



Engineering and Technical Teaching Equipment

Analog Modulations Trainer

EMDA/A

Digital Modulations Trainer

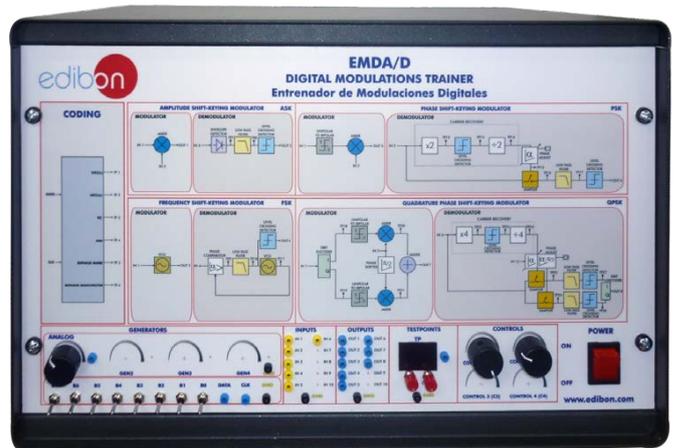
EMDA/D

Pulse Modulations Trainer

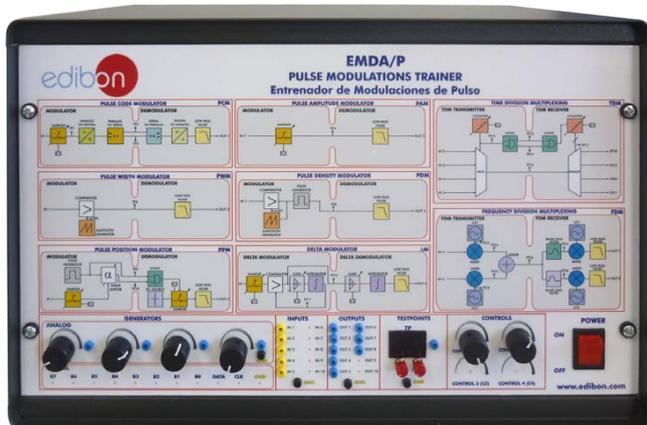
EMDA/P



EMDA/A. Analog Modulations Trainer



EMDA/D. Digital Modulations Trainer



EMDA/P. Pulse Modulations Trainer

www.edibon.com
PRODUCTS
30.- COMMUNICATIONS

INTRODUCTION

The Analog Modulations Trainer, "EMDA/A", Digital Modulations Trainer, "EMDA/D" and Pulse Modulations Trainer, "EMDA/P", are a complete analog, digital and pulse communications trainer 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.



ISO 9001: Quality Management (for Design, Manufacturing, Commercialization and After-sales service)



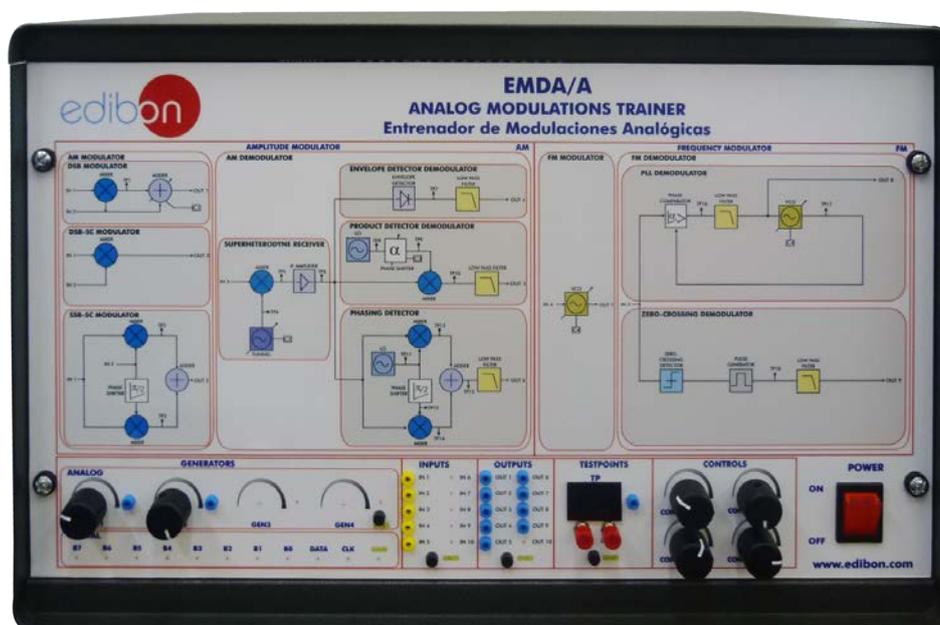
European Union Certificate (total safety)



Certificates ISO 14001 and ECO-Management and Audit Scheme (environmental management)



Certificate and Worlddidac Member



GENERAL DESCRIPTION

The Analog Modulations Trainer, "EMDA/A", is a complete analog communications trainer 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 trainer 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).

SPECIFICATIONS

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.

18 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.

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, 220 V/50 Hz or 110 V/60 Hz.

RECOMMENDED ACCESSORIES (Not included)

- EDAS/VIS-0.25. EDIBON Data Acquisition System / Virtual Instrumentation System (250.000 samples per second).
- EDAS/VIS-1.25. EDIBON Data Acquisition System / Virtual Instrumentation System (1.250.000 samples per second).

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.)

