Analog Modulations Unit

EMDA/A

INTRODUCTION

The Analog Modulations Unit, "EMDA/A", Digital Modulations Unit, "EMDA/D" and Pulse Modulations Unit, "EMDA/P", are a complete analog, digital and pulse communications unit that allows the student to learn the basic concepts about modulation.

They cover the principles of many of the modulation and demodulation techniques used in modern analog and digital communication systems.

The units are provided with a set of practices, through which the user will understand how to work with different modulation and demodulation circuits.

GENERAL DESCRIPTION

The Analog Modulations Unit, "EMDA/A", is a complete analog communications unit designed to explain the basic concepts of analog modulation. It covers the principles of many of the modulation and demodulation techniques used in modern analog communication systems.

The unit provides a basic understanding of the concepts behind analog techniques: Dual side band (DSB), Dual side band suppressed carrier (DSB-SC) and Single side band suppressed carrier (SSB-SC).

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

Functional blocks:

    Modulators and demodulators:

        Amplitude modulation (AM):

            Double side band modulator (DSB).

            Double side band suppressed carrier modulator (DSB-SC).

            Single side band suppressed carrier AM modulator (SSB-SC).

            Radio-frequency tuning.

            Intermediate-frequency (I.F) mixer.

            I.F amplifier.

            Envelope detector.

            Product detector.

        Frequency modulation (FM):

            Voltage controlled oscillator (VCO).

            Phase-locked loop detector (PLL).

    Analog generators:

        Carrier and audio signals.

    Five analog inputs.

    Nine analog outputs.

    Eighteen test points.

    Two controls.

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.

<u>Additional recommended elements</u> (only one) (Not included):

- EDAS/VIS-0.25. EDIBON Data Acquisition System and Virtual Instrumentation (speed: 250,000 samples/s).

- EDAS/VIS-1.25. EDIBON Data Acquisition System and Virtual Instrumentation (speed: 1,250,000 samples/s).

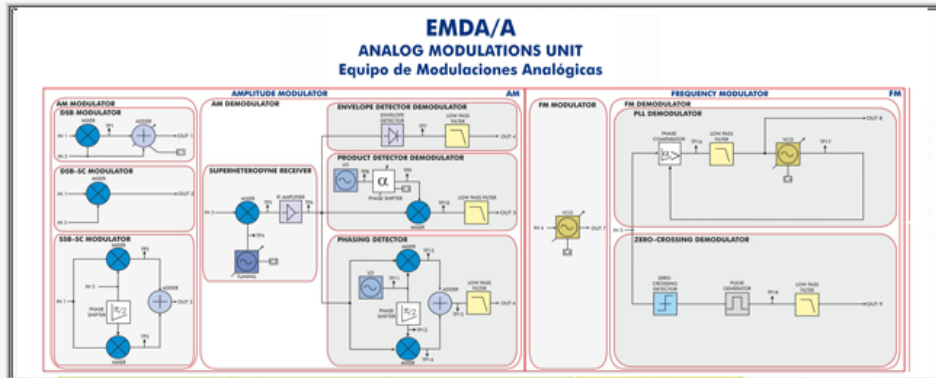## EDAS/VIS. EDIBON Data Acquisition System and Virtual Instrumentation

16 Analog inputs (1 block with **12 voltage channels** and 1 block with **2 current channels** (4 connections)).

 EDAS/VIS-0.25, sampling velocity 250,000 samples per second.

 EDAS/VIS-1.25, sampling velocity 1250,000 samples per second.

2 analog outputs.

24 digital inputs/outputs, configurable as inputs or outputs, with 24 state LED indicators. These digital inputs/outputs are grouped in three ports of eight channels (P0, P1 and P3).

4 digital signal switches 0 - 5 V.

2 analog signal potentiometers 12 V.

Main ON / OFF switch.

Inside: internal power supply of 12 V and 5 V. Potentiometer.

DAB. Data Acquisition Board:

The Data Acquisition board is part of the SCADA system.

For EDAS/VIS-1.25 Version EDIBON Data Acquisition System and Virtual Instrumentation (speed: 1,250,000 samples/s):

PCI Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI.

Analog input:

 Number of **channels= 16** single-ended or 8 differential. **Resolution=16 bits**, 1 in 65536.

 Sampling rate up to: 1,250,000 S/s (samples per second). Input range (V)= $\pm$10 V.

 Data transfers=DMA, interrupts, programmed I/0. Number of DMA channels=6.

Analog output:

 Number of **channels=2**. **Resolution=16 bits**, 1 in 65536. **Max. output rate up to: 900 KS/s.**

 Output range(V)= $\pm$10 V. Data transfers=DMA, interrupts, programmed I/0.

Digital Input/Output: Number of **channels=24 inputs/outputs**. Port 0 up to 8 MHz.

Timing: **Counter/timers=2.** Resolution: Counter/timers: 32 bits.

For EDAS/VIS-0.25 Version EDIBON Data Acquisition System and Virtual Instrumentation (speed: 250,000 samples/s):

 Sampling rate up to: 250,000 S/s (samples per second).

 Analog output: Max. output rate up to: 10 KS/s.

 Digital Input/Output: Number of **channels=24 inputs/outputs**. Port 0 up 1 MHz.

 Rest of characteristics are the same than EDAS/VIS 1.25 Version.

The Data Acquisition board model may change at any moment, providing the same or better features than those required for the unit.

EDAS/VIS/CCSOF. Computer Control + Data Acquisition + Data Management Software:

Compatible with actual Windows operating systems. Amicable graphical frame.

Configurable software allowing the temporal/frequency representation of the different inputs and outputs. Visualization of a voltage of the circuits on the computer screen.

It allows data store in a file, print screens and reports of the signals at any time.

Measurement, analysis, visualization, representation and report of results.

Set of virtual instruments:

 Oscilloscope:

 Channels: 12 simultaneous. Maximum input voltage: 10 V.

 All 12 input channels could be scaled to compare signal with different voltage levels.

 Maximum sampling velocity: 1000 samples per second.

 "Math Menu" with operations as add, rest, multiplication and division, between any of the 12 oscilloscope channels.

 Function generator:

 Two independent signal generators, for sinusoidal, triangular, sawtooth and square.

 Channels: 2 (allowing working simultaneously). Maximum output voltage: 10 V.

 Maximum output rate: 1000 samples per second.

 It includes a graph where an output signal for each channel is shown.

 Spectrum analyzer:

 Channels: 12 (simultaneous). Maximum voltage: 10 V. Digital spectrum analyzer: based on the FFT.

 Maximum sampling velocity: 1000 samples per second.

 Multimeter:

 Voltmeter, channels: 12 (simultaneous). Maximum voltage: 10 V RMS.

 Ammeter, channels: 2 (simultaneous). Maximum ampere: 500 mA RMS per channel.

 Transient analyzer.

 Logic analyzer:

 Number of input channels: 8. TTL Voltage level.

 Clock source: 2 different sources.

 This instrument allows receiving as far as 8 digital signal simultaneously.

 Logic generator:

 Number of transmission channels: 8. TTL voltage level.

 This instrument allows generating up to 8 digital simultaneous signals.

EXERCISES AND PRACTICAL POSSIBILITIES

1.- Study of basic principles of AM modulation and demodulation technique.
2.- Basic principles of DSB modulation and demodulation.
3.- Basic principles of DSBSC modulation and demodulation.
4.- Basic principles of SSBSC modulation and demodulation.
5.- Comparison of the spectrum of AM, SSBSC and DSBSC signals.
6.- Basic principles of FM modulation and demodulation.
7.- Introduction to the PLL operation.

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHTS

EMDA/A:
- 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)

- Oscilloscope (recommended: 1 giga samples per second).

ADDITIONAL RECOMMENDED ELEMENTS (Not included)

Recommended (only one):
- EDAS/VIS-0.25. EDIBON Data Acquisition System and Virtual Instrumentation (speed: 250,000 samples/s).
- EDAS/VIS-1.25. EDIBON Data Acquisition System and Virtual Instrumentation (speed: 1,250,000 samples/s).

SIMILAR UNITS AVAILABLE

Offered in this catalog:

- EMDA/A. Analog Modulations Unit.

Offered in other catalogs:

- EMDA/D. Digital Modulations Unit.
- EMDA/P. Pulse Modulations Unit.
- CODITEL. Telephony Systems Unit.
- ESA. Satellite Unit.

Main screen

Experimental Windows
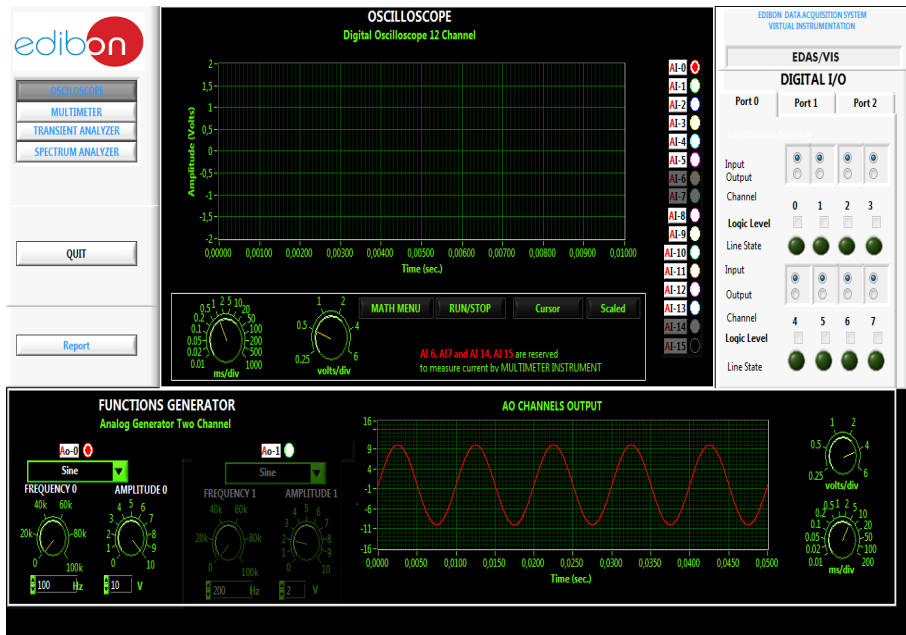
Main screen of
analog virtual instruments

Main screen of
digital virtual instruments

Analog Virtual Instruments Screens
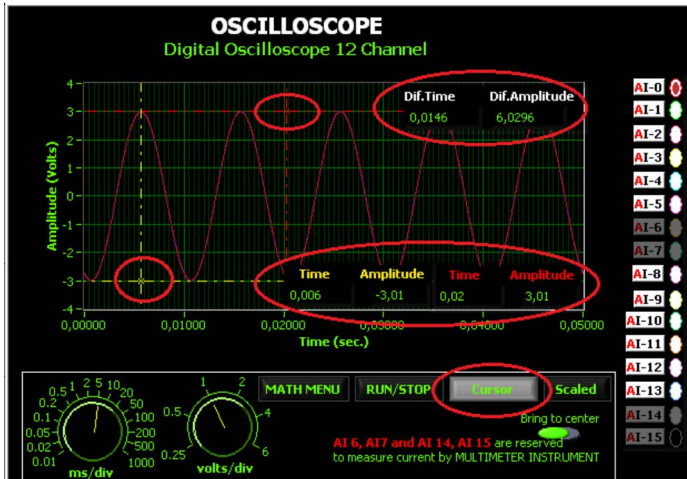
Oscilloscope
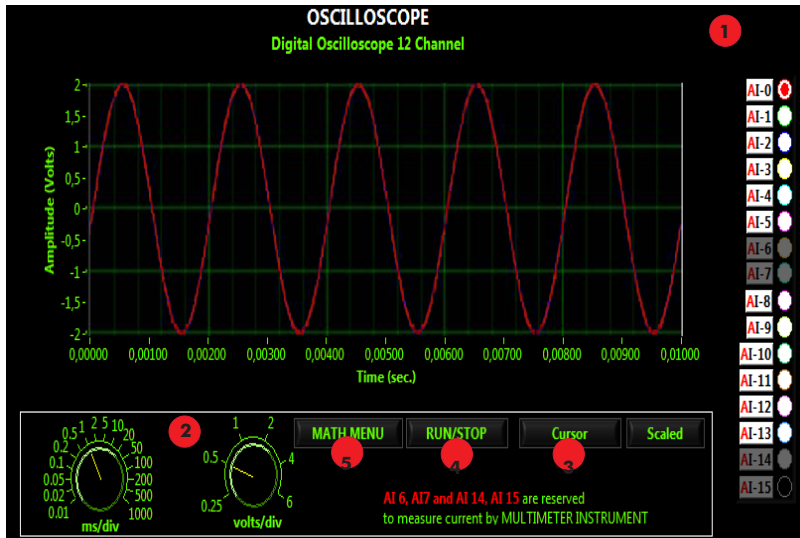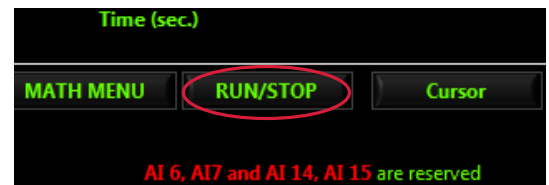

1 Channels selector

2 Handler control axis:
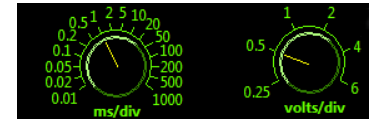
Let us to change the volts per division (volts-axis) and milliseconds per division (time-axis).

3 Cursors

4 Run/Stop:

The Run/Stop button lets us to hold the signal on the screen until pressing this button again. This option lets us to improve the accuracy when you work the with cursors.

Two cursors appear if you press "Cursor" button on oscilloscope's screen. Also several displays appear on the screen that show the volts shift, the time shift and the difference between both. The "Bring to center" button allows us bringing the cursors to center of graph.
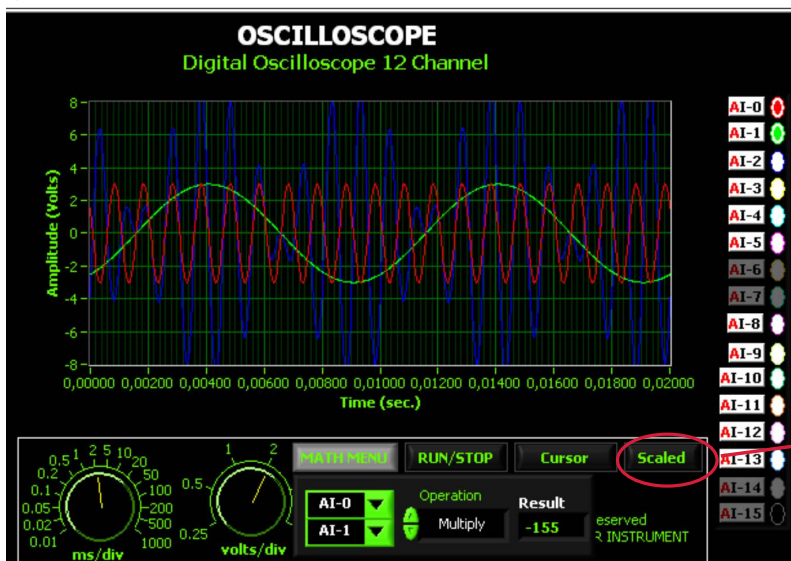
5 MATH MENU:

If you press the MATH MENU button a box appears. This chart contains two channel selectors and an operation selector to apply between the selected channels. The result of the operation will be shown in a display and on the graph. The available operations are ADD, REST, MULTIPLICATION and DIVISION among any of the 12 channels of the oscilloscope.

< In this screen we can see an example of multiplication between the red signal (AI-0) and green (AI-1). The blue signal of the graph is the result of the operation.
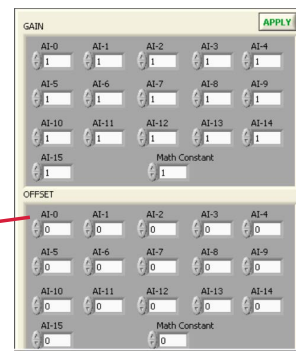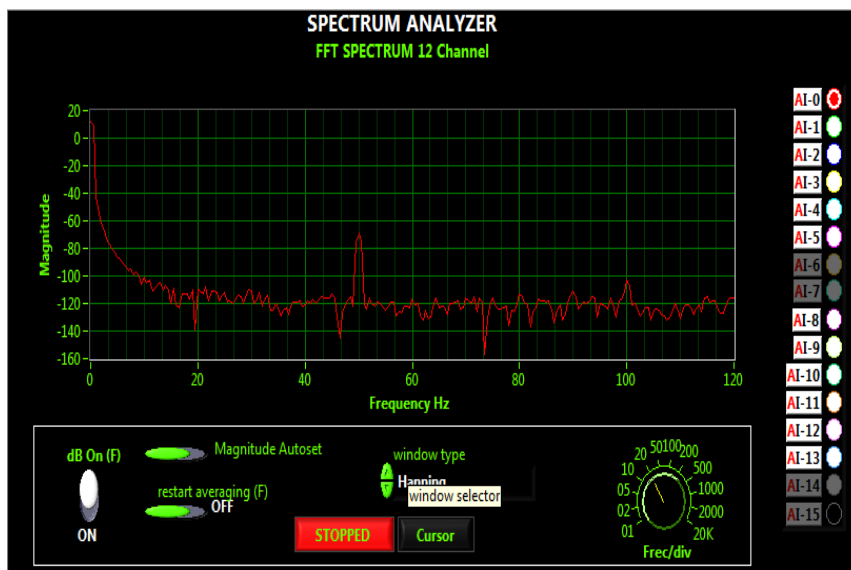

This instrument allows to scale independently each one of the channels. Like wise, the user could scale the result signal of the math operation.

Functions Generator
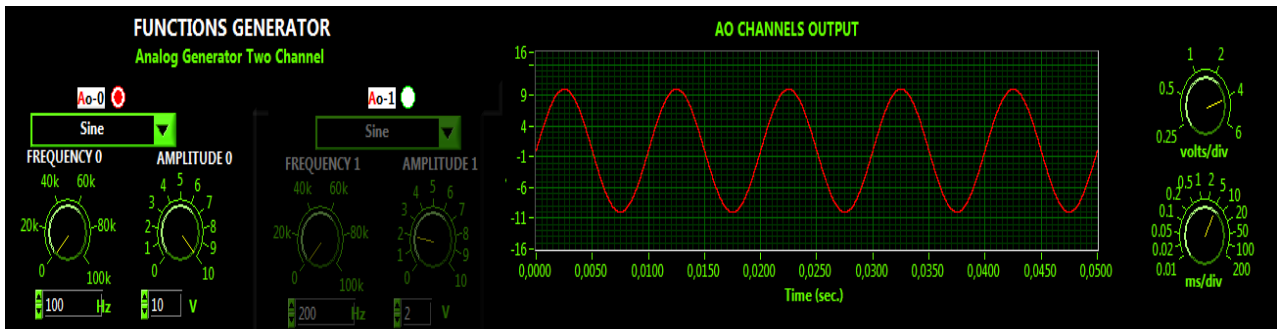
It has 2 channels and 4 type of functions.

Spectrum Analyzer

Multimeter

Voltimeter

Ammeter

Digital spectrum analyzer: based in FFT, Fourier fast transformer.

It lets us to change the frequency per division through a control placed under the graph, it can show magnitude in dB, auto magnitude scaled and it can apply several windows types, (Nothing, Hanning, Hamming, Blackman-harris, exact Blackmann, Blackman, flat top, 4 term B-harris, 7 term B-harris or low sidelobe).

Transient Analyzer
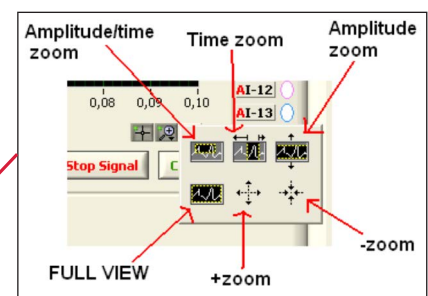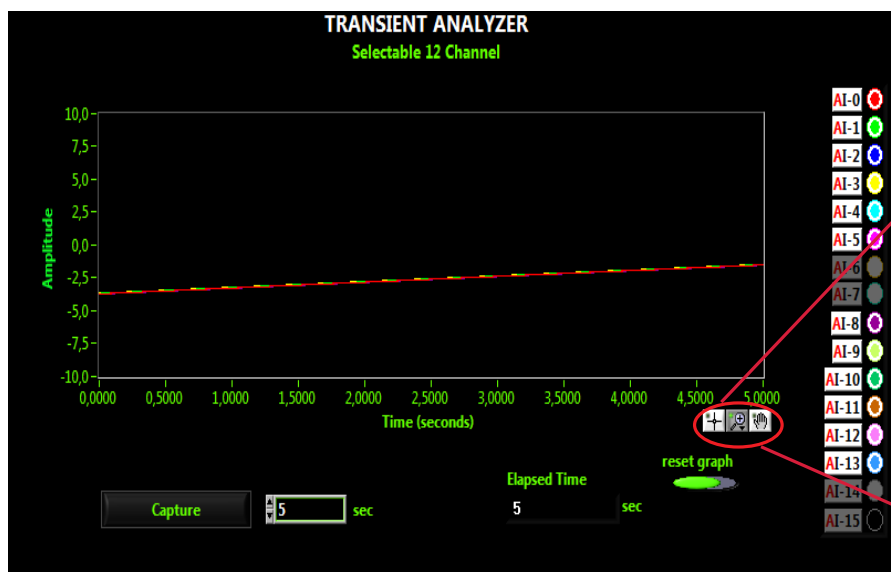
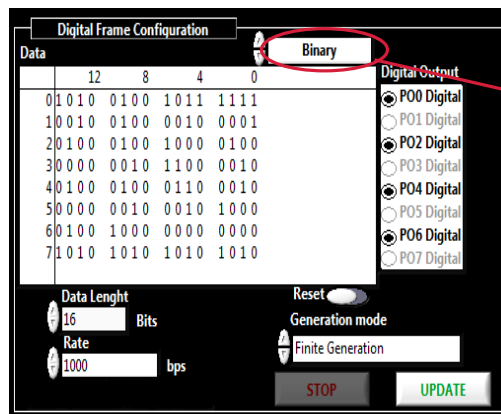The palette is essential to manipulate the graph. This palette has three actuation modes to act on the graph.
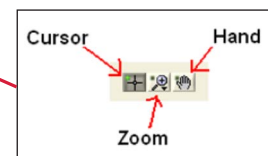
Logic Analyzer
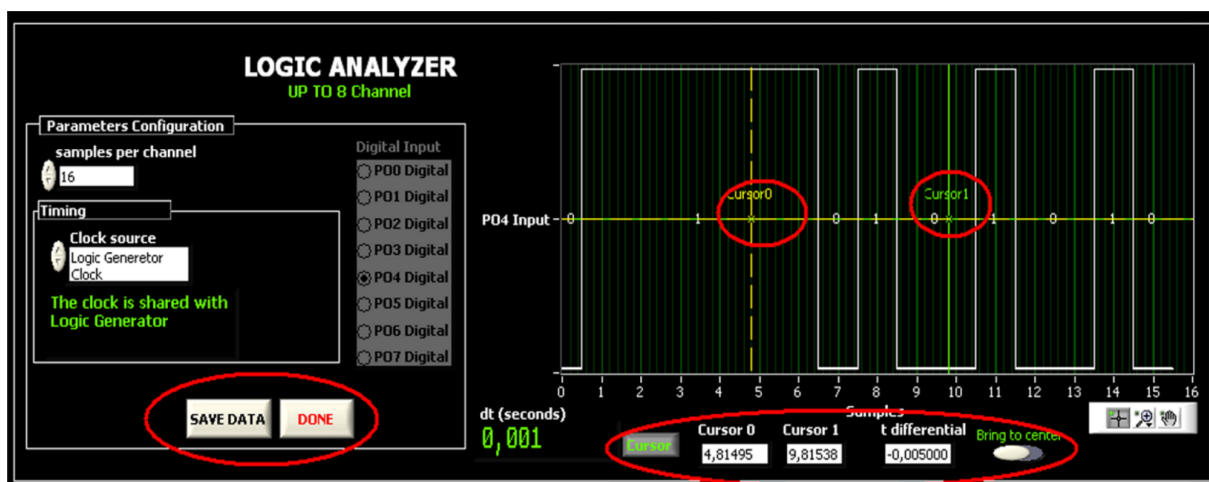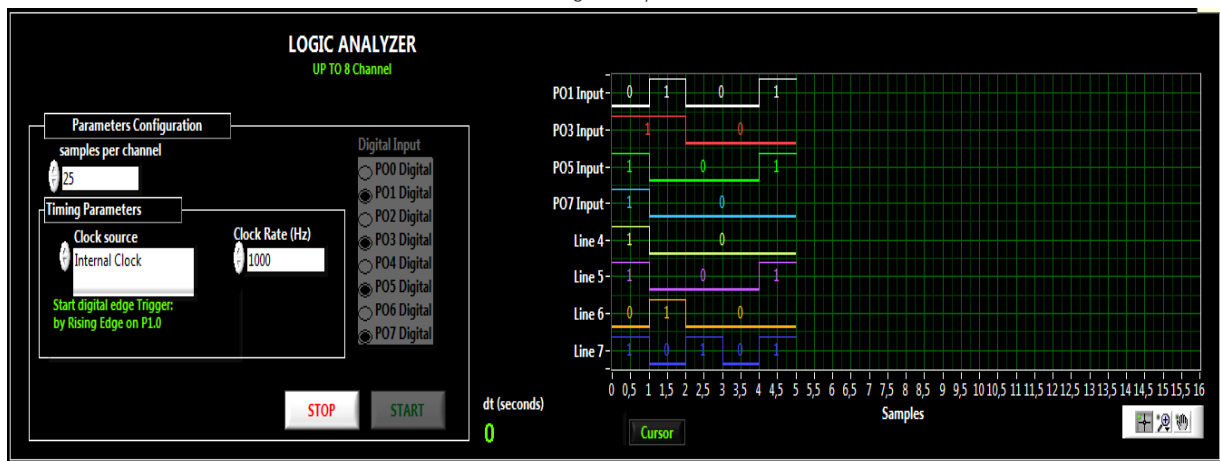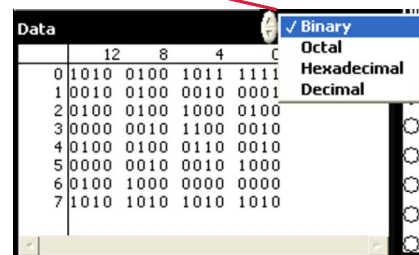
Logic Analyzer
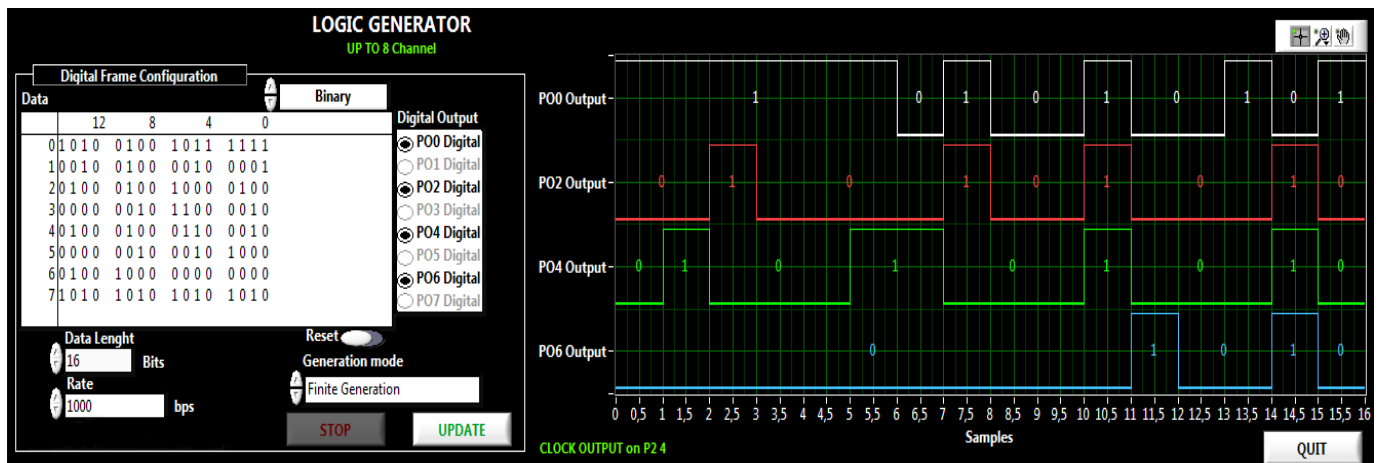
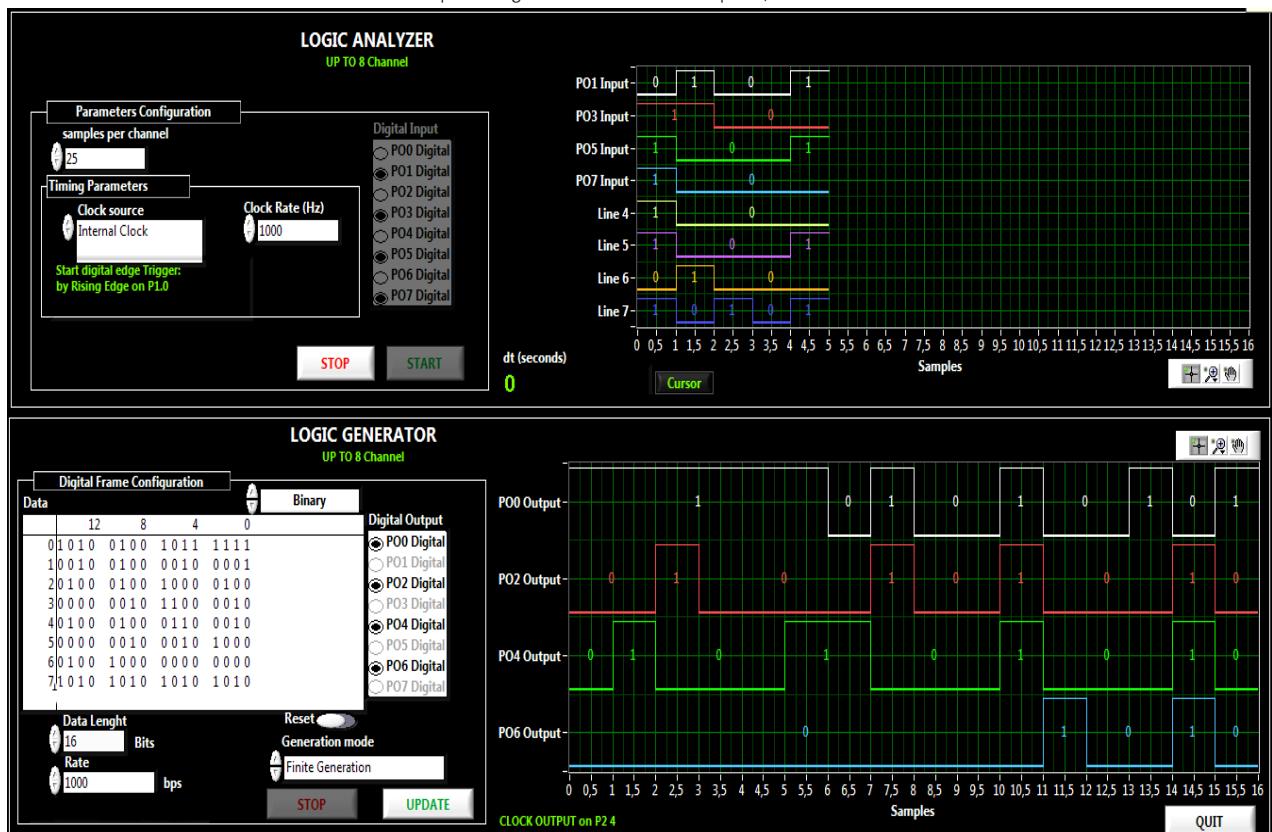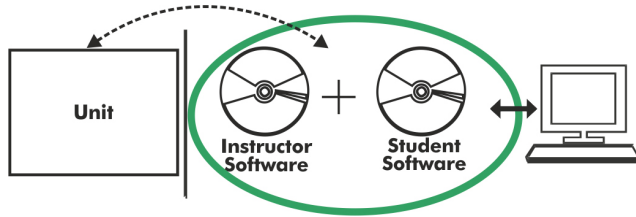It has two generation types: finite generation and continuous generation.

Several numeric bases:
- Binary.
- Octal.
- Hexadecimal.
- Decimal.

Example of digital transmission - Reception, LOOPBACK

## EMDA/A/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.
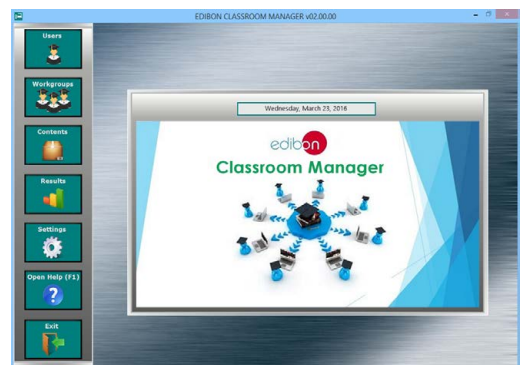
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen
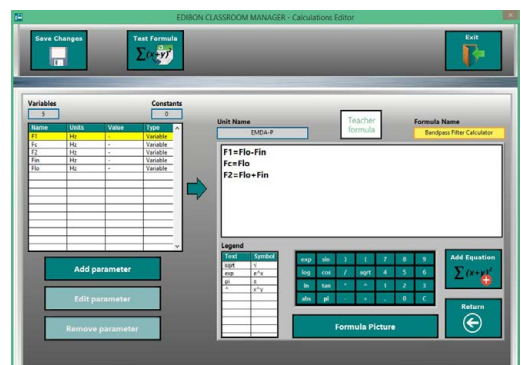
ECAL. EDIBON Calculations Program Package - Formula Editor Screen
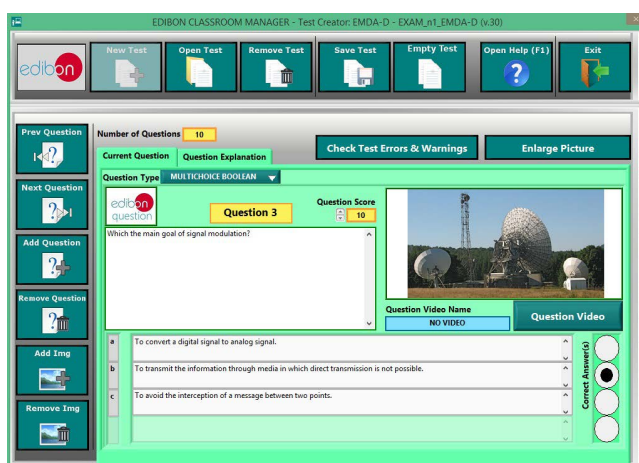
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

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

- 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.

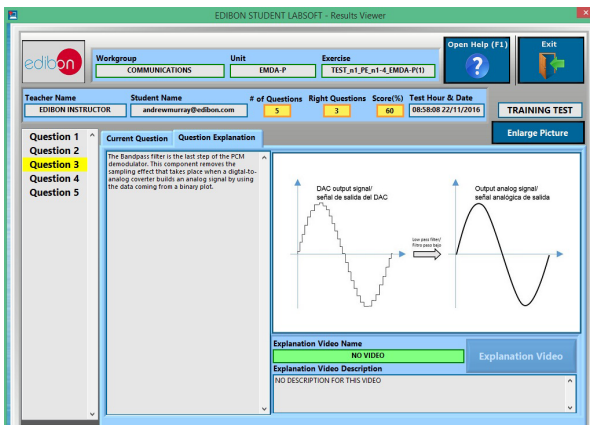For more information see **ICAI** catalogue. Click on the following link:
www.edibon.com/en/interactive-computer-aided-instruction-software
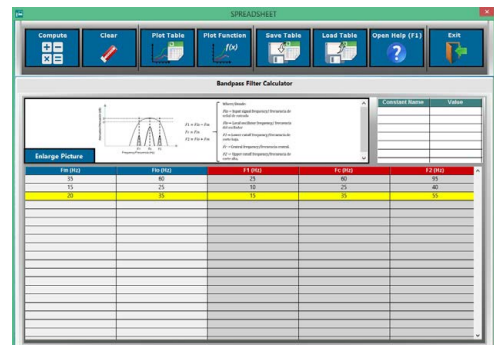

ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen
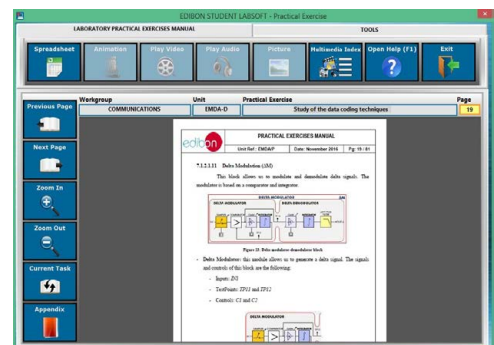
EPE. EDIBON Practical Exercise Program Package Main Screen

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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