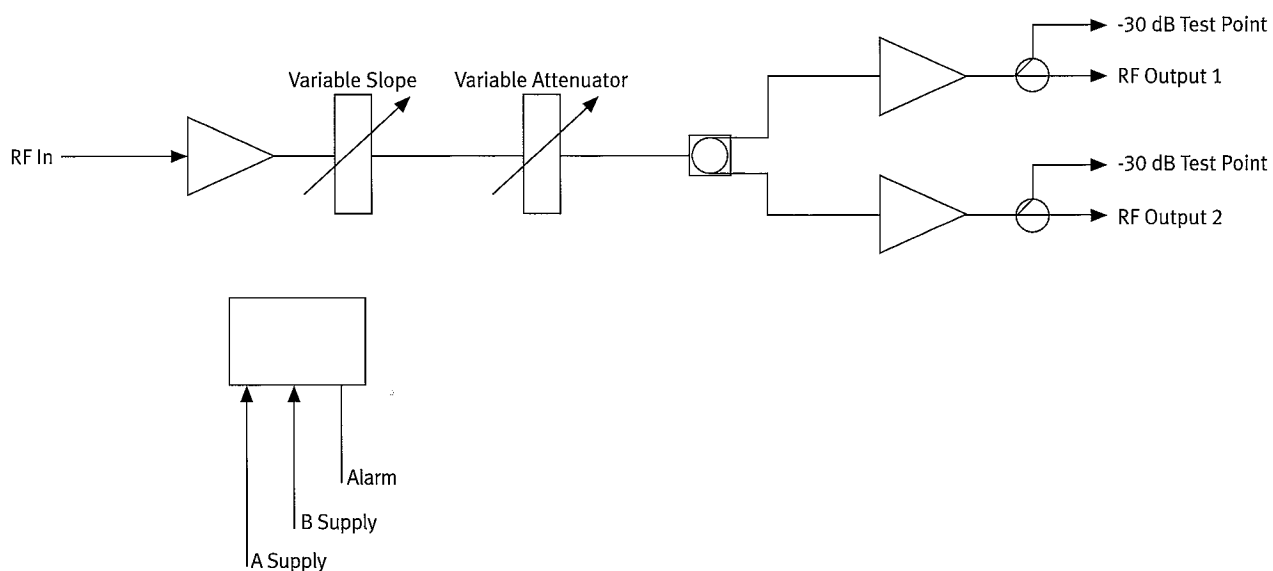


OPTICAL
TRANSMISSION

FEATURES

- One amplifier drives an entire six foot bay of transmitters
- Easily accessible test points
- Front panel gain and slope controls
- Front panel power LED
- Two power double driven outputs
- 50-870 MHz passband
- Primary and redundant powering options available
- Network Management (status monitoring) ready

DUAL AMPLIFIER FUNCTIONAL BLOCK DIAGRAM





OPTICAL
TRANSMISSION

LASER LINK® 870 MHz DUAL AMPLIFIER



Network Technologies

SPECIFICATIONS

	MINIMUM @ 79 CH.	MINIMUM @ 110 CH.
Video Channel Loading (Ch.)	79	110
Input Impedance (Ohms)	75	75
Output Impedance (Ohms)	75	75
Return Loss (50-550 MHz) (dB)	16	16
Return Loss (550-870 MHz) (dB)	14	14
Input Level (dBmV/ch.)	13	11
Output Level (dBmV/ch.)	35	33
Frequency Response (MHz)	50-870	50-870
Ripple (Peak to Valley) (dB)	±.75	±.75
Minimum Full Gain (dB)	22	22
Noise Figure (50 MHz) (dB)	7.5	7.5
Noise Figure (550 MHz) (dB)	8	8
Noise Figure (870 MHz) (dB)	10	10
Gain Control Range (dB)	8	8
Slope Adjustment (dB)	0 to 6	0 to 6
Composite Triple Beat1 (dBc)	-80	-75
Composite Second Order1 (dBc)	-70	-66
Cross Modulation1 (dBc)	-75	-70
Test Point Attenuation (dB)	-30 ±1	-30 ±1

POWER

Provided by Laser Link II Mainframe

PHYSICAL

Operating Temperature °F (°C)	32 to 122 (0 to 50)
Relative Humidity (Min-Max) (Non-condensing)	15-95%
Mounting	Installs into Laser Link II Mainframe
Dimensions (H x W x D) in. (cm)	5.25 x 2.17 x 13.5 (13.33 x 5.51 x 34.29)
Weight lbs. (kg)	3.25 (1.35)

ORDERING INFORMATION

DESCRIPTION	PART #
Amplifier, Laser Link II Mainframe Mounted, 50-870 MHz Dual Output, Full Width Module	252953

Note 1: 77 channels at reference output, 110 channels at reference output.

Specifications subject to change without notice.

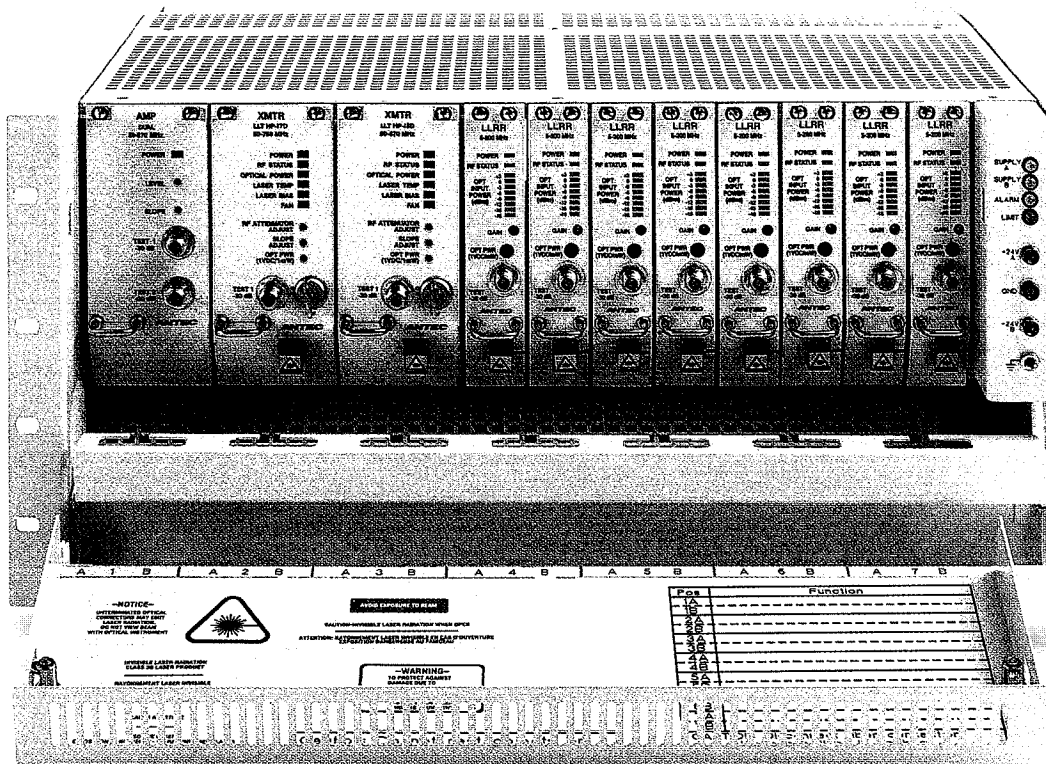


OPTICAL
TRANSMISSION

LASER LINK® II MAINFRAME



Network Technologies



APPLICATION

The Laser Link™ Mainframe houses, powers and routes status information to and from the Laser Link modules.

This shelf consists of up to 14 user-selectable bays that are able to accommodate the full array of Laser Link modules.

BENEFITS

- Efficient use of space
- Easy installation
- Several powering options
- Flexible configurations
- Remote monitoring



Network Technologies

LASER LINK® II MAINFRAME

OPTICAL
TRANSMISSION

FEATURES

- Rack spacers, fans or blowers not required
- User selectable module placement
- Common platform for downstream/upstream modules
- Multiple powering configurations available
- Redundant power supply available
- Network Management (status monitoring) ready

SPECIFICATIONS

ELECTRICAL, ac AND -48 V dc INPUT POWER SUPPLIES

Output Voltage (V dc) (nominal)	24
Ripple and Noise (Max) (output V out @ 24 V)	1% peak to peak

ac INPUT POWER SUPPLY

Output Current ¹ (Max) (amps)	12
Output Power ¹ (W) (Max)	288
Input Voltage Range ² (V ac)	85-264
Fuse Type	ac input line fuse

-48 V dc INPUT POWER SUPPLIES

Output Current ¹ (Max) (amps)	12.6
Output Power ¹ (W) (Max)	302.4
Input Voltage Range (V ac)	36-76
Input Current ³ (amps)	7.16
Fuse Type	8 amp SB 250 V 1/4 x 1 1/4
Efficiency	89%

MODELS

Mainframe with Power Supply

SAFETY AGENCY APPROVALS

CSA 22.2 No. 234, U.L.® 1950, EN 60950, CE Pending

PHYSICAL

Operating Temperature °F (°C)	32 to 122 (0 to 50)
Relative Humidity (Min-Max) (Non-condensing)	5-95%
Mounting in. (cm)	Standard 19 (48.26) Rack/Optional 23 (58.42)
Number of Bays	7-14(depending on module type – full or half width)
Operating Vibration	0.5G @ 50, 60, 100, 120, 150 and 180 Hz
Shipping Vibration	0.5G to 2.5G @ 10 to 60 Hz , discreet sweep in three axes
Dimensions (H x W x D) in. (cm)	8.75 x 19 x 20 (22.23 x 48.26 x 50.80)
Weight lbs. (kg)	17 (7.71)

Note 1: Derated for temperature.

Note 2: AC input range selection is fully automatic.

Note 3: Typical @ 48 V dc and max output current.

Specifications subject to change without notice.



OPTICAL
TRANSMISSION

LASER LINK® II MAINFRAME



Network Technologies

ORDERING INFORMATION

DESCRIPTION	PART #
Mainframe – supports front panel connectorized modules, ac input power supply, 7-14 modules, standard user panel	252986
Mainframe – supports front panel connectorized modules, ac input power supply, 7-14 modules, Element Management Interface Card (EMIC)	252987
Mainframe – supports front panel connectorized modules, -48 V dc input power supply, 7-14 modules, Element Management Interface Card (EMIC)	253314
Mainframe – supports front panel connectorized modules, -48 V dc input power supply, 7-14 modules, standard user panel	253315
Power supply, redundant ac input power supply, rack mounted	252382
Power supply, redundant -48 V dc input power supply, rack mounted	253516
Element Management Interface Card, upgrades 252986 and 253315 Mainframes to support Track Link Element Management System	252989
Upgrade Kit, upgrades earlier version shelves, (132467, 132467-M, 250850, 252373, 252383, 252598, 880306) to support Track Link Element Management System – EMIC plus backplane	252988
Upgrade Kit, upgrades earlier version shelves, (132467, 132467-M, 250850, 252373, 252383), to support front panel connectorized modules – bubble front door, additional module guides, labels	252573