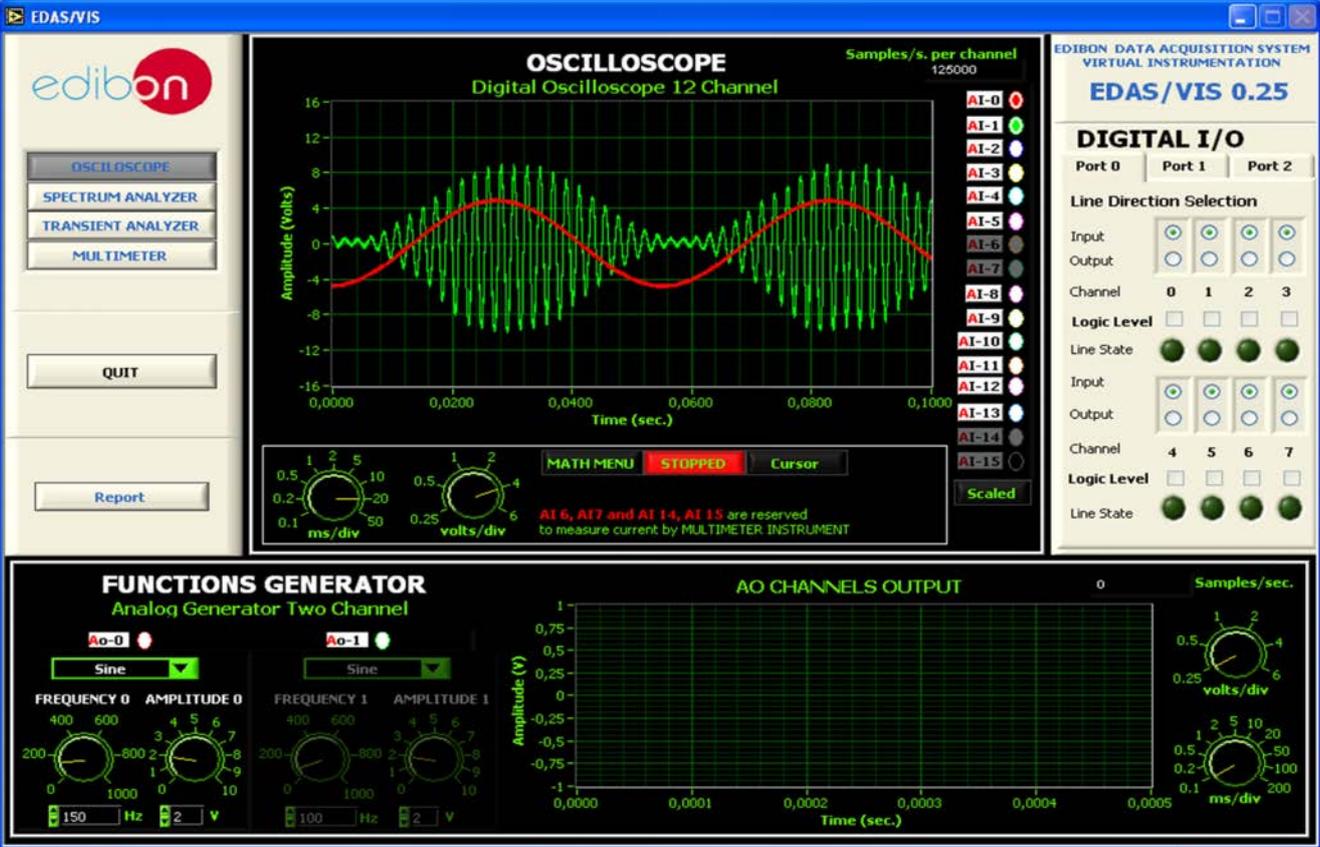
SOME REAL RESULTS OBTAINED FROM THIS UNIT

Some typical results screens with EDAS/VIS. EDIBON Data Acquisition System / Virtual Instrumentation System

DBS (Dual Side Band Amplitude Modulation)

The screens below show the time and frequency representation of a DSB AM signal. As it can be seen in the frequency domain, a DSB contains both side bands and carrier components.

Time domain of a DSB signal



Frequency domain of a DSB signal



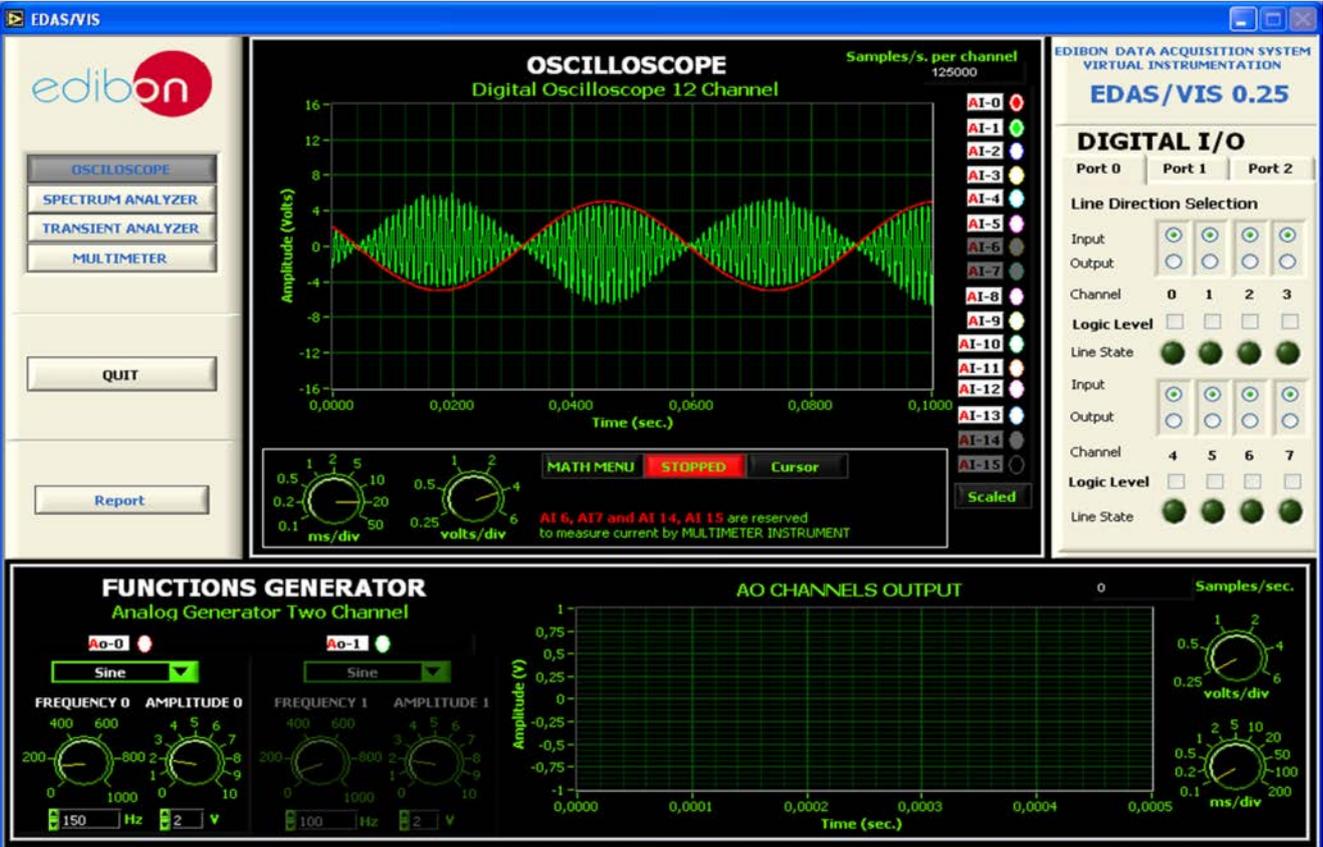
Some **real** results obtained from this Unit

Some typical results screens with EDAS/VIS. EDIBON Data Acquisition System / Virtual Instrumentation System

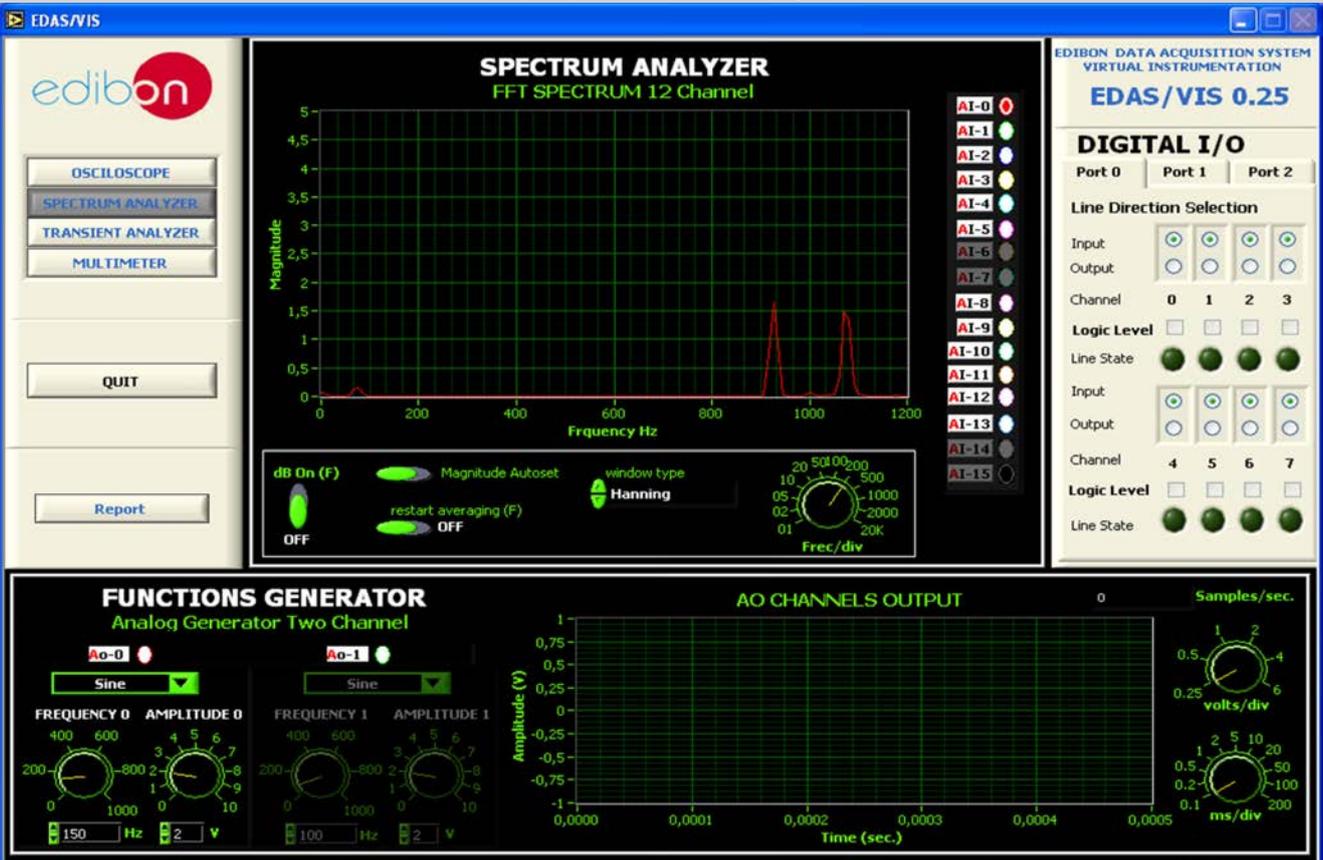
DBS-SC (Dual Side Band Suppressed Carrier Amplitude Modulation)

The screens below show the time and frequency representation of a DSB-SC AM signal. As it can be seen in the frequency domain, the signal contains both side bands components and the carrier is removed.

Time domain of a DSB-SC signal



Frequency domain of a DSB-SC signal

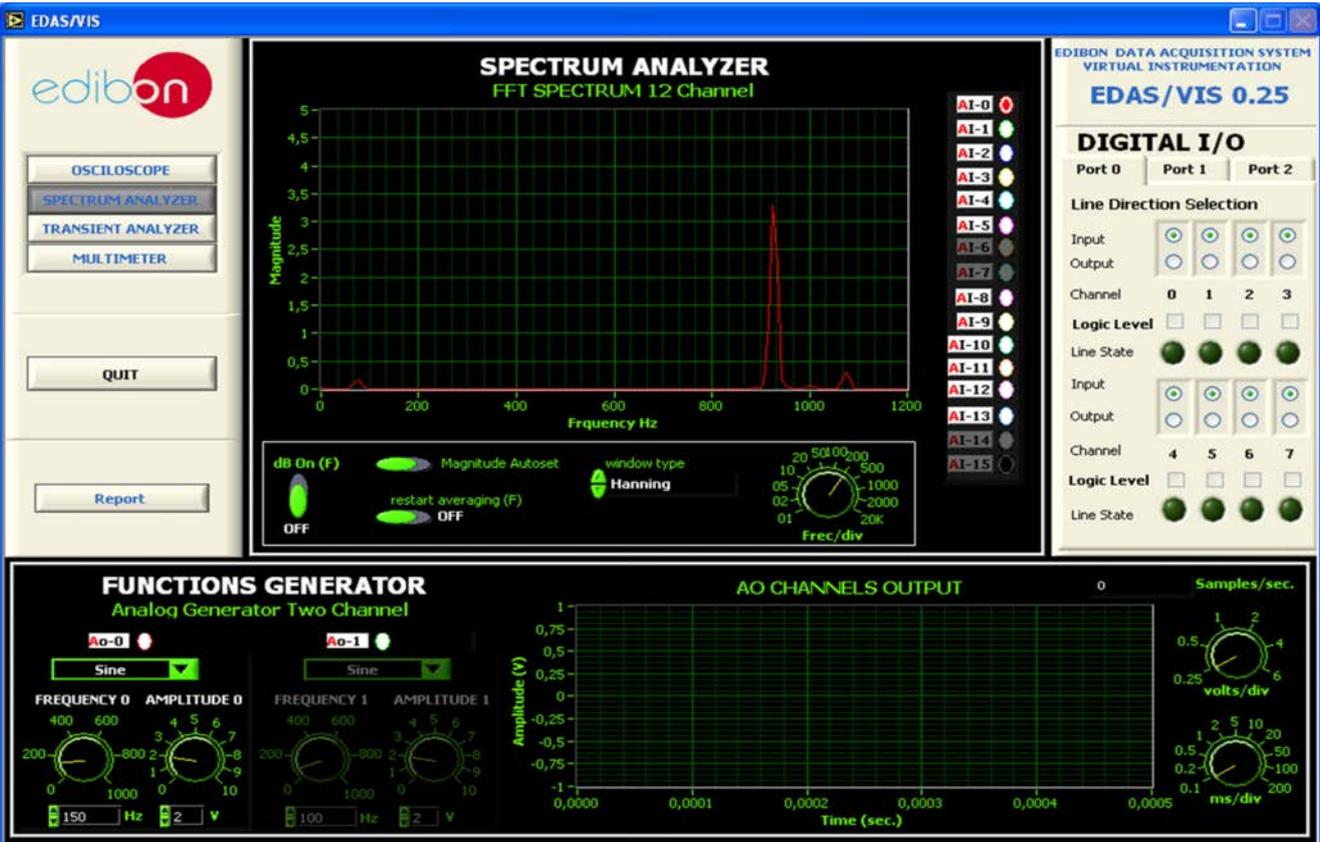


Some **real** results obtained from this Unit

Some typical results screens with EDAS/VIS. EDIBON Data Acquisition System / Virtual Instrumentation System

SSB-SC (Single Side Band Suppressed Carrier Amplitude Modulation)

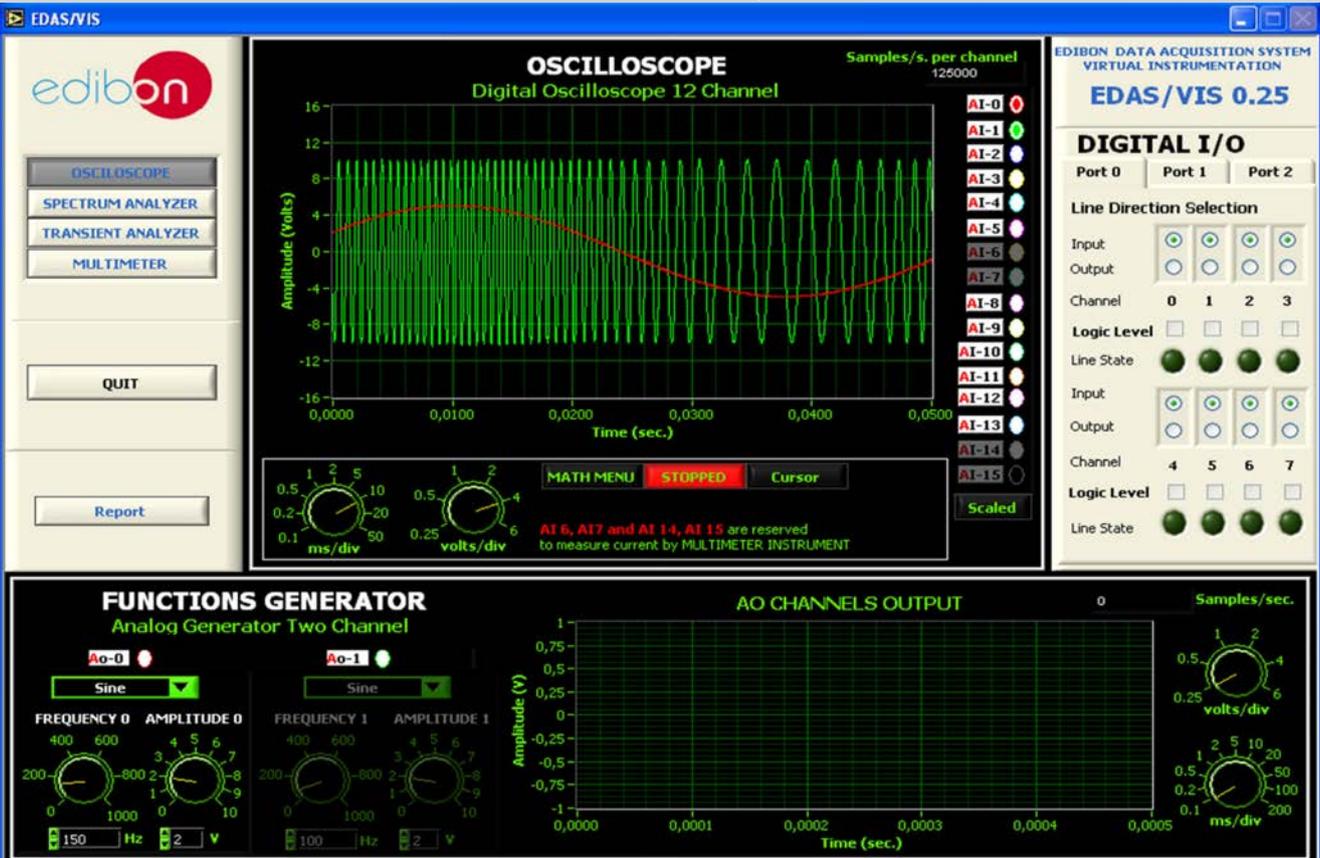
The screen below shows the frequency representation of a SSB-SC AM signal. The signal only contains a single component.
Frequency domain of a SSB-SC signal



FM (Frequency Modulation)

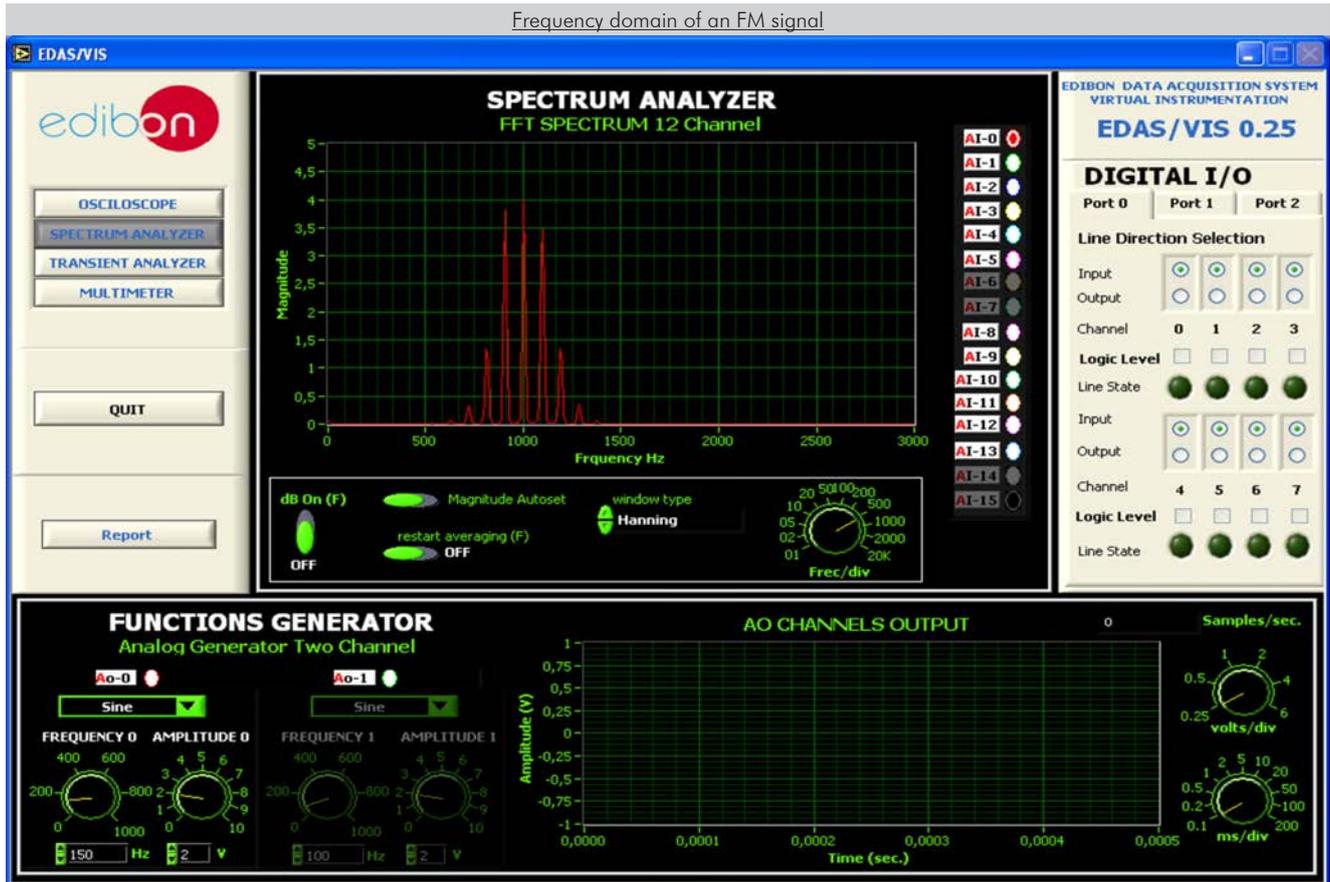
The screens below show the time and frequency representation of a FM signal. As it can be seen in the time domain, the frequency of the signal is varied according to the amplitude of the information signal.

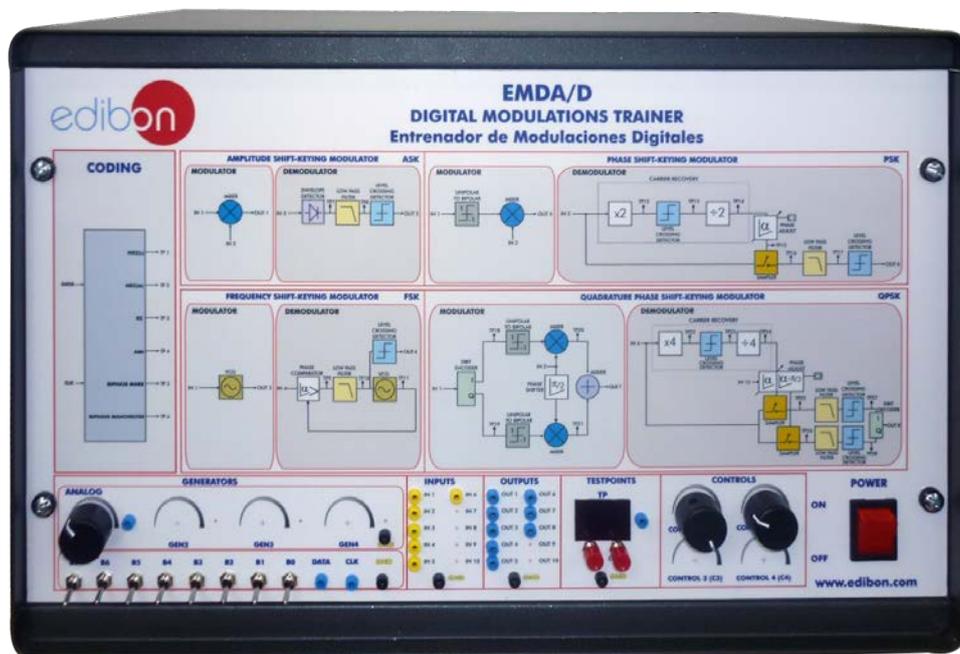
Time domain of an FM signal



Some **real** results obtained from this Unit

Some typical results screens with EDAS/VIS. EDIBON Data Acquisition System / Virtual Instrumentation System





GENERAL DESCRIPTION

The Digital Modulations Trainer, “EMDA/D”, is a complete digital communications trainer designed to explain the basic concepts of digital modulation. It covers the principles of many of the modulation and demodulation techniques used in modern digital communication systems.

The trainer provides a basic understanding of the concepts behind digital communications techniques: Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK) and Quadrature Phase Shift Keying (QPSK). It allows students to study some of the line coding techniques like NRZ(L), NRZ(M), RZ, RB, etc.

SPECIFICATIONS

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

Functional blocks:

Line Coding:

- Non Return to Zero Level line coding circuit (NRZL).
- Non Return to Zero Mark line coding circuit (NRZM).
- Biphase Manchester line coding circuit.
- Biphase Mark circuit line coding circuit.
- Return to Zero line coding circuit (RZ).
- Return to Bias line coding circuit (RB).
- Alternate Mark Inversion line coding circuit (AMI).

Modulators and demodulators:

Amplitude-Shift Keying (ASK):

- Mixer.
- Filter.

Frequency-Shift Keying (FSK):

- Phase-Locked Loop detector (PLL).

Phase-Shift Keying (PSK):

- Unipolar to Bipolar converter.
- Mixers.

Specifications

Carrier recovery circuit:

Multiplier and divider circuits.

Squarer circuit.

Voltage Controlled Oscillator (VCO).

Sampler.

Filter.

Level-Crossing detector.

Quadrature Phase-Shift Keying (QPSK):

Dbit encoder circuit.

Unipolar to Bipolar converters.

Mixers.

Carrier recovery circuit:

Multiplier and divider circuits.

Squarer circuit.

Voltage Controlled Oscillator (VCO).

Samplers circuits.

Filter.

Level-Crossing detectors.

Dbit decoder circuit.

Analog Generators:

Carrier signal.

Digital Generators:

A byte (8 bits, serial).

Six analog Inputs.

Eighth analog Outputs.

28 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.

EXERCISES AND PRACTICAL POSSIBILITIES

- | | |
|---|---|
| 1.- Study of the data coding techniques. | 4.- Study of basic principles of PSK modulation and demodulation technique. |
| 2.- Study of basic principles of ASK modulation and demodulation technique. | 5.- Study of basic principles of QSK modulation and demodulation technique. |
| 3.- Study of basic principles of FSK modulation and demodulation technique. | |

REQUIRED SERVICES

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

RECOMMENDED ACCESSORIES (Not included)

- EDAS/VIS-0.25. EDIBON Data Acquisition System / Virtual Instrumentation System (250.000 samples per second).
- EDAS/VIS-1.25. EDIBON Data Acquisition System / Virtual Instrumentation System (1.250.000 samples per second).

DIMENSIONS AND WEIGHTS

EMDA/D:

- 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.)

SOME REAL RESULTS OBTAINED FROM THIS UNIT

Some typical results screens with EDAS/VIS. EDIBON Data Acquisition System / Virtual Instrumentation System

ASK (Amplitude Shift Keying)

The screen below shows the time representation of an ASK signal. As it can be seen, the carrier signal is transmitted as long as the information signal is at high logic level and it is suppressed when it is at low level.

Time domain of an ASK signal



FSK (Frequency Shift Keying)

The screen below shows the time representation of a FSK signal. As it can be seen, the frequency of the carrier signal is changed according to the logic level of the information signal.

Time domain of a FSK signal



Some **real** results obtained from this Unit

Some typical results screens with EDAS/VIS. EDIBON Data Acquisition System / Virtual Instrumentation System

PSK (Phase Shift Keying)

The screen below shows the time representation of a PSK signal. As it can be seen, the phase of the carrier signal is changed according to the logic level of the information signal.

Time domain of a PSK signal

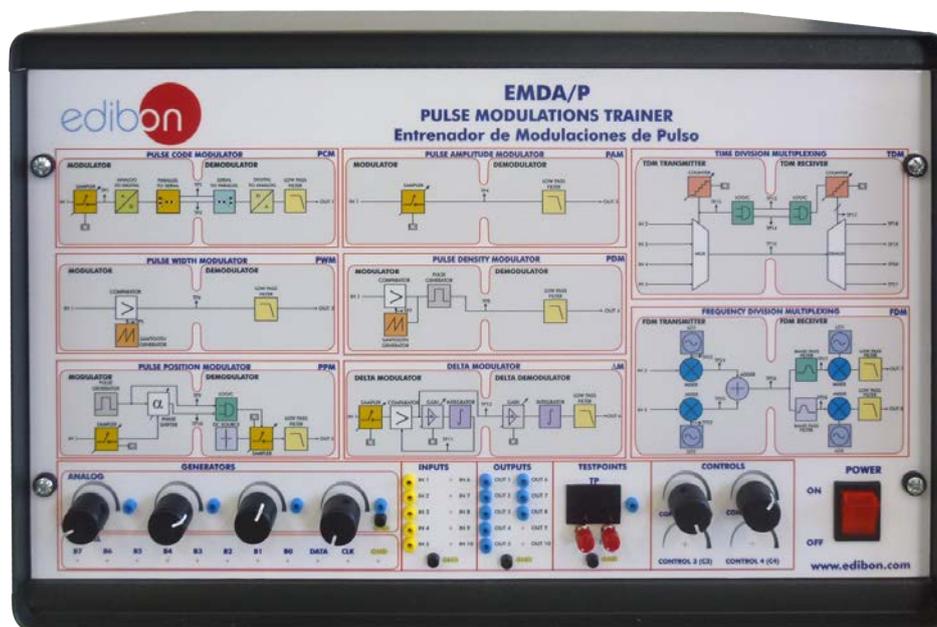


QPSK (Quadrature Phase Shift Keying)

The screen below shows the time representation of a QPSK signal. As it can be seen, the phase of the carrier signal is changed according to the logic level of the information signal.

Time domain of a QPSK signal





GENERAL DESCRIPTION

The Pulse Modulations Trainer, “EMDA/P”, is a complete modulations trainer designed to explain the basic concepts of pulse modulation. It covers the principles of many of the modulation and demodulation techniques used in modern communication systems.

The trainer provides a basic understanding of the concepts behind pulse communications techniques: Pulse Code Modulation (PCM), Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Density Modulation (PDM), Pulse Position Modulation (PPM). Finally, it allows students to study the basic principles of Time Division Multiplexing (TDM) and Frequency Division Multiplexing (FDM) are introduced.

SPECIFICATIONS

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

Functional blocks:

Modulators and demodulators:

Pulse Code Modulation (PCM):

- Sample & Hold circuit.
- Analog to Digital Converter (ADC).
- Parallel to Serial circuit.
- Serial to Parallel circuit.
- Digital to Analog Converter (DAC).
- Filter.

Pulse Amplitude Modulation (PAM):

- Sampler circuit.
- Filter.

Pulse Width Modulation (PWM):

- Sawtooth Generator circuit.
- Comparator circuit.
- Filter.

Pulse Density Modulation (PDM):

- Sawtooth Generator circuit.
- Comparator circuit.
- Filter.

Pulse-Position Modulation (PPM):

- Pulse Generator circuit.
- Samplers circuits.
- Phase Shifter.
- Filters.

Delta Modulation (ΔM):

- Sample Generator circuit.
- Comparator circuit.
- Integrators circuit.
- Amplifiers.
- Filters.

Time Division Multiplexing (TDM):

- Multiplexer and Demultiplexer.
- Synchronization circuits.

Frequency Division Multiplexing (FDM):

- Local Oscillators.
- Mixers.
- Adder circuit.
- Band-Pass Filters.
- Low Pass Filters.

Analog Generators:

- Two audio signals.
- Two carrier signals.

Five analog Inputs.

Ten analog Outputs.

28 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.

EXERCISES AND PRACTICAL POSSIBILITIES

- | | |
|--|--|
| <ul style="list-style-type: none"> 1.- Basic principles of PCM modulation and demodulation. 2.- Basic principles of PAM modulation and demodulation. 3.- Basic principles of PWM modulation and demodulation. 4.- Basic principles of PPM modulation and demodulation. 5.- Basic principles of PDM modulation and demodulation. | <ul style="list-style-type: none"> 6.- Basic principles of Delta modulation and demodulation. 7.- Introduction to the work principle of TDM. 8.- Introduction to the work principle of FDM. |
|--|--|

REQUIRED SERVICES

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

RECOMMENDED ACCESSORIES (Not included)

- EDAS/VIS-0.25. EDIBON Data Acquisition System / Virtual Instrumentation System (250.000 samples per second).
- EDAS/VIS-1.25. EDIBON Data Acquisition System / Virtual Instrumentation System (1.250.000 samples per second).

DIMENSIONS AND WEIGHTS

EMDA/P:

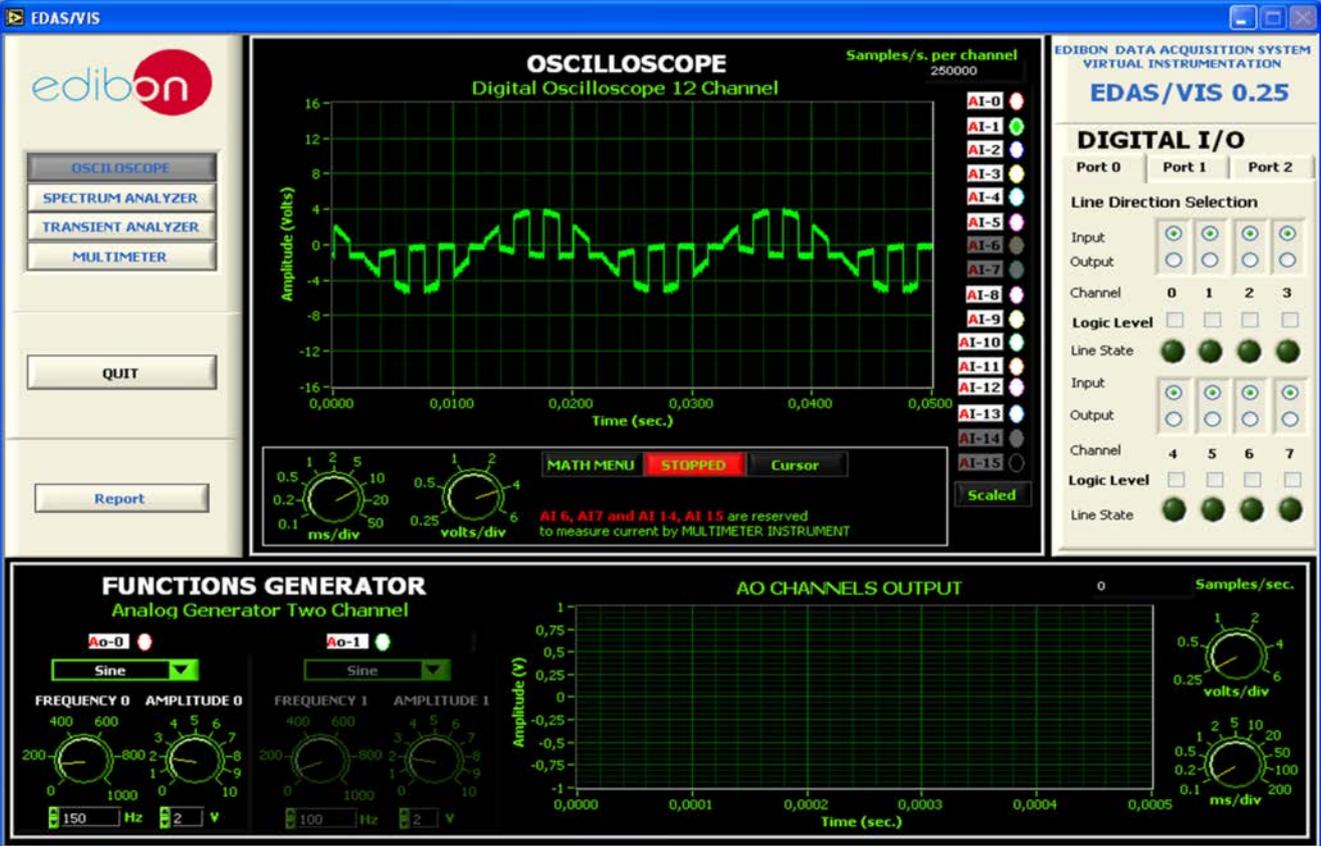
- Dimensions: 490 x 330 x 310 mm approx.
(19.29 x 12.99 x 12.20 inches approx.)
- Weight: 20 Kg approx.
(44 pounds approx.)

SOME REAL RESULTS OBTAINED FROM THIS UNIT

Some typical results screens with EDAS/VIS. EDIBON Data Acquisition System / Virtual Instrumentation System

PAM (Pulse Amplitude Modulation)

The screen below shows the time representation of a PAM signal. As it can be seen, the PAM signal is obtained by sampling the information signal.
Time domain of a PAM signal



PWM (Pulse Width Modulation)

The screen below shows the time representation of a PWM signal. As it can be seen, the width of the carrier signal is changed according to the amplitude of the information signal.
Time domain of a PWM signal



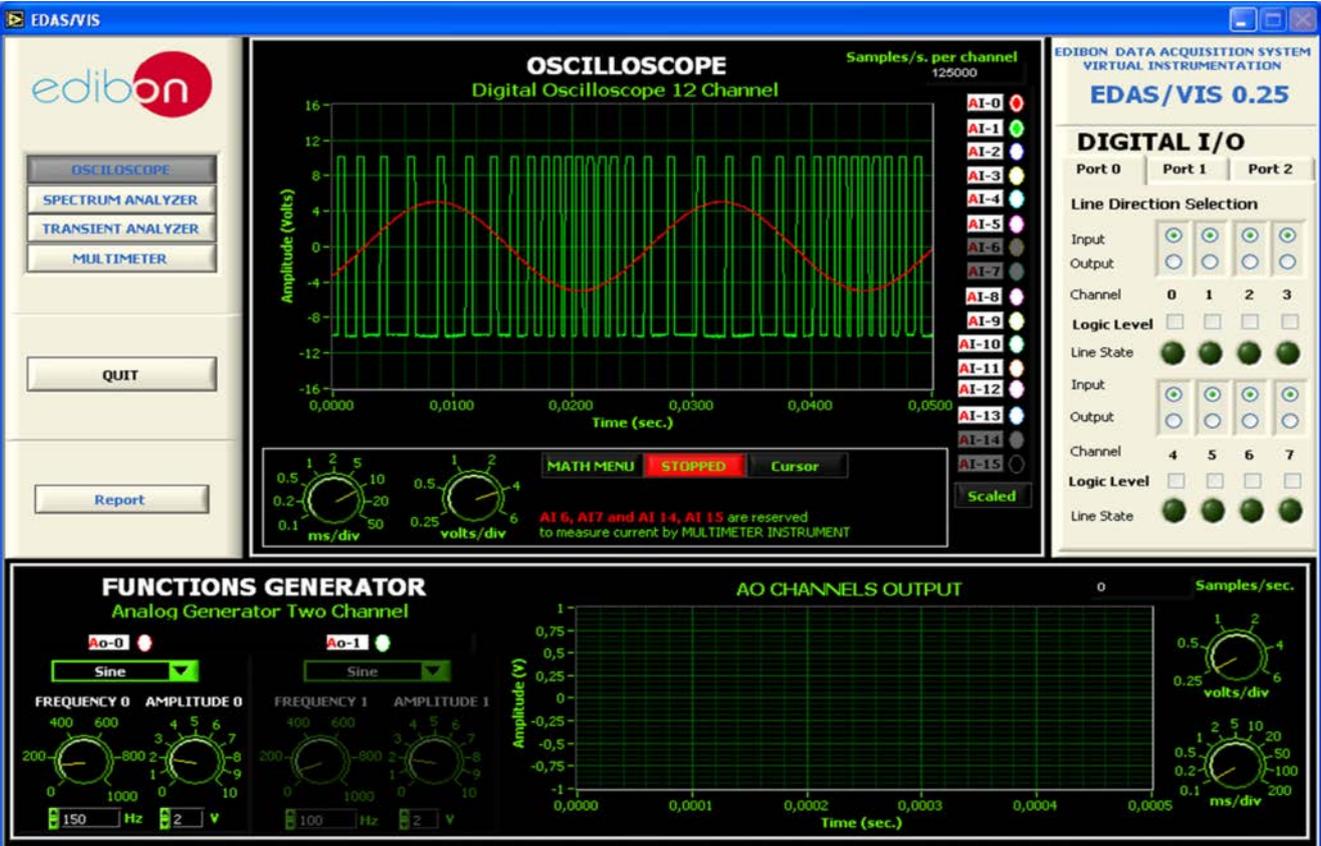
Some **real** results obtained from this Unit

Some typical results screens with EDAS/VIS. EDIBON Data Acquisition System / Virtual Instrumentation System

PDM (Pulse Density Modulation)

The screen below shows the time representation of a PDM signal. As it can be seen, the density of the carrier signal is changed according to the amplitude of the information signal.

Time domain of a PDM signal



TDM (Time Division Multiplexing)

The screen below shows the time representation of a TDM signal. As it can be seen, the TDM signal intercalates different signals samples within a sampling interval.

Time domain of a TDM signal

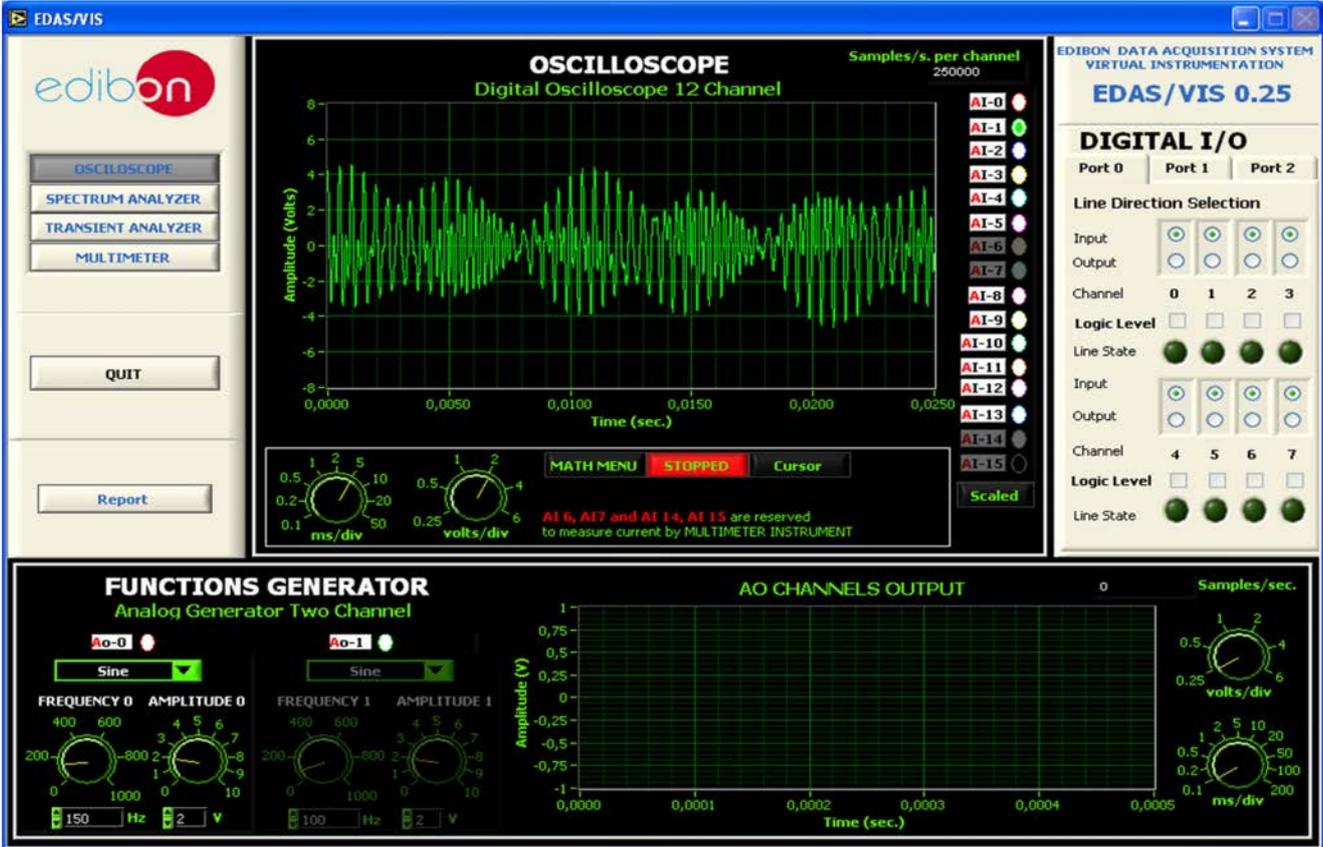


Some **real** results obtained from this Unit

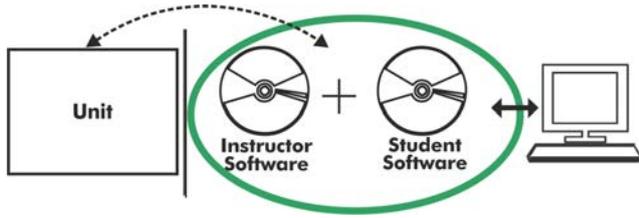
Some typical results screens with EDAS/VIS. EDIBON Data Acquisition System / Virtual Instrumentation System

FDM (Frequency Division Multiplexing)

The screen below shows the time representation of an FDM signal. As it can be seen, the FDM signal contains different signals of different frequencies.
Time domain of a FDM signal



EMDA/ICAI. Interactive Computer Aided Instruction Software System:



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:

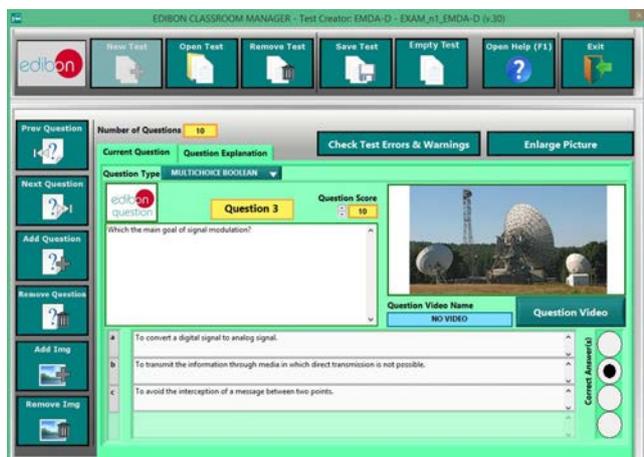
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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

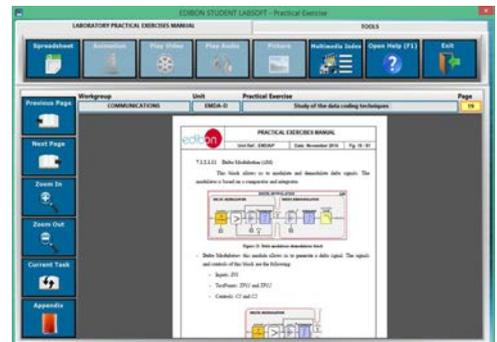
- Student Log-In & Self-Registration.
- Existing Tasks checking & Monitoring.
- Default contents & scheduled tasks available to be used from the first session.
- Practical Exercises accomplishment by following the Manual provided by EDIBON.
- Evaluation Methods to prove your knowledge and progression.
- 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:

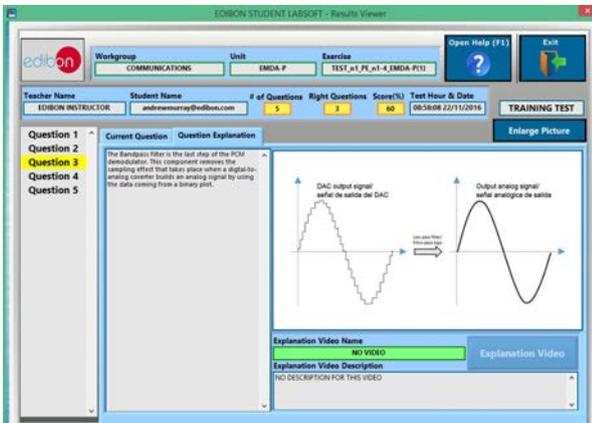
www.edibon.com/en/files/expansion/ICAI/catalog



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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REPRESENTATIVE:

