edibon
Technical Teaching Equipment

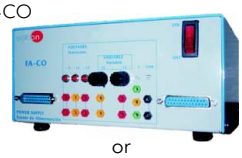
Communications Integrated Laboratory

LICOMBA

Laboratory structure

① Power Supply

FA-CO

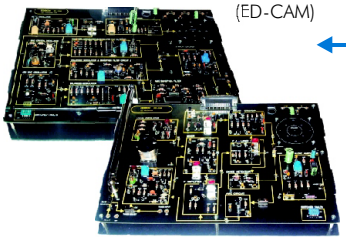


or

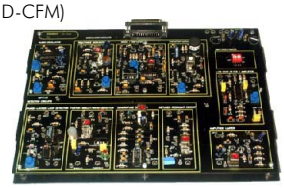
EBC-100

② Modules
(power supply needed)
Available analog communications modules:

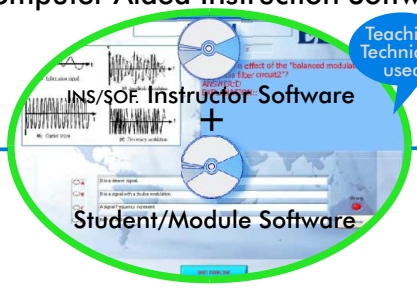
(ED-CAM)



(ED-CFM)

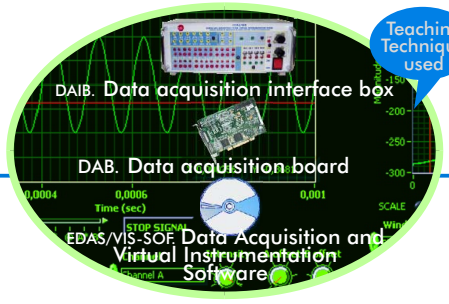


③ CAI. Computer Aided Instruction Software System



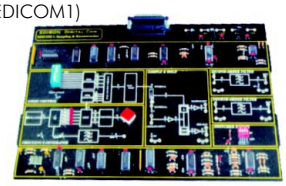
④ LICOMBA/CAL. Computer Aided Learning Software (Results Calculation and Analysis)

⑤ EDAS/VIS. EDIBON Data Acquisition System/ Virtual Instrumentation System

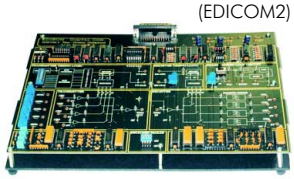


② Modules
(power supply needed)
Available digital communications modules:

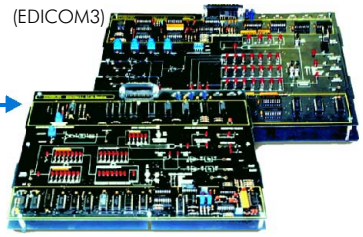
(EDICOM1)



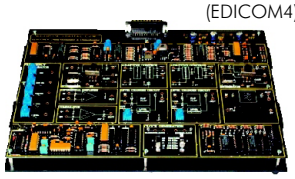
(EDICOM2)



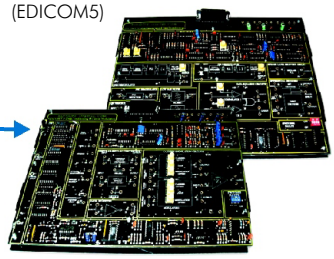
(EDICOM3)



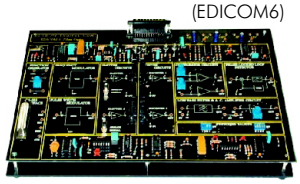
(EDICOM4)



(EDICOM5)



(EDICOM6)



The Complete Laboratory includes parts 1 to 5 and any part can be supplied individually or additionally. (Power supply + Module/s is the minimum supply).

Available Modules

Analog Communications

- ED-CAM. **AM Communications.**
- ED-CFM. **FM Communications.**

Digital Communications

- EDICOM 1. **Signals Sampling and Reconstruction.**
- EDICOM 2. **Time Division Multiplex (TDM). PAM Transmitter and Receiver.**
- EDICOM 3. **MIC-TDM Transmission/Reception.**
- EDICOM 4. **Delta Modulation and Demodulation.**
- EDICOM 5. **Line codes. Signal Modulation and Demodulation.**
- EDICOM 6. **Optical Fibre Transmission and Reception.**

ISO:9001-2000 Certificate of Approval. Reg. No. E204034

European Union Certificate

Certificates ISO 14001: 2004 and ECO-Management and Audit Scheme
(environmental management)

Worlddidac Quality Charter Certificate
Worlddidac Member

INTRODUCTION

EDIBON presents a flexible and modular-based system for learning analog and digital communications.
The advantage given by this learning and teaching system is that the student establishes his own rhythm, thus rendering unnecessary to keep pace with the rest of the class.
Any desired configuration can be chosen(see next page), according to working mode, areas of study and number of working posts.
Being a modular and open system, it is very economical and may be enlarged depending on required needs; all previously acquired systems are fully compatible and valid.

GENERAL DESCRIPTION

The Communications modules are specifically designed for an in-depth analysis and study of analog and digital communications and modulation techniques.
The students may use each module independently to the others, along with the external "FA-CO" power supply, or the "EBC-100" Base Unit.
The modules have test points placed on them for taking measurements.

What are the parts included in the laboratory?

① **Power supply:**

There are two choices for supplying the modules:

FA-CO. Power Supply:

Using this system training and practices can be done conventionally. This is the most common power supply used.

EBC-100. Base Unit :

This unit is self-complete it includes hardware, power supply and the necessary connections for supplying power and allocating the available modules.

② **Modules:**

They consist on electronic boards which permit the student to do the exercises/practices corresponding to the target subject.
On these modules the circuits to be designed are serigraphed. Real components are displayed to familiarize the student with them. There are many points where measures can be taken (voltage, current intensity, resistance, etc.).
Moreover, circuit and electronic **component faults can be simulated too**.
Every Module has its own manual, that gives the theoretical knowledge and explains everything the student needs to carry out the exercise /practice. We provide eight copies of the manual per module.
Connectors and cables for completing the exercises and practices are included.

③ **CAI. Computer Aided Instruction Software System:**

The best help in classroom for both teacher and students.
Includes:

3.1) INSTRUCTOR SOFTWARE. INS/SOF: Classroom Management Software Package (Instructor Software).
Only one package is needed per classroom.
Helps creating databases, reports and statistical comparisons among many more features.

3.2) STUDENT SOFTWARE . Computer Aided Instruction Software Packages (Student/Module Software).
Each module has its own package.
Gives the students the proper assistance on theoretical knowledge as well as in practice, presenting exercises and questions.

④ **LICOMBA/CAL. Computer Aided Learning Software (Results Calculation and Analysis):**

Windows, based software, simple and easy to use, specifically developed for use with EDIBON communications modules.

⑤ **EDAS/VIS. EDIBON Data Acquisition System/ Virtual Instrumentation System:**

EDIBON has developed this unique data acquisition interface, link between modules and PC, for an adequate visualization of the results yielded by the modules.
The components together (hardware + software) makes the computer work as virtual instruments: Oscilloscope, Functions Generator, Spectrum Analyzer, Transient Analyzer, Multimeter, Logic Analyzer and Logic Generator, with all their features and applications.
Includes:

5.1) Hardware: DAIB. Data Acquisition Interface Box + DAB. Data Acquisition Board.
5.2) Software: EDAS/VIS-SOF. Data Acquisition and Virtual Instrumentation Software.

Complete LICOMBA LABORATORY included: ①+②+③+④+⑤

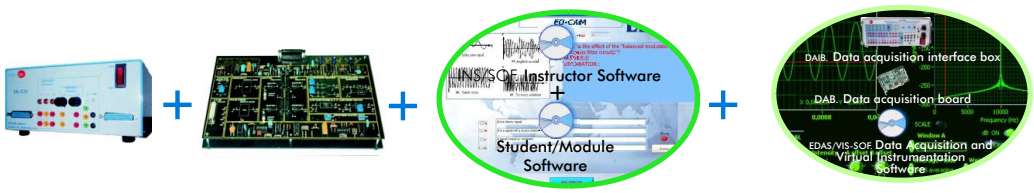
Minimum supply: ① Power supply + ② Modules. (Every module needs power supply).

Working possibilities:

A) CAI + EDAS/VIS + LICOMBA/CAL working possibility (complete EDIBON system)

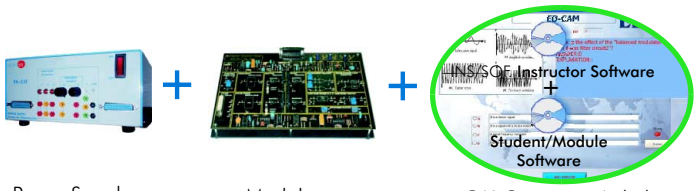
Power Supply + Modules + CAI.Computer Aided Instruction Software System + EDAS/VIS. EDIBON Data Acquisition System/ Virtual Instrumentation System + LICOMBA/CAL.Computer Aided Learning Software (Results Calculation and Analysis)

B) CAI + EDAS/VIS working possibility



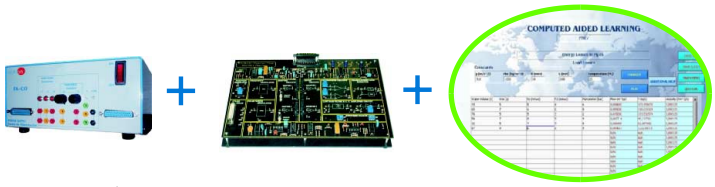
Power Supply + Modules + CAI.Computer Aided Instruction Software System + EDAS/VIS. EDIBON Data Acquisition System/ Virtual Instrumentation System

C) CAI working possibility



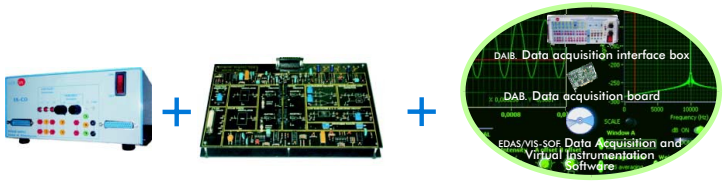
Power Supply + Modules + CAI.Computer Aided Instruction Software System

D) LICOMBA/CAL working possibility



Power Supply + Modules + LICOMBA/CAL.Computer Aided Learning Software (Results Calculation and Analysis)

E) EDAS/VIS working possibility



Power Supply + Modules + EDAS/VIS. EDIBON Data Acquisition System/Virtual Instrumentation System

F) Simplest working possibility

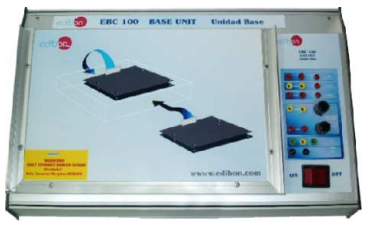
Power Supply + Modules

① Power Supply

FA-CO. **Power Supply**

Fixed outputs: + 5 V, ± 12 V, 1 A.
Variable outputs: ± 12 V, 0.5 A.
AC output: 12V. or 24V.
Outputs through either 2mm. contact terminals, or through 25 pin CENTRONICS connectors (2 outputs).
LED's voltage indicators.
Robust construction.
Supply: 110/220V A.C.
Frequency: 50/60 Hz.

FA-CO includes all the requirements for full working with any module ED-CAM, ED-CFM and EDICOM type.



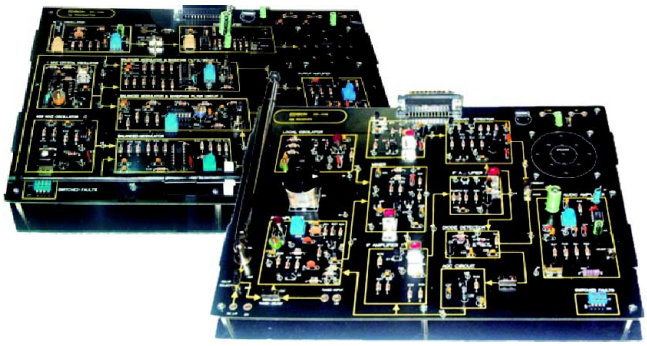
EBC-100. **Base Unit**

Hardware support and power supply.
Modules supporting unit.
Variable outputs ± 12 V.
Fixed outputs + 5V, + 12V, -12V.
AC output: 12V. or 24V.
Outputs through either 2 mm. contact terminals, or through 25 pin CENTRONICS connector.
LED'S voltage indicators.
Supply: 110/220 V. A.C.
Frequency: 50/60 Hz.
Robust construction.
EBC-100 includes all the requirements for full working with any module ED-CAM, ED-CFM and EDICOM type.

Analog Communications

Available modules:

ED - CAM **AM Communications**



SPECIFICATIONS

The module consist of two different boards:
One is the transmitter, the other one the receiver.
Communication between them may be through connecting cables or by antennas.
Modulation study:
D.S.B.: Double Sideband.
S.S.B.: Single Sideband.
DSB-SC: Double Sideband with Suppressed Carrier.
Also contains an audio amplifier and a loudspeaker.
Adjustable audio volume through the amplifier.
Output signal selector through loudspeaker or headphones.
Sixteen error commuter switches (eight per board).
Telescopic antenna.
Numbered testing points for measurements using an oscilloscope.
Transmitter specifications:
DSB output frequency: 1 MHz.
SSB output frequency: 1.4 MHz.
DSB MODULATOR, consisting of: a crystal oscillator (1MHz.); a balanced modulator and a band-pass filter N.1; and a ceramic pass-band filter.
SSB MODULATOR, consisting of: an oscillator of 455 kHz.; A balanced modulator; a ceramic pass-band filter; and a balanced modulator and pass-band filter N.2
Receiver specifications:
Type: Superheterodyne.
Two Detectors:
Detector diode for demodulation of AM-DSB.
Product detector for demodulation of AM-SSB.
Frequency range: 525 Hz. to 1605 KHz.
Intermediate frequency: 455 KHz.
Blocks: Local oscillator; BFO; Product detector; Radio-frequency amplifier; mixer; two intermediate-frequency amplifiers; AGC (automatic gain control); and an audio amplifier.

PRACTICAL POSSIBILITIES

1.- Analysis of the main features of the transmitter and the receiver.
2.- Analysis of modulation:
D.S.B.: Double Sideband.
S.S.B.: Single Sideband.
3.- Signal modulation using AM-DSB :
Carrier modulation.
Amplitude modulation.
Frequency modulation.
Analysis of DSB modulation.
Diode detector operation.
Superheterodyne receiver operation.
AM-DSB signal reception and demodulation.
Generation of DSB modulated signals.
4.- Signal modulation using AM- SSB :
Analysis of SSB modulation.
Analysis of the AM-SSB demodulator.
Analysis of BFO (heterodyne oscillator).
AM-SSB signal reception and demodulation.
5.- Analysis of the Image Frequency.
6.- Adjustment of Tuning Circuits.
7.- Error Generator.

Note: FA-CO or EBC-100 Units give all the supplies required for this module.

ED-CFM **FM Communications**

SPECIFICATIONS

The module consists of a single board for studying FM communications, including transmission and reception, and also noise effects existing in communication.
The board includes two frequency modulators and five discriminator circuits.
Alternatively it is possible to modulate the amplitude of the FM signal using an external noise input signal.
Transmitter:
Modulator circuits: Reactor and Varactor.
Output frequency: 455 KHz.
Frequency range of theaudio oscillator: 300 Hz. To 3.4 KHz.
Receiver:
Demodulator circuits: Tuner resonator, square-law detector, ratio discriminator, synchronous detector, and a Foster-Seeley discriminator.
Low-pass filter/Amplifiers.
Filter cutoff frequency: 3.4 KHz.
Eight commuter switches.
Testing points for measurements using an oscilloscope.

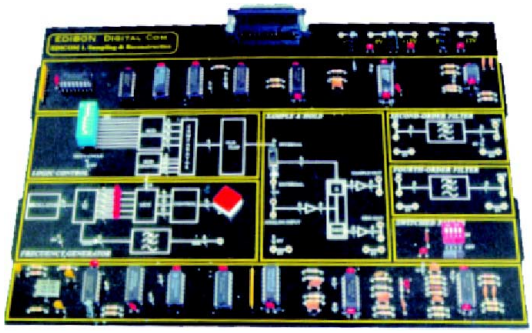
PRACTICAL POSSIBILITIES

1.- Introduction:
Main features of the FM transmitter-receiver board.
2.- FM Modulation:
Analysis of the reactor modulator.
Analysis of the varactor modulator.
3.- Frequency Demodulation Techniques:
Analysis of the Untuned Resonant Circuit.
Analysis of the Quadratic Detector.
Analysis of the Foster-Seeley Detector.
Analysis of the Ratio Detector.
Analysis of the Closed-Loop Phase Detector Circuit.
4.- Adjustment of Tuning Circuits.
5.- Error Generator.

Note: FA-CO or EBC-100 Units give all the supplies required for this module.

Available modules:

EDICOM1 Signals Sampling and Recostruction



SPECIFICATIONS

The module consists of a board for studying the principles of Sampling Theorem.

Internally the board generates a 1 KHz. signal which shall be used as the transmitted signal, as well as five different sampling frequency signals.

The board also contains a circuit for calculating the time percentage used in each sampling period when the signal is sampled.

Sampling frequencies: 2, 4, 8, 16, and 32 KHz.

Sampling utilization factor: variable 0-90% using 10% stepping.

Two low-pass filters; cutoff frequency: 3.4 KHz., of 2nd. and 4th. order, for receiving, as the filter's order increases its gradient is stronger, allowing a better reconstruction.

There is an output for the sampled signal, and another for the sampling and maintenance of the signal.

There exists the possibility of introducing a sampled or pure signal, external to the board.

Allows faults simulation.

PRACTICAL POSSIBILITIES

1.- Description of the principles of signal sampling and reconstructions.

2.- Visualization of the main signals involved in a sampling process.

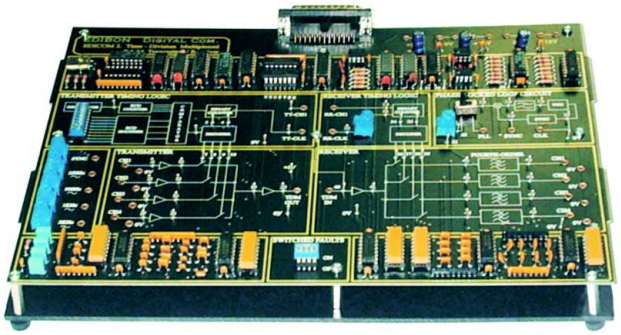
3.- Analysis of the whole signal sampling and reconstruction cycle.

4.- Comparison of the use of a 2nd. against 4th. order filter in the recovery process of a signal.

5.- Faults simulation.

Note: FA-CO or EBC-100 Units give all the supplies required for this module.

EDICOM2 Time Division Multiplex (TDM). P.A.M Transmitter and Receiver



SPECIFICATIONS

This module consists of a board for studying Pulse Amplitude Modulation and Demodulation (PAM), and Time Division Multiplex (TDM).

Sampling and time division multiplex are analyzed for each channel.

Includes analog tetrapolar switches installed both in the transmitter and the receiver for channel multiplexing and demultiplexing.

Input channels: 4 TDM and PAM.

Analog channels: 250 Hz., 500 Hz, 1 KHz, and 2 KHz.

Sampling frequency: 16 KHz per channel.

Sampling utilization factor: variable with transmission from 0 to 90% using 10% steps per channel.

Analog channels: 250 Hz., 500 Hz, 1 KHz, and 2 KHz, variable amplitude with potentiometer.

Low-pass filter cutoff frequency: 3.4 KHz.

Three operation modes, allowing verification of the receiver's complexity and channel usage, depending on the transmitted information.

Possibility of transmitting externally supplied signals.

The board permits introducing faults simulation using a switchboard, thus enabling the student to study in depth the board's operation and localization of faults.

PRACTICAL POSSIBILITIES

1.- Analysis of the principles of Time Division Multiplex (TDM).

2.- Analysis of the features of the Transmitter, the Receiver and all the other circuits.

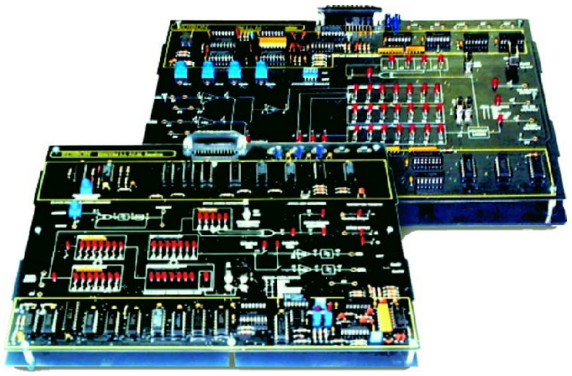
3.- Comparison between different operation modes, varying with their connections.

4.- Faults simulation.

Note: FA-CO or EBC-100 Units give all the supplies required for this module.

Available modules:

EDICOM3 MIC-TDM Transmission/Reception



SPECIFICATIONS

This module consists of two boards for studying the modulation of a two-channel MIC-TDM system:

Transmission board (EDICOM 3.1).

Reception board (EDICOM 3.2).

Here is analyzed analog signal transmission using two-channel sampling, multiplexing, and coding, thus generating a lay transmitted to the receiver which recovers the two analog signals.

The module also allows checking error codes.

Depending on the selected error check code, it shows how some detect and other detects and corrects the error, but in the process sacrificing the signal resolution.

Input channels: two PCM channels.

Codes generated by the transmitter: pseudo random for the synchronizing signal.

Error checking: even and odd parity, and Hamming code.

Includes two continuos signal generators of 1 and 2 KHz, and another two direct current signal generators, all of them of variable amplitude using potentiometer.

Possibility of faults simulation.

PRACTICAL POSSIBILITIES

1.- Analysis of transmission in a two-channel MIC-TDM system.

2.- Study of the transmitter characteristic codes.

3.- Analysis of receiver operation varying the transmitter output signal.

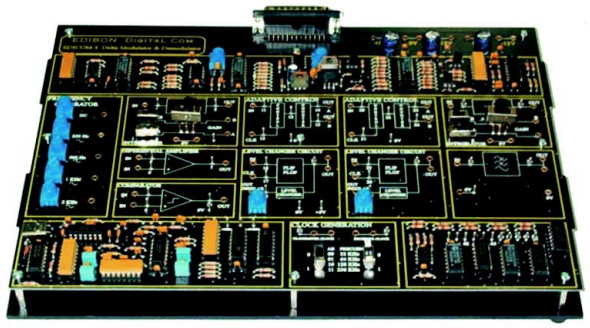
4.- Use of synchronizing code sequences for data transmission.

5.- Use of the clock generation circuit for reducing connections between transmitter and receiver to a single one.

6.- Faults simulation.

Note: FA-CO or EBC-100 Units give all the supplies required for this module.

EDICOM4 Delta Modulation and Demodulation



SPECIFICATIONS

This module consists of a board for studying Delta, Adaptive Delta and Delta/Sigma Modulation.

Delta modulation transforms an analog signal into a stream of digital data, transmitting one bit every time the analog signal is sampled. The transmitter sends "1" if the signal has increased since the last time it was sampled, or "0" if it has decreased.

Later on the analog signal must be rebuilt at the receiver.

This modulation has some drawbacks depending on various parameters, for example the variation slope of the analog signal to be transmitted at the sampling frequency. Due to this there are different types of delta modulation.

This module allows to show the three main deltas:

Delta modulation: The basic one. May transmit with errors, if the signal contains high frequency components or direct current levels.

Adaptive-delta modulation: Using variable gain integrators the frequency problem can be solved. The consequence is an increase of circuitry complexity.

Sigma-delta modulation: Both problems are solved with this technique, with the added advantage of low-level of circuitry complexity.

Thus one single board suffices for transmitting and recovering the original signal.

This allows the study of the parameters implied in modulation and demodulation: sampling frequency, sampling step size, and analog input signal frequency and amplitude.

Sampling frequencies: 32, 64, 128, and 256 KHz.

Low-pass "Butterworth" filter with cutoff frequency at 3.4 KHz.

Transmitter and receiver in-built integrators enabling selection of four different gains using switches or automatic gain variation.

Includes four input signals at 250 Hz, 500 Hz, 1 KHz, and 2 K H z , and also a direct current signal, all of them of variable amplitude and potentiometer, as well as the possibility of introducing an external signal.

PRACTICAL POSSIBILITIES

1.- Analysis of Delta, Adaptive Delta, and Delta Sigma Modulation.

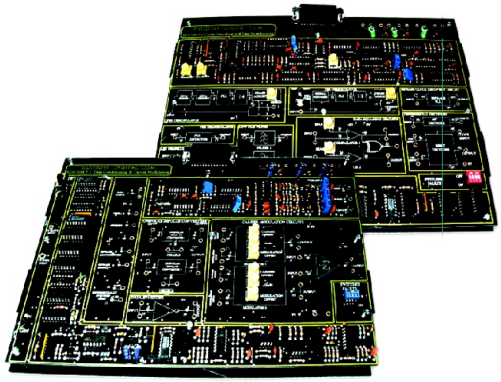
2.- Construction of a Delta Modulator/Demodulator system.

3.- Construction of an Adaptive Delta Modulator/Demodulator system.

4.- Construction of a Sigma-Delta Modulator/Demodulator system.

Note: FA-CO or EBC-100 Units give all the supplies required for this module.

EDICOM5 **Line codes. Signal Modulation and Demodulation**



SPECIFICATIONS

This module consists of two boards for studying data conditioning:

Transmission board (EDICOM 5.1): for data coding and signal modulation.

Reception board (EDICOM 5.2): for signal demodulation and data decoding.

The aim is to study carrier modulation/demodulation techniques: ASK, PSK, FSK, and QPSK.

Also to study data coding formats: NRZ(L), NRZ(M), RZ, Two-phase (Manchester), and Two-phase (Mark).

Carrier wave frequency: 1.44 MHz, (I) 960 KHz, (Q) 960 KHz.

It Includes two carrier modulators and two unipolar-bipolar converters.

Elements: a data inverter, an amplifier-adder, and bit decoder installed in the receiver.

For completing the practices, it is necessary to use the boards of Module EDICOM 3.

The EDICOM 5.2 board contains all the demodulators and circuitry needed for recovering the signal.

Faults simulation.

PRACTICAL POSSIBILITIES

1.- Analysis of line codes used for short-distance digital transmission: NRZ (L), NRZ (M), RZ, AMI, RB, Two-phase (Manchester), and Two-phase (Mark).

2.- Relationship between binary mode and modulation rate.

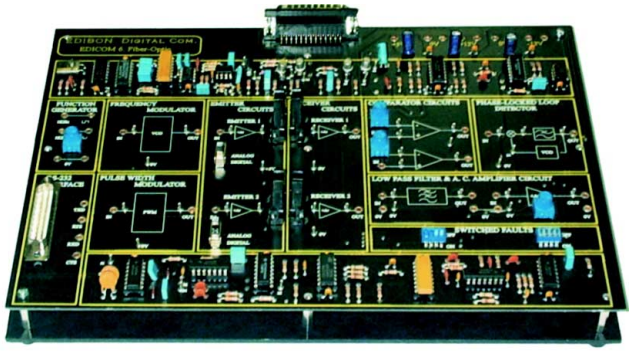
3.- Analysis of digital modulation techniques: ASK, PSK, FSK, and QPSK, studying their features at the transmitter and the demodulation at the receiver.

4.- Faults simulation.

5.- Requires "EDICOM 3" module.

Note: FA-CO or EBC-100 Units give all the supplies required for this module.

EDICOM6 **Optical Fibre Transmission and Reception**



SPECIFICATIONS

This module consists of one board for studying optical fibre transmission and reception.

Different methods comprising the modulation of a light source are described: amplitude modulation, frequency modulation, signal pulse-width modulation; as well as their subsequent recovery and reconstruction.

Transmission medium: optical fibre cable.

Sources: analog and digital.

Two optical fibre transmission and reception circuits.

Maximum transmitter frequency: 300 KHz.

4th order low-pass filter with cutoff frequency at 3.4 KHz.

Interface RS232.

This module may be used together with EDICOM 4 to enable its better use, though it may also be used independently.

Faults simulation.

PRACTICAL POSSIBILITIES

1.- Analysis of optical fibre transmission and reception.

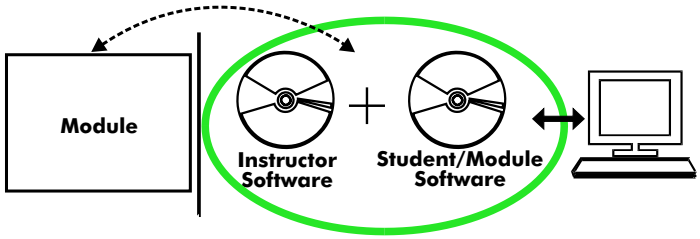
2.- Analysis of the various methods used for modulating a beam of light: amplitude modulation and pulse-width modulation.

3.- Analysis of the transmission of digital signals using optical fibre.

4.- Faults simulation.

Note: FA-CO or EBC-100 Units give all the supplies required for this module.

③ CAI. Computer Aided Instruction Software System



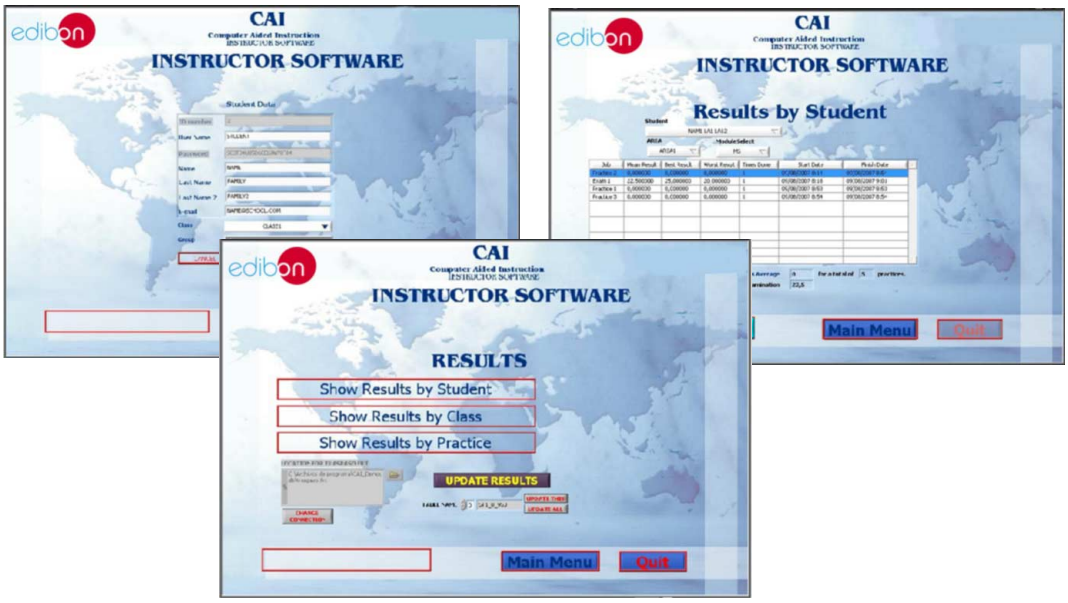
With no physical connection between module and computer, this complete package consists on an Instructor Software (INS/SOF) totally integrated with the Student/Module Software. Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students. These, on the other hand, get a virtual instructor who helps them to deal with all the information on the subject of study.

With the **INS/SOF. Classroom Management Software Package (Instructor Software)**, the Teacher has a whole range of options, among them:

- Organize Students by Classes and Groups.
- Create easily new entries or delete them.
- Create data bases with student information.
- Analyze results and make statistical comparisons.
- Print reports.
- Develop own examinations.
- Detect student's progress and difficulties.

...and many other facilities.

The Instructor Software is the same for all the modules, and working in network configuration, allows controlling all the students in the classroom.



Computer Aided Instruction Software Packages (Student/Module Software).

It explains how to use the module, run the experiments and what to do at any moment.

Each module has its own Student Software package.

- The options are presented by pull-down menus and pop-up windows.
- Each Software Package contains:

  Theory: that gives the student the theoretical background for a total understanding of the studied subject.

  Exercises: divided by thematic areas and chapters to check out that the theory has been understood.

  Guided Practices: presents several practices to be done, alongside the modules, showing how to complete the circuits and get the right information from them.

  Exams: set of questions presented to test the obtained knowledge.

✱ Both Instructor Software and Student/Module Software are available in English and Spanish. Any other language available on request.

Available Student/Module Software Packages:

Analog Communications:

- ED-CAM/SOF. AM Communications.
- ED-CFM/SOF. FM Communications.

Digital Communications

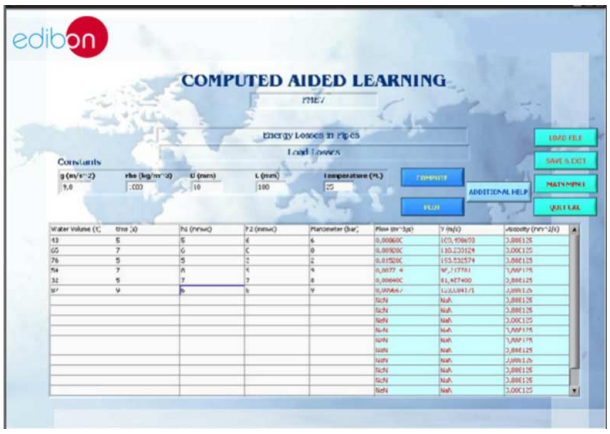
- EDICOM 1/SOF. Sampling and Reconstruction Signals.
- EDICOM 2/SOF. Time Division Multiplex (TDM). PA Transmitter and Receiver.
- EDICOM 3/SOF. MIC-TDM Transmission/Reception.
- EDICOM 4/SOF. Delta Modulation and Demodulation.
- EDICOM 5/SOF. Line codes. Signal Modulation and Demodulation.
- EDICOM 6/SOF. Optical Fibre Transmission and Reception.

④ LICOMBA/CAL. Computer Aided Learning Software (Results Calculation and Analysis)

This Computer Aided Learning Software (CAL) is a Windows based software, simple and very easy to use specifically developed by EDIBON. It has been designed to cover different areas of science: Basis Electronics, Communications, Basic Electricity, Mechanics, Basic Fluid Mechanics and General Fluid Mechanics*.
*Although only the purchased areas will be activated and ready to use.

CAL is a class assistant that helps in making the necessary calculations to extract the right conclusions from data obtained during the experimental practices.
With a single click, CAL computes the value of all the variables involved.
Also, CAL gives the option of plotting and printing the results.

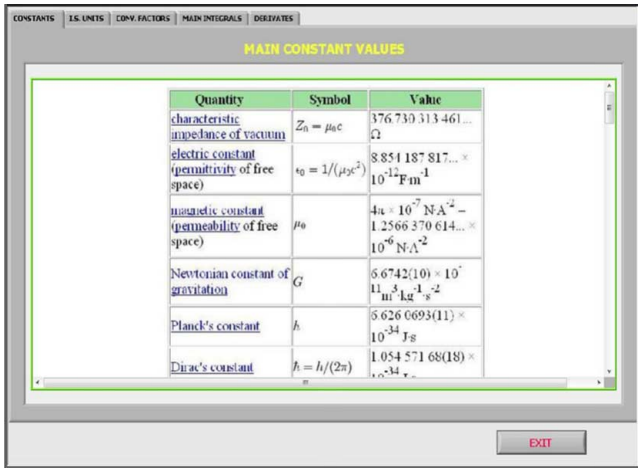
Once the Area of study is selected, the right module can be chosen among a wide range, each one with its own set of lab exercises.



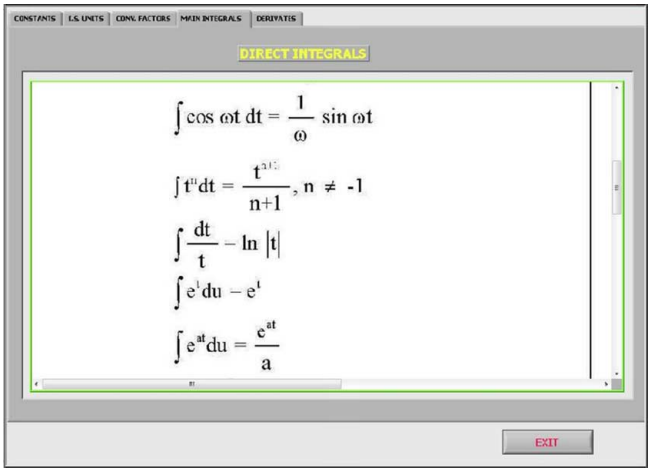
Simply insert the experimental data, with a single click CAL will perform the calculations.

Between the plotting options, any variable can be represented against any other.
And there exist a great range of different plotting displays.

Among the given choices, an additional help button can be found, which offers a wide range of information, such as constant values, unit conversion factors and integral and derivative tables.

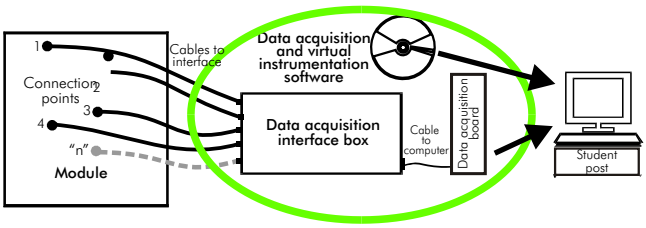


It provides a handy option to avoid using different reference sources while in progress. For example: the values of Physical constants, their symbols and right names, conversion factors...



...and the very useful Integral and Derivative tables.

⑤ EDAS/VIS. EDIBON Data Acquisition System/Virtual Instrumentation System



EDAS/VIS is the perfect link between the electronic modules and the PC. With the EDAS/VIS system, information from the modules is sent to the computer. There, it can be analyzed and represented.

We easily connect the Data Acquisition Interface Box (DAIB) to the modules with the supplied cables (connection points are placed in the modules). Like any other hardware, the DAIB is connected to the PC through the Data Acquisition Board (DAB), and by using the Data acquisition and Virtual Instrumentation Software (specific for every module), the student can get the results from the undertaken experiment/practice, see them on the screen and work with them.

This EDAS/VIS System includes DAIB + DAB + EDAS/VIS-SOF:

5.1)Hardware:

5.1.1) **DAIB. Data Acquisition Interface Box:**

Metallic box. Dimensions: 310 x 220 x 145 mm. approx.

Front panel:

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

Sampling velocity **1,250,000 samples per second** for **EDAS/VIS 1.25 Version.**

Sampling velocity **250,000 samples per second** for **EDAS/VIS 0.25 Version.**

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 0-5V. 2 Analog signal potentiometers±12V.

Main ON/OFF switch.

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

Back panel: Power supply connector. SCSI connector (for data acquisition board).

Connecting cables.

DAIB

+

5.1.2) **DAB. Data Acquisition Board:**

For EDAS/VIS 1.25 Version:

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)=±10V.

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

Analog output:

Number **channels=2. Resolution=16 bits**, 1 in 65536. **Max. output rate up to: 833KS/s.**

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

Digital Input/Output: Numbers 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:

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 to 1 Mhz.**

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

DAB

+

5.2)**EDAS/VIS-SOF. Data Acquisition and Virtual Instrumentation 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:

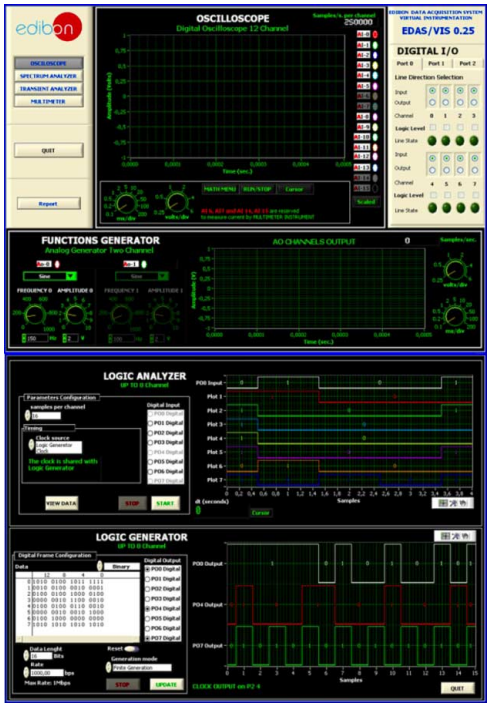
- **Oscilloscope:**
  Channels: 12 simultaneous. Maximum input voltage:±10V.
  All 12 input channels could be scaled to compare signal with different voltage levels.
  "Math Menu" with operations as Addition, Subtraction, Multiplication and Division, between any of the 12 oscilloscope channels.
- **Function Generator:**
  Two independent signal generators, for sinusoidal, triangular, saw tooth and square.
  Channels: 2 (allowing working simultaneously). Maximum output voltage: ±10V.
  It includes a graph where an output signal for each channel is shown.
- **Spectrum Analyzer:**
  Channels: 12 (simultaneous). Max. voltage:±10V. Spectrum analyzer: based on the FFT.
- **Multimeter:**
  Voltmeter (**Channels: 12** (simultaneous). Max. voltage:±10V RMS).
  Ammeter (**Channels: 2** (simultaneous). Max. Ampere: 500 mA rms per channel).
- **Transient Analyzer.**
- **Logic Analyzer:**
  Number of Input channels: 8. TTL Voltage Level. **Clock Source: 3 different sources.**
  This instrument allows receiving as far as 8 digital signal simultaneously at 1 or 8 Mbps (depending the version).
- **Logic Generator:**
  Number of transmission channels: 8 . TTL voltage level.
  This instrument allows generating up to 8 digital simultaneous signals of 1 or 8 Mbps (depending of the version).

Sampling velocity 1,250,000 samples per second for EDAS/VIS 1.25 Version.

Sampling velocity 250,000 samples per second for EDAS/VIS 0.25 Version.

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

EDAS/VIS-SOF



Important! Only one EDAS/VIS is needed for all basic electronic boards. One EDAS/VIS is needed for each student work post.
The EDAS/VIS allows to work with several basic electronic boards simultaneously.

∗ Software available in English and Spanish. Any other language available on request.

Note: **for more information see EDAS/VIS specific Catalogue:**www.edibon.com/products/catalogues/en/units/communications/digital/EDAS-VIS.pdf

REQUIRED SERVICES

-Electrical power supply needed for FA-CO and EBC-100: single-phase, 220V/50Hz or 110V/60 Hz.

-For using EDAS/VIS, CAI and/or LICOMBA/CAL a Computer (PC) is required.

DIMENSIONS AND WEIGHTS

Each module:	- Dimensions: 300 x 210 x 45 mm. approx.
	- Weight: 300 gr. approx.
FA-CO:	- Dimensions: 225 x 205 x100 mm. approx.
	- Weight: 2 Kg. approx.
EBC-100:	- Dimensions: 410 x 298 x 107 mm. approx.
	- Weight: 2 Kg. approx.

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

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