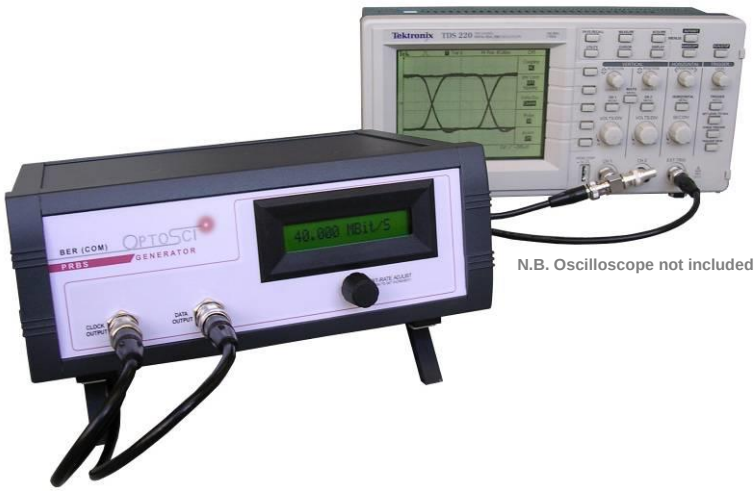
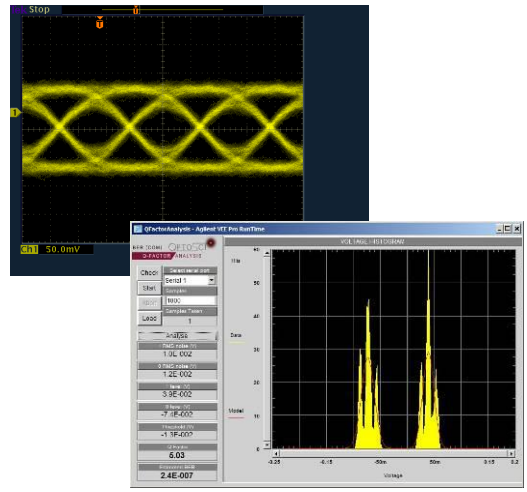
Eye Diagrams & BER in Optical Communications

Educator Kit BER(COM)

COMPREHENSIVE LABORATORY BASED EDUCATIONAL PACKAGE IN EYE DIAGRAMS & BIT ERROR RATES (BER)



N.B. Oscilloscope not included



MAIN FEATURES AND BENEFITS:

- An extension module to ED-COM (& ED-WDM Series) which investigates Eye Diagrams and BER in optical communication systems
- Used with ED-COM, it provides all specialised hardware to perform the experimental investigation
- Extensive literature support including: student and instructor's manuals with theory, experiments & sample results
- Self contained teaching package saving significant course, literature and hardware development effort

THE EXPERIMENTAL INVESTIGATION* ADDRESSES:

- Basics of eye patterns
- Using eye patterns as a qualitative diagnostic tool
- Rise time, pulse width and jitter measurements
- Bit-rate limitations due to noise
- Bit-rate limitations due to dispersion
- Q-factors and Bit Error Rate (BER) from noise amplitudes
- Q-factors and BER from eye pattern histograms
- Compare LED and laser response over different fibre lengths and bit rates

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***Full details of the experiments and equipment specifications are provided overleaf**

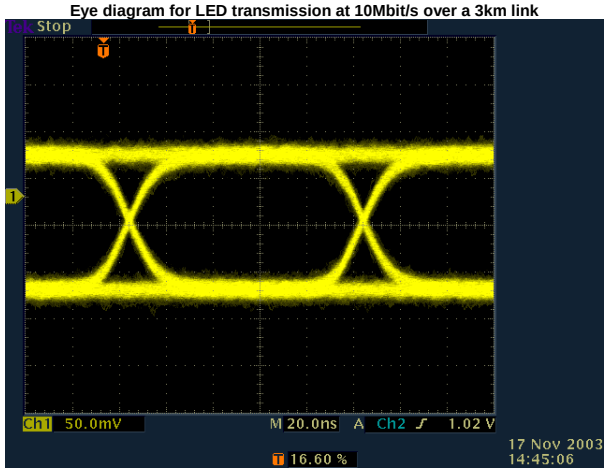
Laboratory Exercises

Eye patterns are a widely used tool for studying the quality and stability of digital communication systems. BER(COM) allows the student to generate and evaluate eye diagrams and investigate the effects of noise, attenuation and dispersion on eye diagrams and BER for the many communication system permutations allowed by OPTOSCI's ED-COM educator kit. (*see potential use of BER(COM) with ED-WDM Series later*).

The experimental investigation includes:

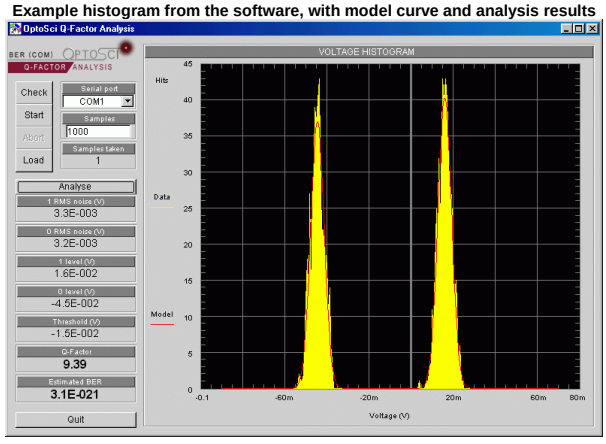
- Generation of eye patterns using BER(COM) connected straight to an oscilloscope. Observe appearance of eye pattern at various bit rates, and measure rise/fall times.

Eye diagram for LED transmission at 10Mbit/s over a 3km link



- Insert ED-COM in the data path to view eye pattern with LED and laser transmitter.
- Observe how a poor quality signal, due to receiver noise, attenuation or dispersion over the fibre link, causes the "eye" to "close".
- Measure and compare rise/fall times, pulse width and jitter from the eye patterns for the LED and laser transmitters, using various fibre link lengths (1 to 5km) and bit rates (1 to 40Mbits/s).

Example histogram from the software, with model curve and analysis results



- Measure noise amplitudes from the eye patterns for both transmitters over various fibre link lengths and bit rates. Estimate and compare BER using Q-factors derived from the noise amplitude measurements.
- For both transmitters over various fibre link lengths and bit rates use the statistical analysis software supplied to estimate and compare the Q-factors and BER derived from signal level (eye pattern) histograms.
- Examine the results in relation to attenuation and dispersion measurements made previously with ED-COM.

Product Description

The OPTOSCI BER(COM) module consists of the following hardware elements: -

- A pseudo random bit stream generator (1 to 40Mbits/s), with additional outputs for a clock at the data bit rate and an impulse signal (used to determine fibre link lengths in ED-COM).
- A 2km reel of ST connectorised graded index multi-mode optical fibre.
- An ST bulkhead connector.
- All required electrical interconnects and RF cables.

In addition, a comprehensive literature and software package is supplied as follows:-

- Student laboratory manual, describing the background theory and experimental procedure, with associated exercises to encourage the student to discuss the implications of their results.
- An instructor's manual dealing with all aspects of using the kit and providing sample results for the experiments and exercises.
- OptoSci Q-Factor Analysis Software which can be run on a PC to determine Q-factors and BER from the eye pattern histograms generated by BER(COM).

Additional required equipment:-

- OPTOSCI ED-COM educator kit.
- A two channel digital storage oscilloscope (DSO) with USB output, minimum bandwidth of 50MHz, and minimum *real time* sampling rate of 500MSa/s (*contact OptoSci to confirm suitable DSO models for use with BER(COM)*).
- The Q-Factor Analysis Software requires a PC running a Windows version from XP up to 10.

BER(COM) use with ED-WDM Series

The PRBS and Q-factor software supplied with BER(COM) can also be used for BER and chromatic dispersion experiments with OptoSci's ED-WDM Series of kits (see ED-WDM Series datasheet for details).

Ordering Information

BER(COM)	BER in Optical Communications
ED-COM	Fibre Optic Communications

Since OPTOSCI are committed to continuously improving the design and performance characteristics of our products, these specifications are subject to change without notice.

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