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Model 310B Wideband O/E Converter



Allows display and measurement of wideband analog and digital optical signals on oscilloscopes and BER testers.

- 1 and 2 Ghz bandwidths, DC coupled.
- 3 laboratory instruments in one: Optical Detector, Linear Amaplifier, ECL Limiting Amplifier.
- DC coupling permits extinction-ratio testing to <-33dBm.
- High conversion gain allows eye diagram measurements to <-43dBm optical levels.
- Built-in 20 dB Linear Amplifier gain block for sub-microwatt optical waveform analysis.
- Built-in unique ECL limiting amplifier for performing BER tests on optical sources.
- CSA certified and CE Mark.
- APD detector options: Si, Ge, InGaAs; 600-1600 nm range.
- Universal optical connector with screw-on adapters.
- Plastic 1 mm fiber option.

General Description

The **Model 310B** is comprised of three distinct and independent functional blocks as shown on the front panel drawing in Figure 1. The **Optical Detector** section performs the basic O/E operation; the **Linear Amplifier** provides additional wideband gain when required; and the **ECL Limiting Amplifier** may be used to convert an analog binary signal into standard emitter coupled logic (ECL) levels for communications or bit error ratio measurement and test purposes. These three functional blocks are described in more detail below.

The **Optical Detector** section accepts an input optical signal from a fiber and converts it into a high-fidelity electrical analog signal. The high conversion gain (>10,000 V/W) is more than 10 times that available in any other DC-coupled O/E instrument with 2 GHz bandwidth. The conversion gain is adjustable via a precision vernier 10-turn panel control. Output signal level and conversion gain versus optical input power are shown in Figure 2. The DC reference level is also front panel adjustable around true zero, to make exact alignment with reference oscilloscope gridlines more convenient. Excessive optical input power is indicated by an overload LED, and internal protection is also activated to minimize the possibility of detector damage.

The **Linear Amplifier** provides 20 dB of AC-coupled gain in the 0.1-1500 MHz band. When detecting very weak signals (less than 1 microwatt), it is useful to have a convenient amplifier to aid high-level oscilloscope viewing. The amplifier can also be used as a general purpose RF gain block, for independent applications (e.g., as a scope probe amplifier).

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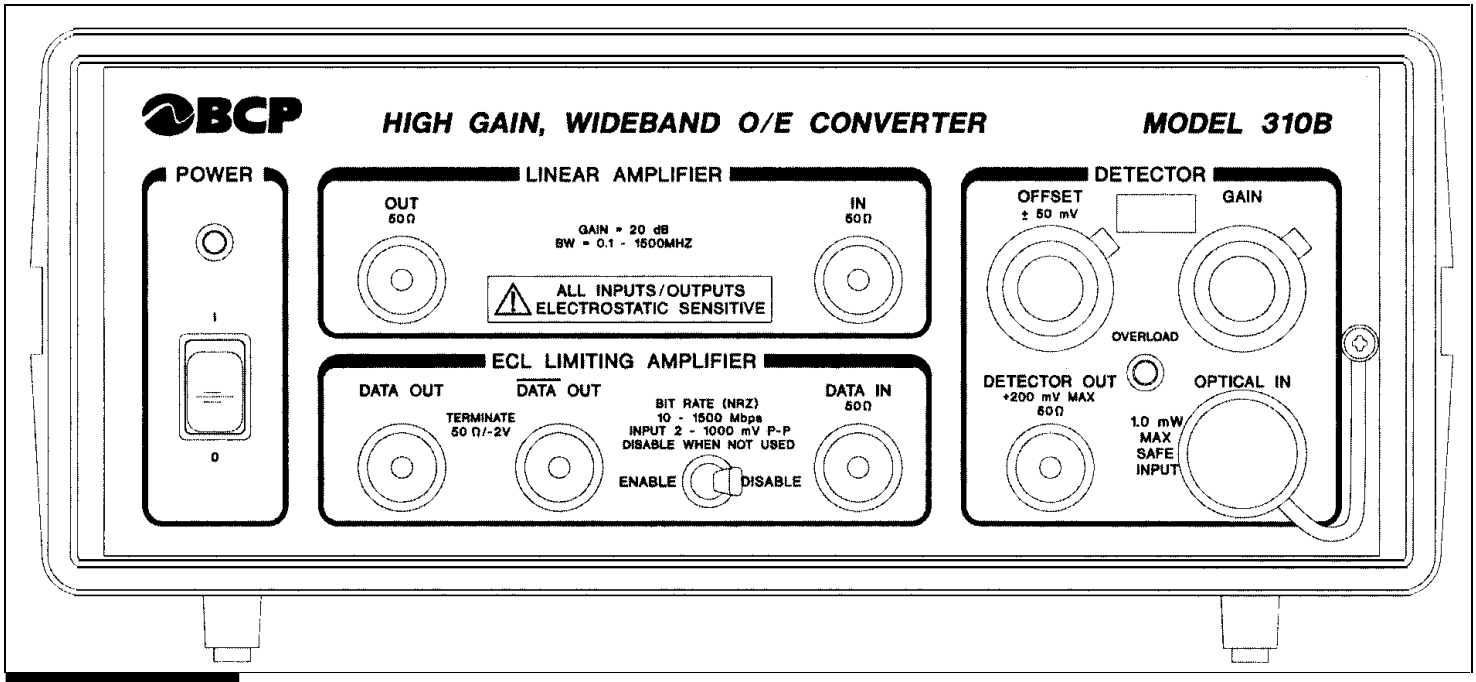
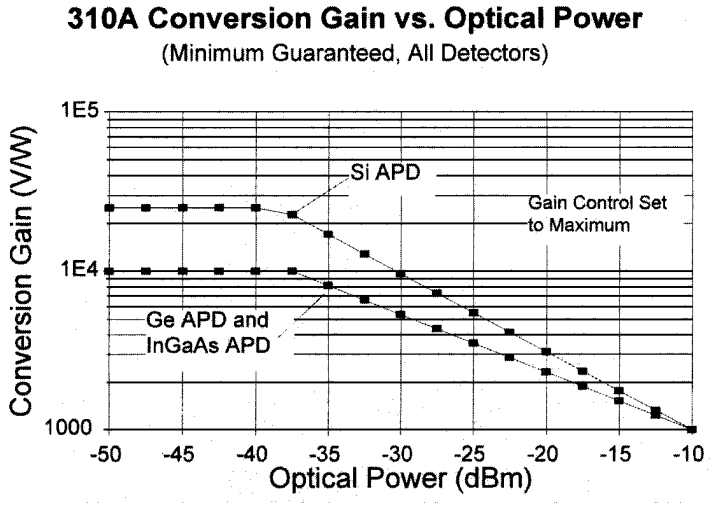


Figure 1

The **ECL Limiting Amplifier** (ECLLA) is a unique feature of the **Model 310B**, which is not found on any other type of O/E converter. O/E instrument users often encounter a need to perform bit error rate tests on optical sources or use their O/E instruments as substitute receivers in communications experiments. The ECL Limiting Amplifier makes it possible to interface with standard ECL inputs on BER test sets, or drive any ECL interface with the optical signal recovered by the **Model 310B** Detector section. When the ECLLA is enabled via its front panel switch, and an input is applied (from the Detector or Linear Amplifier output), an internal automatic gain control function takes over, thus freeing the user from having to set detector gain levels for optimum ECL operation. Bit error ratio performance of better than 10^{-9} can be achieved at 1.5Gbps with optical input levels less than a -33dBm.

The **Model 310B** can be equipped with detector options which cover the wavelength bands of 600-900nm (Si APD), 1100-1450nm (GeAPD), and 1100-1600nm (InGaAs APD). Standard fiber optic connector options of SMA, ST, FC, SC and other types are available. SMA and N-type RF connector options are also available.

Figure 2



Model 310B
Wideband O/E Converter

Specifications (continued)

OPTICAL DETECTOR

Detector Type	Bandwidth (Note 1)		Conversion Gain	Wavelength	Fiber	MDS
	Typical	Minimum	(Note 2)	(Note 3)	**Interface** (Note 4)	(Note 5)
Silicon APD (Options 0XXX)	0-1000 MHz	0-750 MHz	25,000 V/W	600-900 nm	200/230	4 nW
Silicon APD (Options 5XXX)	0-1000 MHz	0-750 MHz	25,000 V/W	600-900 nm	1000	4 nW
Ge APD (Options 1XXX)	0-2000 MHz	0-1500 MHz	10,000 V/W	1100-1450 nm	50/125	20 nW
InGaAs APD (Options 3XXX)	0-2000 MHz	0-1500 MHz	10,000 V/W	1100-1600 nm	50/125	20 nW

Polarity: Non-inverting

DC Offset: Adjustable ∀50 mV around zero with 50 ohm DC-coupled load.

Overload indicator: Indicator will typically alarm at 50 microwatts with gain set to maximum. Alarm threshold increases as gain is reduced. Detector is internally protected from damage for input power levels below 1 mW.

Detector Options: See "Ordering Information" on next page for specific part numbers.

Notes

Note 1: -3 dB (electrical) limits.

Note 2: Minimum guaranteed conversion gain at the indicated wavelength with GAIN control set to maximum. Gain may be reduced by a factor ∃x 10 with the front panel GAIN control. See Figure 2.

Note 3: Wavelength range with full guaranteed conversion gain. Useful wavelength range extends beyond the values shown above but with reduced gain.

Note 4: Optical power is routed from the front panel to the internal detector by means of a fiber optic pigtail. The core/cladding dimensions (in microns) are as indicated.

Note 5: MDS is input "Minimum Detectable Signal". It is defined as the minimum input optical signal power required for unity output peak signal-to-RMS noise ratio at maximum detector gain, measured by using the full detector bandwidth.

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Specifications (continued)

LINEAR AMPLIFIER	
Gain	20 dB, minimum
Bandwidth	0.1 to 1500 MHz, minimum (-3 dB limits) Typically 2000 MHz.
Maximum Linear Output	1.0 Vpp, minimum, 50 ohm load
Polarity	Non-inverting
Input Impedance	50 ohms, AC-coupled
ECL LIMITING AMPLIFIER	
Bit Rate	10 to 1500 Mb/s, minimum
Input Dynamic Range (10^{-9} BER)	1 to 1000 mV p-p, minimum
Input Impedance	50 ohms, AC-coupled
Input Data Pattern Constraints	Since the amplifier is AC-coupled, the analog input data must have a long term running 1/0 data balance of between 60/40 and 40/60 (50/50 for optimum performance). Also, transition density should average at least one out of every ten bits.
Output Signal Levels	Complementary ECL -0.9 to -1.7V, typical (10K/100K ECL Logic compatible)
Output Termination Required	50 ohms to -2V, or 50 ohms AC-coupled
GENERAL	
I/O Panel Connectors	SMA Female or N Female
Power Requirements	100-240 VAC, 50-60 Hz, 25 watts maximum
Temperature Range	Operating, 10E to 40EC. Storage, -20E to 70EC
Dimensions Table Top	10.13" wide x 10.39" deep x 4.54" high (25.7cm x 26.4cm x 11.5cm)
Rack Mount	19.00" wide x 10.39" deep x 5.22" high (48.3cm x 26.4cm x 13.3cm)
Weight	6 pounds (2.7 kg)

Ordering Information

LR102161

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Model 310B-XXXX

Detector Option
0 = Si APD
1 = Ge APD
3 = InGaAs APD
4 = Special
5 = Si APD Plastic 1mm

Chassis Option
T = Table Top
R = Rack Mount

RF Connector Option
S = SMA
N = Type N

Optical Connector Adaptor Option
1 = SMA 905/906
2 = ST/PC
3 = FC/PC
5 = SC
6 = DIN 46256
7 = D4 (2mm)
7 = D4 (2mm)
8 = DIAMOND HMS-0 (3.5mm)
9 = DIAMOND HMS-10 (2.5mm)
A = DIAMOND HMS-10/A
F = Special (Contact BCP)
K = HP Versatile Link 45XX Series (Simplex, non-latching; 1mm POF)

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