

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 Unit, "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 Transmission Lines Unit, "ELT", has been designed by EDIBON to study a standardized coaxial line to analyze realistic measurements. The unit 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).

GENERAL DESCRIPTION

The Transmission Lines Unit, "ELT", 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: +12 V.

Frequency range: 1 Hz to 50 KHz.

Sine signal generator block:

Amplitude: ± 2.5 V.

Frequency range: 1 Hz to 100 KHz.

Triangle signal generator block:

Amplitude: ± 2.5 V.

Frequency range: 1 Hz to 100 KHz.



ELT detail

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

Transmission lines block:

Two transmission lines.

Two BNC connectors for each transmission line.

Five 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 two lines.

Load block:

Type of loads: resistive, inductive and capacitive loads.

First group of loads:

1 K Ω potentiometer.

33 Ω resistance.

1 nF capacitor.

4.7 μ H inductance.

Short circuit/open circuit.

Second group of loads:

1 K Ω potentiometer.

50 Ω resistance.

10 nF capacitor.

4.7 μ H inductance.

Short circuit/open circuit.

Switches to connect and disconnect each load.

Three 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.

Required elements (Not included):

- MED87. Two Channel Digital Oscilloscope 70 MHz.

EXERCISES AND PRACTICAL POSSIBILITIES

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| 1.- Familiarization with the unit. | 9.- Measuring the length of a line with TDR. |
| 2.- Analysis of the attenuation measurement along the line with Sine signal. | 10.- Use TDR to identify faults in the transmission line. |
| 3.- Analysis of the attenuation and distortion measurements along the line with triangle signal. | 11.- Use TDR to identify the differences between matched loads and mismatched loads and study of the transmission line impedance. |
| 4.- Analysis of the attenuation and distortion measurements along the line with square signal. | 12.- Use TDR to identify the differences between inductive and capacitive loads. |
| 5.- Calculation of insertion losses. | 13.- Finding discontinuities on a line with TDR. |
| 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 of the velocity of propagation with time domain reflectometry (TDR). | |

REQUIRED SERVICES

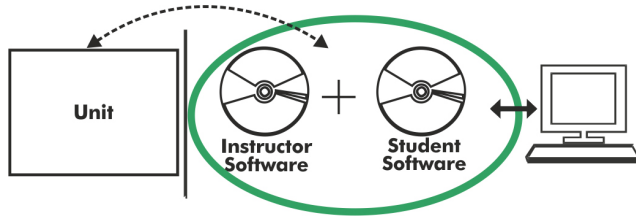
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|---|
| - Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz. |
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DIMENSIONS AND WEIGHTS

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| ELT: |
| - 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.). |

REQUIRED ELEMENTS (Not included)

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|---|
| - MED87. Two Channel Digital Oscilloscope 70 MHz. |
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ELT/ICAI. Interactive Computer Aided Instruction Software:

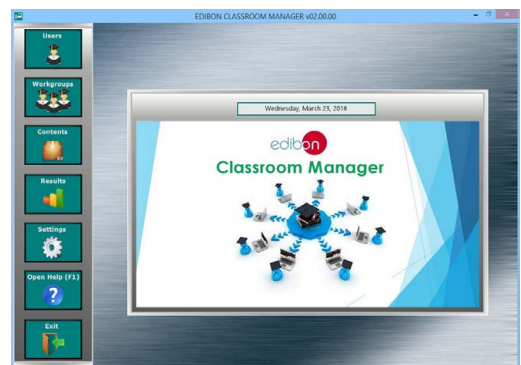
With no physical connection between unit and computer, this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

Instructor Software**- ECM-SOF. EDIBON Classroom Manager (Instructor Software).**

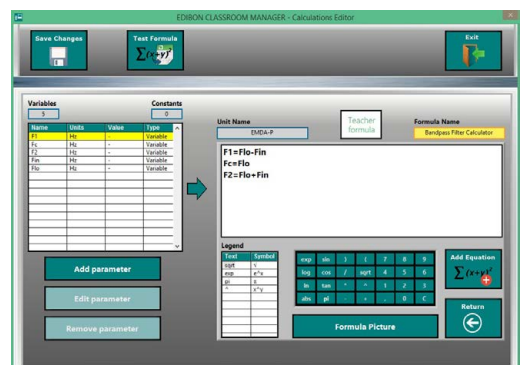
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

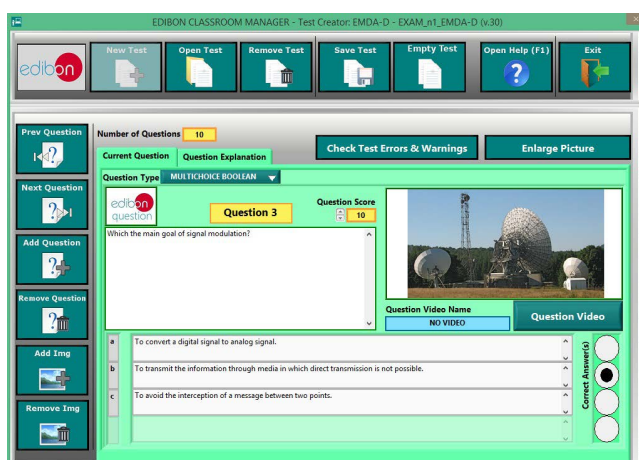
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.
- Updatable Contents.
- Report generation, User Progression Monitoring and Statistics.



ECM-SOF, EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL, EDIBON Calculations Program Package - Formula Editor Screen



ETTE, EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question



ERS, EDIBON Results & Statistics Program Package - Student Scores Histogram

Optional
Student Software

- ESL-SOF. EDIBON Student Labsoft (Student Software).

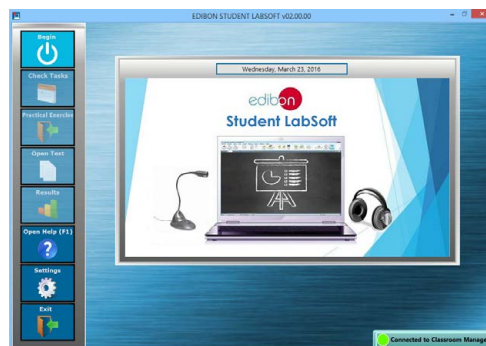
ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session. Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

Innovative features:

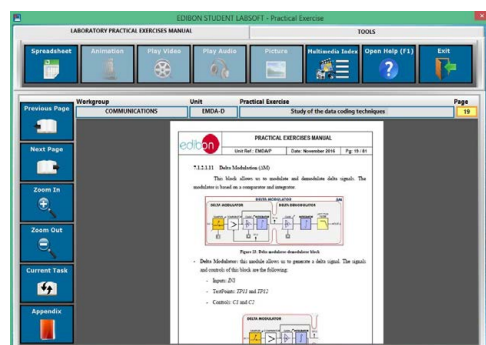
- Student Log-In & Self-Registration.
- Existing Tasks checking & Monitoring.
- Default contents & scheduled tasks available to be used from the first session.
- Practical Exercises accomplishment by following the Manual provided by EDIBON.
- Evaluation Methods to prove your knowledge and progression.
- Test self-correction.
- Calculations computing and plotting.
- Equation System Solver Engine.
- User Monitoring Learning & Printable Reports.
- Multimedia-Supported auxiliary resources.

For more information see ICAI catalogue. Click on the following link:

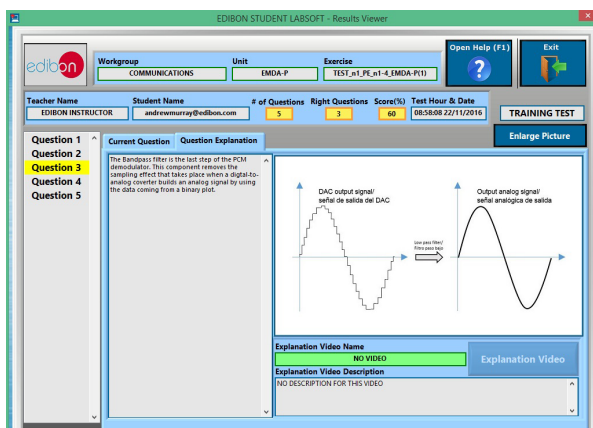
www.edibon.com/en/interactive-computer-aided-instruction-software



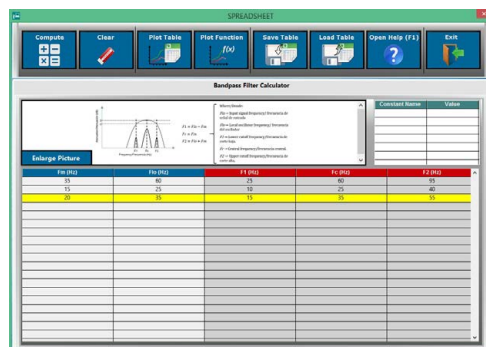
ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen



EPE. EDIBON Practical Exercise Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

* Specifications subject to change without previous notice, due to the convenience of improvement of the product.



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Edition: ED01/25
Date: January/2025

REPRESENTATIVE:

