

'ELLMAX' Fibre-Optics

EFO1100 series



Description

The Feedback "ELLMAX" Fibre-Optics range of equipment provides the means to investigate various aspects of fibre-optic technology and its use in transmitting analogue and digital data, with particular reference to Telecommunications.

The Fibre-Optics Educator EFO1101 comprises a Transmitter, a Receiver, two lengths of fibre-optic cable and various electrical connectors and accessories. These are supplied in a specially designed carrying case. The manual, together with the associated textbook on Communications Systems, offers a large amount of relevant theory, supported by a range of practical assignments covering:

- Properties of Light
- Infra-red radiation
- Fibre-Optic technology
- Opto-electronic devices
- Fibre-Optic Attenuation
- Analogue transmission methods
- Digital transmission methods

The Fibre-Optics Monitor EFO1105 has been designed for fibre-optics and general optics measurement applications. It is suitable for use with the EFO1101 Educator.

The Fibre-Optics Power Meter EFO1102 is an accurate, versatile unit for measuring optical power levels at terminated optical cables. The Educator EFO1101 together with Power Meter EFO1102 and Monitor EFO1105 allow all the fundamental concepts of Telecommunications as well as Fibre-optics to be demonstrated in a realistic, practical way. The only additional equipment required is an a.c. voltmeter. The use of external signal sources and power supplies is optional.

Features

- Fibre-optic measuring techniques
- Demonstrates standard properties of light (visible and infra-red)
- Analogue and Digital data transmission
- Self-contained training package

“ELLMAX” Fibre-Optics Educator

EFO1101

The Fibre-Optics Educator consists of the following items:

Optical Transmitter with infra-red led, red LED, variable output control; variable frequency, pseudo-random and square wave generators; TTL, CMOS and RS232 voltage levels and manual digital inputs; high and low impedance analogue inputs and variable analogue gain. Power is from an internal battery, or single external dc power supply (9 V to 15 V). A mains adaptor socket is also provided.

Optical Receiver with loudspeaker analogue output and high and low impedance analogue outputs, variable analogue gain; buzzer digital output and TTL, CMOS and RS232 voltage level digital outputs, variable digital sensitivity. Power is from an internal battery, or single external dc power supply (9 V to 15 V). A mains adaptor socket is also provided.

Accessories including comprehensive instruction manual, book on Telecommunications, two lengths (1m and 5m) of optical cable, optical connector, microphone, FM radio, a torch, earpieces, mirror and various connectors. All items come complete with batteries.

The Educator is housed in a custom designed case. The many applications and demonstrations that can be carried out with the Educator include:

- Showing the properties of Light and Infra-red radiation using a novel approach.
- Transmission of high quality Analogue (e.g. speech and music) and Digital data (including Morse code) over Fibre-optics and Free Space using both Visible and Infra-red light.
- “Listening” to various light sources, such as mains lighting, torch light, sunlight, infra-red light, or the transmitter’s variable frequency generator, using the loudspeaker incorporated in the receiver.
- Measuring the frequency of a rotating disc or vibrating object using light reflection or transmission.
- Construction of an alarm system based on the presence of a light signal.
- Clarifying the important differences between Analogue and Digital techniques.
- Measurement of the optical absorption or reflection properties of various materials.
- Testing out Analogue or Digital optical receivers and transmitters.

The Fibre-Optics Educator can transmit Analogue or Digital data over Free-Space or through Fibre-optics. With low-cost plastic fibre, transmission distances over 100 metres are possible. The normal advantages of a fibre-optics link over a conventional electrical system may be obtained with the Educator, for example:

- Immunity to electrical interference.
- Complete electrical isolation.
- Secure transmission, with no radiated waves from the cable.
- No earth loops.

TTL, CMOS and RS232 voltage interfaces are available at the Transmitter and Receiver. The system operates at digital rates from dc to 20kBit/s. A buzzer may also be switched into the digital circuit to give an audible indication of the output.

Both high and low impedance analogue interfaces are incorporated in the Transmitter and Receiver units. The Receiver also contains a loudspeaker which may be switched into an analogue output. The analogue bandwidth covers a range between 25 Hz to 25 KHz.

The Fibre-Optics Educator is ideal for utilising or assessing the benefits of fibre-optics systems over conventional transmission systems. The novel switchable digital/analogue nature of the Educator allows great flexibility in the type of data that can be transmitted. For those organisations with no practical experience of fibre-optics, the Educator provides an effective means of obtaining a 'hands-on' introduction to this new technology.

"ELLMAX" Fibre-Optics Power Meter

EFO1102

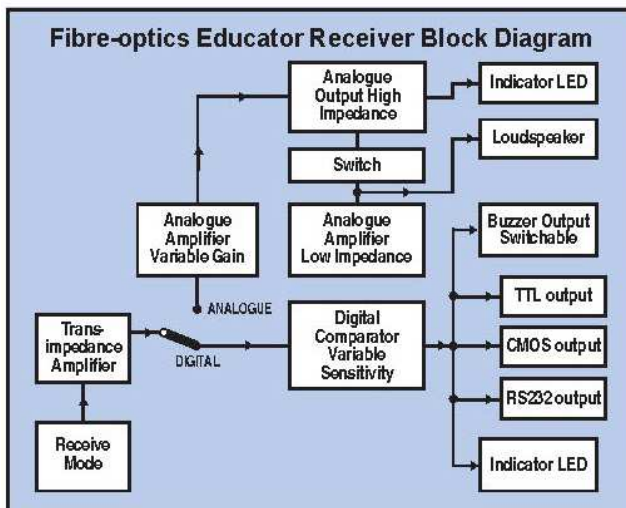
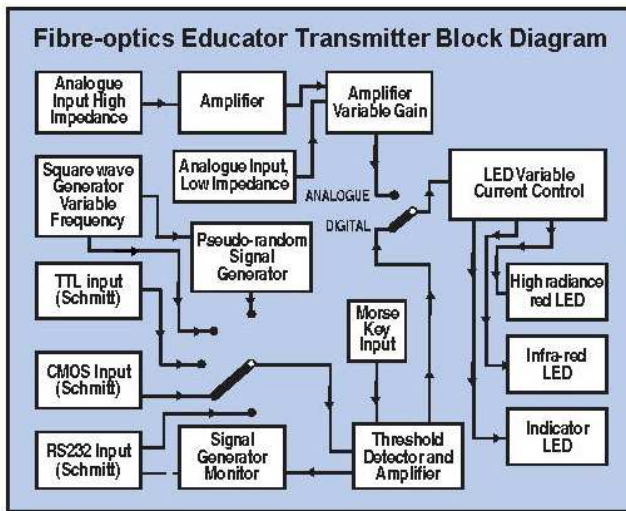
The Fibre-Optics Power Meter is an accurate, versatile, low-cost unit for measuring optical power levels at terminated optical cables. An easy to read pointer scale gives readings in both dBm and μ W. The meter has a broad measurement range of 1 mW (0 dBm) down to a sensitivity of better than 1nW (-60dBm).

The meter is calibrated at a wavelength of 820 nm, and permits accurate measurements between 800 nm and 850 nm. A large area receiving diode ensures maximum light acceptance. Battery life is typically 500 hours.

The meter is of robust construction and comes complete with accessories, including Instruction Manual, battery, electrical connectors and strong carrying case. Connector options for the meter include SMA and STRATOS. Please state which connector option you require when ordering. The diagrams show the functions of the Transmitter and Receiver units in simplified form.



The diagrams show the functions of the Transmitter and Receiver units in simplified form.



'ELLMAX' Fibre-Optics Monitor

EFO1105

The Fibre-Optics Monitor is a versatile, fully portable product that has been designed for fibre-optics and general optics measurement applications. A high radiance led in the transmitter ensures a good measurement performance for all types of multimode optical-fibres, including 50µm core graded index fibre. Connector options for the Monitor include SMA (US standard) and STRATOS connectors. The Monitor consists of the following items:

An Optical Transmitter

Contains a high radiance infra-red led in the connector receptacle, un-housed infra-red LED, variable output control; variable frequency square wave generator; both digital and analogue inputs. Power is from an internal battery, or single external d.c. power supply (9 V to 15 V). A mains adaptor socket is also provided.

Optical Receiver

Contains a loudspeaker with analogue output, low impedance analogue output and variable analogue gain; mean power monitor output: silicon p-i-n diode mounted in connector receptacle. Power is from an internal battery, or single external dc power supply (9 V to 15 V). A mains adaptor socket is also provided. Accessories include Instruction Manual, various electrical connectors, microphone, batteries and robust carrying case.

Fibre-Optics Educator

Transmitter/Receiver combination

Bandwidth

Analogue:

25 Hz to 25 kHz (3 dB points).

Digital:

d.c.to 20 kbit/s.

Range for Analogue transmission

(better than 40 dB S.N.R.):

25 dB.

Range for Digital transmission

(better than 1 in 105 error rate):

25 dB.

NB. The transmission rates above are for a fibre link with the high radiance red LED being used to launch light into a 1mm plastic fibre.

Attenuation measurement range:

50 dB.

Operating temperature range:

0 to 50 °C.

Optical connectors:

AMP, DNP.

Transmitter

Typical power launched into 1 mm plastic fibre from high radiance red led:

20 µW pk (at maximum setting) at 9 V supply.

Typical output power from infra-red LED:

2 mW (at maximum setting) at 9 V supply.

Variable LED drive control:

20 dB range (± 3 dB) for high radiance LED.

Schmitt threshold levels

TTL: 1.2 V and 1.6 V.

CMOS: 2.8 V and 3.8 V.

RS232: 0.35 V and 0.8 V (optical output phase opposite to TTL & CMOS).

127 bit length pseudo-random generator.

20 Hz to 4.5 kHz (for square wave and pseudo-random signal).

Signal Generator

Variable clock rate:

Maximum Transmitted Data Rate for

less than 10% pulse width distortion:

TTL: 0.5 Mbit/s. CMOS: 100 kbit/s. RS232: 0.5 Mbit/s.

Input Impedance at Analogue Sockets:

Low Z: 8 Ω to ground.

High Z: 20k Ω capacitively coupled.

High Z & Low Z inputs are at the same phase.

Receiver

Receiver Diode:

Silicon p.i.n.

Minimum power better than 1 in 105 error rate:

50 nW peak at 660 nm.

Variable Digital Threshold Voltage:

30 mV to 1.25 V (corresponding to 30 nW and 1.2 µW respectively at 660 nm).

Digital Outputs

TTL.

CMOS (positive level determined by supply voltage).

RS232 (positive and negative levels determined by supply voltages).

Phase of RS232 is opposite to TTL & CMOS.

Minimum Power for 40dB Signal to Noise Ratio:

50 nW pp at 660 nm. 25 nW pp at 940 nm.

Analogue Output Impedance

High Z: 1 k Ω . Low Z: Less than 1 Ω .

Power Requirements

9 V battery (type PP3).

Optional external d.c. supply.

1 Transmitter +9 V to +15 V (current is 25 mA typically at 9 V).

2 Receiver +9 V to +15 V (current is 25 mA typically at 9V) and -9 V to -15 V (5 mA) for RS232 Interface.

Dimensions

(approximate for each unit)

Width: 200 mm (7.8"),

Height: 130 mm (9.6"),

Depth: 90 mm (3.5").

Weight

(approximate for each unit)

Transmitter: 750 gms (26oz).

Receiver: 900 gms (31oz).

Ordering Information

Tender Specification

Fibre-Optics Educator EFO1101

A self-contained fibre-optics training equipment. To include separate transmitter and receiver, suitable for analogue and digital transmission using TTL, CMOS and RS232 voltage levels. Built-in variable frequency, pseudo-random & square wave generators; loudspeaker, variable gain high and low impedance outputs. Complete with fibre-optic cable, connectors, textbook, assignments manual, microphone, FM radio, torch & all necessary accessories.

Fibre-Optics Power Meter EFO1102

Measurement Range

Linear: 200pW to 1mW.
dBm: -60dBm to 0dBm.

Accuracy

Response: ±5% or ±0.2dB (at 820nm).
Between ranges: ±1%.
Scale reading: ±1.5% of full scale.

Calibration

Wavelength: 820 nm (less than 2% variation from 800nm to 850 nm).

Wavelength range for response >20% of 820nm response:

400 nm to 1000 nm.

Photodiode:

Silicon p.i.n. (typically 0.48 A/W at 820 nm),
15 mm² sensitive area, square, 1.4 mm optical distance.

Complete light acceptance by diode sensitive area for fibre up to 1mm diameter N.A.:

0.5.

Optical Connector:

SMA or other connector option (standard 9mm).

Output Socket:

5kΩ output impedance.

Linear full scale: 1 V.

Maximum voltage without overload: 2 V.

Output settling time to within 1%:

Less than 3 seconds.

Operating temperature range:

0 °C to 50 °C.

Temperature coefficient at 820 nm:

±0.1 %/°

Power Requirements:

9 V battery (type PP3).

Optional d.c. supply:

+7 V to +15 Vd.c.

Current is 1.0 mA typically at 9 V.

Typical alkaline battery life is 500 hours.

Dimensions

(approximate for each unit)

Width: 175 mm (6.8"),

Height: 112 mm (4.4"),

Depth: 60 mm (2.3")

(approximate) 600 g (21oz).

Weight

Ordering Information

Fibre-Optics Power Meter EFO1102

Tender Specification

A battery-powered meter to measure optical power levels at terminated optical cables in dBm and µW. Wavelength range: 400-1000nm. Measurement range: Linear 200pW to 1mW, dbm -60dBm to 0dBm.

Fibre-Optics Monitor

Transmitter/Receiver combination

Attenuation measurement range

Standard method:

30 dB (±0.2dB accuracy).

High loss method:

45 dB (±0.5dB accuracy).

Temperature dependence of

above accuracy figures:

0.01 dB/°C typical.

Analogue Bandwidth:

25Hz to 20kHz (3dB points).

Range for analogue transmission

(better than 40dB SNR):

25 dB (this range is for a fibre link, with high radiance LED being used to launch light into graded index fibre, core diameter 50µm, N.A. 0.21).
0°C to 70°C.

Operating Temperature Range:

Transmitter

Typical power launched from LED in connector re-

ceptacle into 50µm graded index fibre, N.A. 0.21: 5 µW peak (at maximum setting).

Typical output power from unboxed LED: 3 mW (at maximum setting).

Variable LED drive control:

20 dB range (±3 dB).

Peak Output Wavelength/Spectral Width

LED in connector housing:

820 nm/35 nm.

Unboxed LED:

880 nm/80 nm.

Tone Generator Frequency (typical)

Fixed: 400 Hz.

Variable: 100 Hz to 5 kHz.

EFO1105

30 dB (±0.2dB accuracy).

45 dB (±0.5dB accuracy).

0.01 dB/°C typical.

25Hz to 20kHz (3dB points).

25 dB (this range is for a fibre link, with high radiance LED being used to launch light into graded index fibre, core diameter 50µm, N.A. 0.21).
0°C to 70°C.

Operating Temperature Range:

Transmitter

Typical power launched from LED in connector re-

ceptacle into 50µm graded index fibre, N.A. 0.21: 5 µW peak (at maximum setting).

Typical output power from unboxed LED: 3 mW (at maximum setting).

Variable LED drive control:

20 dB range (±3 dB).

Peak Output Wavelength/Spectral Width

LED in connector housing:

820 nm/35 nm.

Unboxed LED:

880 nm/80 nm.

Tone Generator Frequency (typical)

Fixed: 400 Hz.

Variable: 100 Hz to 5 kHz.

Tone Generator Output

Square wave, 50:50 mark:

Max. transmitted digital data rate for less than 15% pulse width distortion:

space ratio to within 1%.

0.5 Mbit/s.

Receiver

Photodiode type:

Silicon p.i.n.

Minimum optical power for 40dB

Signal to Noise ratio:

12 nW pp at 850 nm.

Typical response at 850nm at Analogue output:

2.5 V/ μ W to 82 V/ μ W (over Analogue gain range).

Typical response at 850nm at

mean power monitor:

50mV/ μ W.

Power Requirements

9 V battery (type PP3) for each unit.

Optional external dc supply:

+9 V to +15 V d.c. (current is 25 mA typical at 9 V).

Dimensions

(approximate for each unit)

Width: 128 mm (5.0"),

Height: 97 mm (3.8"),

Depth: 75 mm (2.9").

(approximate) 500gm (17oz).

Fibre-Optics Monitor EFO1105

Weight

Ordering Information

Tender Specification

A battery-powered monitor comprising a Transmitter and Receiver; to test continuity and measure attenuation in fibre-optic cable, detect infra-red radiation, test analogue and digital optical receivers.



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Feedback reserves the right to change these specifications without notice.