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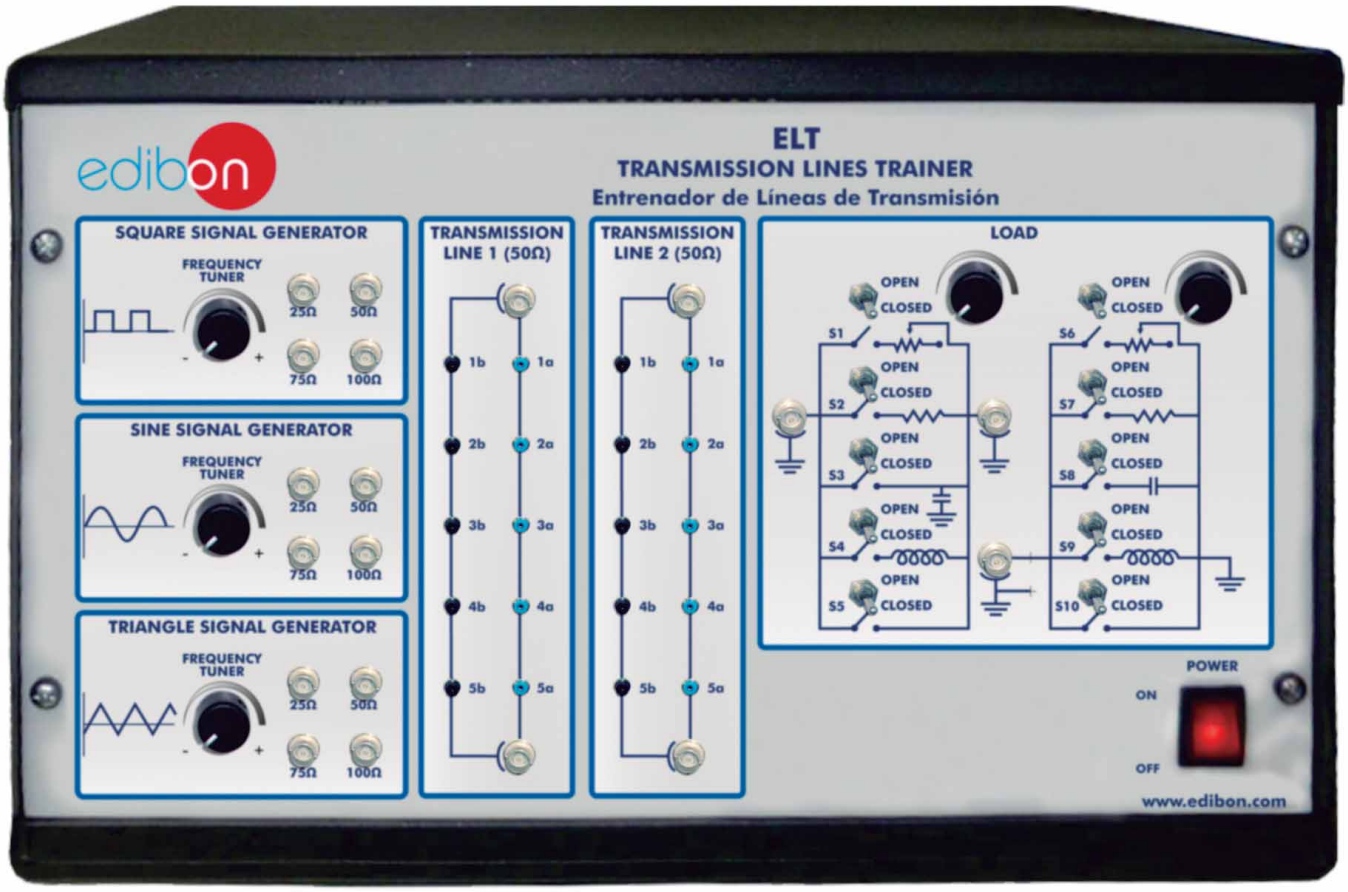
Technical Teaching Equipment

Transmission Lines Trainer

ELT



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INTRODUCTION

The Communication industry requires an ever-high data rates in the communication systems, the greater data rates needs that the components of a communication system are designed to ensure the signal integrity.

The transmission lines have critical importance in the design of communication systems, because is a main element in the terrestrial communication systems. The correct transmission of the information depends on a good design of this critical component.

The Transmission Lines Trainer "ELT" has been designed as integrated unit for help the student to understand the basic principles of the transmission line measurement theory.

The coaxial cable is the most common way to build a transmission line, because they allow a reliable communication from low frequencies to microwaves frequencies. The "ELT" has been designed to study a standardized coaxial line to analyze realistic measurements.

The trainer is fully provided with a set of practices that allow the student to study and to understand the diverse techniques to testing the signal transmission in a line (in steady-time and in time domain) and the techniques to characterize a transmission line (mismatches, variation of impedances, discontinuities, etc).

ISO 9000: Quality Management
(for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate
(total safety)

Certificates ISO 14000 and
ECO-Management and Audit Scheme
(environmental management)

Worlddidac Quality Charter Certificate and
Worlddidac Member

GENERAL DESCRIPTION

The trainer is divided into different blocks: Signal generators, Transmission lines and Loads.

- Signal Generators block: It contains a group of signal generators in order to study the behaviour of different types of signals. Each signal generator contains an encoder to change the signal frequency and four BNC connectors with different output impedance. There are three types of generators: Square Signal Generator, Sine Signal Generator and Triangle Signal Generator.

- Transmission Line block: It contains two transmission lines made each one of 40 m. of cable RG-174, in order to study an individual transmission line of 40 m. or 80 m. transmission line with the sum of both lines. The two transmission lines contain two BNC connectors at the beginning and the end of the line and five test points with 10 m. of coaxial cable between each other. The first and the last test points are internally connected to the nearest BNC connectors.

- Load block: This block contains two sets of loads, to configure the different termination loads or to configure the different discontinuities in the transmission line. The two sets of loads have a variable resistance, a fixed resistance, a capacitive load, an inductive load, a short circuit, etc. These different loads are set with an associated switch with each one.

SPECIFICATIONS

All elements are mounted in a metallic box, with power supply and block diagrams.

Signal Generators blocks:

Square Signal Generator block:

Amplitude: +12V.

Frequency range: 1Hz to 50KHz.

Sine Signal Generator block:

Amplitude: ± 2.5 V.

Frequency range: 1 Hz to 100KHz.

Triangle Signal Generator block:

Amplitude: ± 2.5 V.

Frequency range: 1 Hz to 100KHz.

Each signal generator contains an encoder to change the signal frequency and four BNC connectors with different output impedance.

Transmission Lines block:

2 transmission lines.

2 BNC connectors for each transmission line.

5 Test points along of each transmission line. The first and the last test point are straight connected with the BNC connectors and there is 10 m. of coaxial cable between test points.

40 m. of RG-174 coaxial cable in each line, a total of 80 m. in the 2 lines.

Load block:

Type of loads: resistive, inductive and capacitive loads.

First group of loads:

1 KΩ potentiometer.

33Ω Resistance.

1nF Capacitor.

4.7 μH Inductance.

Short circuit/Open circuit.

Second group of loads:

1 KΩ potentiometer.

50Ω Resistance.

10nF Capacitor.

4.7 μH Inductance.

Short circuit/Open circuit.

Switches to connect and disconnect each load.

3 BNC connectors.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Familiarization with the trainer.

2.- Analysis of the attenuation measurement along the line with Sine signal.

3.- Analysis of the attenuation and distortion measurements along the line with Triangle signal.

4.- Analysis of the attenuation and distortion measurements along the line with Square signal.

5.- Calculation of insertion losses.

6.- Measuring of VSWR of a matched and mismatched load and the conversion in return loss and reflection coefficient.

7.- Calculation of line impedance and reflection coefficient with the Smith chart.

8.- Analysis the velocity of propagation with TDR.

9.- Measuring the length of a line with TDR.

10.- Use TDR to identify faults in the transmission line.

11.- Use TDR to identify the differences between matched loads and mismatched loads and study of the transmission line impedance.

12.- Use TDR to identify the differences between inductive and capacitive loads.

13.- Finding discontinuities on a line with TDR.

REQUIRED SERVICES

-Electrical supply: single-phase, 220 V/50 Hz. or 110 V/60 Hz.

-Oscilloscope (recommended: 1 giga samples per second)

DIMENSIONS & WEIGHTS

-Dimensions: 490 x 330 x 310 mm. approx.
(19.29 x 12.99 x 12.20 inches approx.)

-Weight: 20 Kg. approx.
(44 pounds approx.).

✱Specifications subject to change without previous notice, due to the convenience of improvements of the product.

edibon INTERNATIONAL

C/ Del Agua, 14. Polígono Industrial San José de Valderas.
28918 LEGANÉS. (Madrid). SPAIN.
Phone: 34-91-6199363 FAX: 34-91-6198647
E-mail: edibon@edibon.com WEB site: **www.edibon.com**

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