Summarized
Catalogue
two(2)

3. Communications

edibon

www.edibon.com

3.- Communications

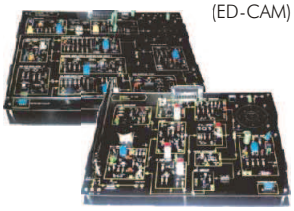
Equipment list

LICOMBA. **Communications Integrated Laboratory:**

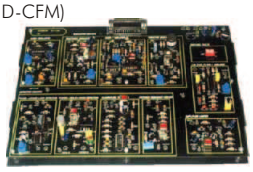
Laboratory structure

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

(ED-CAM)



(ED-CFM)



① Power Supply

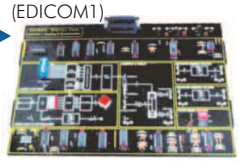
FA-CO

or

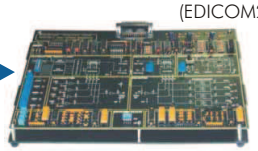
EBC-100

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

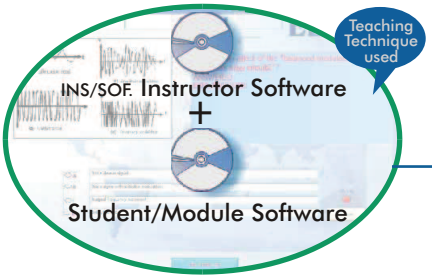
(EDICOM1)



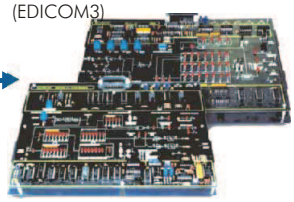
(EDICOM2)



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



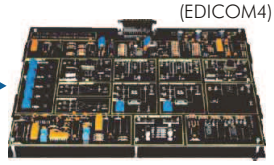
(EDICOM3)



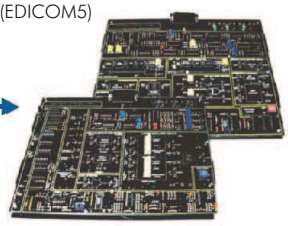
④ **LICOMBA/CAL.** Computer Aided Learning Software
(Results Calculation and Analysis)

PC

(EDICOM4)

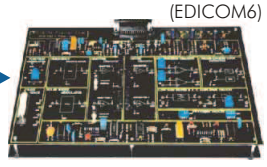


(EDICOM5)



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

(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.**

More information in: www.edibon.com/products/catalogues/en/units/communications/analog/LICOMBA.pdf

LICOMBA. **Communications Integrated Laboratory:**

① Power Supply

There are two choices for suppling the modules:

FA-CO. **Power Supply**

SPECIFICATIONS SUMMARY

Fixed outputs: + 5 V, ± 12 V, 1 A. Variable outputs: ± 12 V, 0.5 A. AC output: 12V. or 24 V. 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 from ED-CAM, ED-CFM and EDICOM type.
Dimensions: 225 x 205 x 100 mm. approx. Weight: 2 Kg. approx.

EBC-100. **Base Unit,** with built-in power supply

SPECIFICATIONS SUMMARY

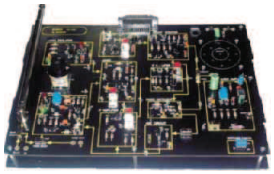
Hardware support and power supply. Modules supporting unit.
Fixed outputs + 5V, + 12V, -12V. Variable outputs ± 12 V. AC output: 12 V. or 24 V. Outputs through either 2mm. contact terminals, or through 25 pin CENTRONICS connector. LED's voltage indicators. Robust construction. Supply: 110/220 V. A.C. Frequency: 50/60 Hz.
EBC-100 includes all the requirements for full working with any module from ED-CAM, ED-CFM and EDICOM type.
Dimensions: 410 x 298 x 107 mm. approx. Weight: 2 Kg. approx.

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 manuals per module. Connectors and cables for completing the exercises and practices are included.
Power supply needeed (FA-CO or EBC-100).
Dimensions (approx.) of each board = 300 x 210 x 45 mm. Weight: 300 gr.

➤Analog Communications

ED-CAM. **AM Communications**



SPECIFICATIONS SUMMARY

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 (1 MHz.); 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.

More information in: www.edibon.com/products/catalogues/en/units/communications/analog/LICOMBA.pdf

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.

ED-CFM. **FM Communications**

SPECIFICATIONS SUMMARY

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 the audio 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.

More information in: www.edibon.com/products/catalogues/en/units/communications/analog/LICOMBA.pdf

PRACTICAL POSSIBILITIES

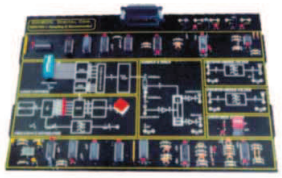
1.- Introduction:
Main features of the FM transmitter-receiver board.
2.- FM Modulation:
Analysis of the reactor modulator.
Analysis of the varactor modulator.
3.- Frequency Demodulation Techniques:
Analysis of the Untuned Resonant Circuit.
Analysis of the Quadratic Detector.
Analysis of the Foster-Seeley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

LICOMBA. **Communications Integrated Laboratory:**

② Modules

➤ **Digital Communications**

EDICOM1. **Signals Sampling and Reconstruction**



SPECIFICATIONS SUMMARY

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.

More information in: www.edibon.com/products/catalogues/en/units/communications/digital/LICOMBA.pdf

PRACTICAL POSSIBILITIES

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

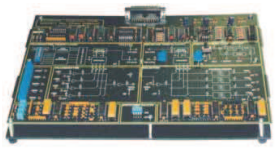
2.- Visualization of the main signals involved in a sampling process.

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.

EDICOM2. **Time Division Multiplex (TDM). PAM Transmitter and Receiver**



SPECIFICATIONS SUMMARY

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.

It 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.

More information in: www.edibon.com/products/catalogues/en/units/communications/digital/LICOMBA.pdf

PRACTICAL POSSIBILITIES

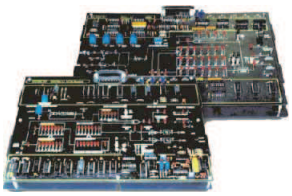
1.- Analysis of the principles of Time Division Multiplex (TDM).

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.

EDICOM3. **MIC-TDM Transmission/Reception**



SPECIFICATIONS SUMMARY

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.

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.

More information in: www.edibon.com/products/catalogues/en/units/communications/digital/LICOMBA.pdf

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.

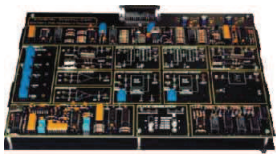
6.- Faults simulation.

LICOMBA. **Communications Integrated Laboratory:**

② Modules

➤**Digital Communications**

EDICOM4. **Delta Modulation and Demodulation**



SPECIFICATIONS SUMMARY

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.

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. Adaptive-delta modulation. Sigma-delta modulation.

This allows the study of the parameters: 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 KHz, and also a direct current signal, all of them of variable amplitude and potentiometer, as well as the possibility of introducing an external signal.

More information in: www.edibon.com/products/catalogues/en/units/communications/digital/LICOMBA.pdf

PRACTICAL POSSIBILITIES

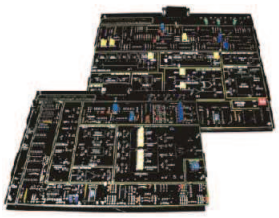
1.- Analysis of Delta, Adaptive Delta, and Delta Sigma Modulation.

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.

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



SPECIFICATIONS SUMMARY

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.

More information in: www.edibon.com/products/catalogues/en/units/communications/digital/LICOMBA.pdf

PRACTICAL POSSIBILITIES

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

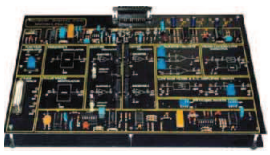
2.- Relationship between binary mode and modulation rate.

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.

EDICOM6. **Optical Fibre Transmission and Reception**



SPECIFICATIONS SUMMARY

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.

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

Faults simulation.

More information in: www.edibon.com/products/catalogues/en/units/communications/digital/LICOMBA.pdf

PRACTICAL POSSIBILITIES

1.- Analysis of optical fibre transmission and reception.

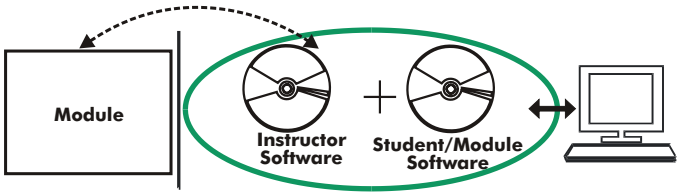
2.- Analysis of the various methods used for modulating a beam of light: amplitude modulation and pulse-width modulation.

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

4.- Faults simulation.

LICOMBA. **Communications Integrated Laboratory:**

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.

- INS/SOF. Classroom Management Software (Instructor Software):

The Instructor can:

- 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.

Instructor Software

- Computer Aided Instruction Softwares (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.

- The options are presented by pull-down menus and pop-up windows.
- Each Software 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 with the module, showing how to complete the circuits and get the right information from them.

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

Student/Module Software

Available Student/Module Softwares:

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

➤Digital Communications
- EDICOM 1/SOF. Signals Sampling and Reconstruction.
- EDICOM 2/SOF. Time Division Multiplex(TDM). PAM 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/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.

CAL is a class assistant that helps in making the necessary calculations to extract the right conclusions from data obtained during the experimental practices.

CAL will perform the calculations.

CAL computes the value of all the variables involved.

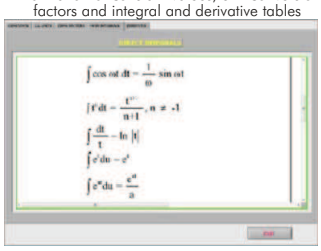
It allows to plot and print the results. Between the plotting options, any variable can be represented against any other.

Different plotting displays.

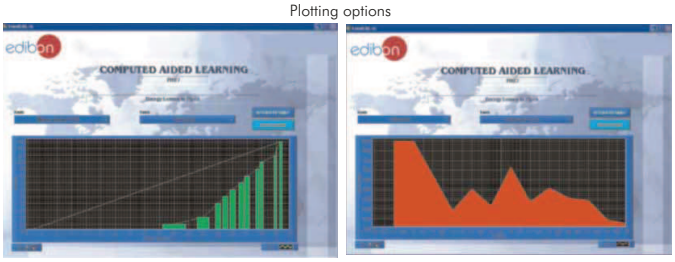
It has a wide range of information, such as constant values, unit conversion factors and integral and derivative tables.

Calculations

Information of constant values, unit conversion factors and integral and derivative tables



Plotting options



Available Softwares:

➤Analog Communications
- ED-CAM/CAL. AM Communications.
- ED-CFM/CAL. FM Communications.

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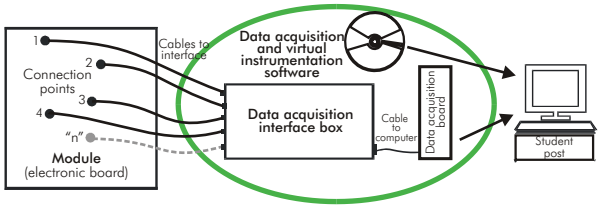
More information in: www.edibon.com/products/catalogues/en/units/communications/digital/LICOMBA.pdf

LICOMBA. **Communications Integrated Laboratory:**

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



EDAS/VIS is the perfect link between the 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 the student can get the results from the undertaken experiment/practice, see them on the screen and work with them.

The EDAS/VIS System includes a Hardware: DAIB Data Acquisition Interface Box + DAB. Data Acquisition Board and a Software: EDAS/VIS-SOF. Data Acquisition and Virtual Instrumentation Software:

1) DAIB. **Data Acquisition Interface Box:**
Metallic box. Dimensions: 310 x 220 x 145 mm. approx.
Front panel:
16 Analog inputs.
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.
4 Digital signal switches 0-5 V. 2 Analog signal potentiometers ±12 V.
Inside: Internal power supply of 12 and 5 V. Potentiometer.
Back panel: Power supply connector. SCSI connector (for connecting with the data acquisition board).
Connecting cables.

DAIB

+

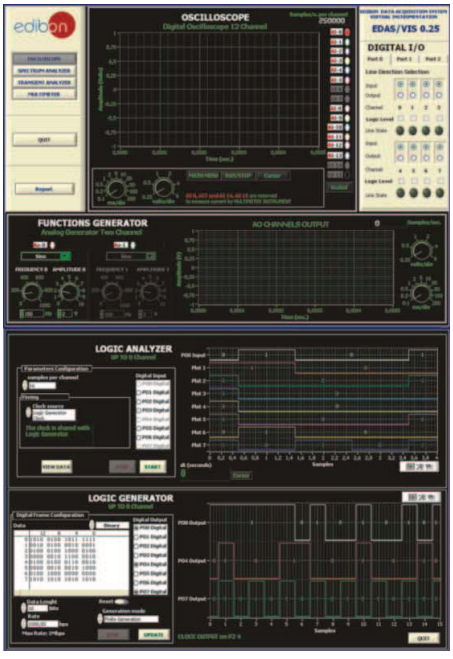
2) DAB. **Data Acquisition Board:**
PCI Data acquisition board (National Instruments) to be placed in a computer slot.
For EDAS/VIS 1.25 Version:
Analog input: Number of channels= 16. Sampling rate up to: 1,250,000 S/s (samples per second).
Analog output: Number of channels= 2. Max. output rate up to: 833 KS/s.
Digital Input/Output: Number of channels= 24 inputs/outputs.

For EDAS/VIS 0.25 Version:
This is a similar version to the 1.25, with the following differences:
Sampling rate up to: 250,000 S/s (samples per second).
Analog output: Max. output rate up to: 10 KS/s.


DAB

+

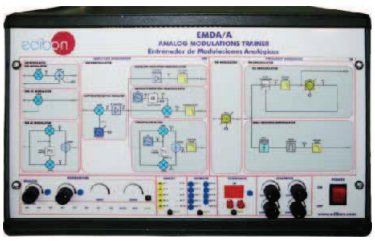
3) EDAS/VIS-SOF. **Data Acquisition and Virtual Instrumentation Software:**
Compatible with actual Windows operating systems. Friendly graphical frame.
Configurable software allowing the temporal/frequency representation of the different inputs and outputs. Visualization of a voltage of the circuits 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.
-**Function Generator:**
Two independent signal generators, for sinusoidal, triangular, saw tooth and square. Channels: 2.
-**Spectrum Analyzer:**
Channels: 12 (simultaneous).
-**Multimeter:**
Voltmeter (Channels: 12 (simultaneous)). Ammeter (Channels: 2 (simultaneous)).
-**Transient Analyzer.**
-**Logic Analyzer:**
Number of Input channels: 8.
Clock Source: 3 different sources.
This instrument allows receiving as far as 8 digital signal simultaneously at 1 or 8 Mbps (depending of the version).
-**Logic Generator:**
Number of transmission channels: 8.
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.



EDAS/VIS-SOF

More information in: www.edibon.com/products/catalogues/en/units/communications/digital/LICOMBA.pdf

EMDA/A. **Analog Modulations Trainer**



SPECIFICATIONS SUMMARY

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.
It 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.
- 5 Analog Inputs. 9 Analog Outputs.
- 18 Test points. 2 Controls.

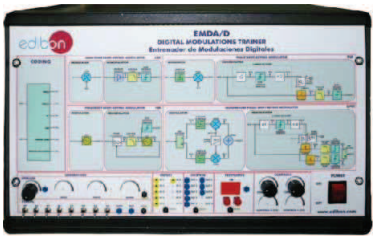
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions (approx.) = 490 x 330 x 310 mm. Weight: 20 Kg.

More information in: www.edibon.com/products/catalogues/en/units/communications/analog/EMDA-A.pdf

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.

EMDA/D. **Digital Modulations Trainer**



SPECIFICATIONS SUMMARY

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.
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.
    - 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:
  - 1 byte (8 bits, serial).
- 6 Analog Inputs. 8 Analog Outputs.
- 28 Test points. 2 Controls.

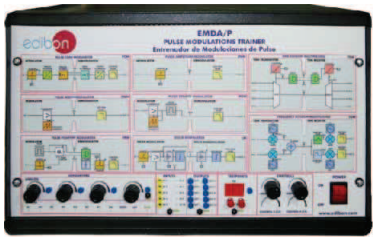
Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions (approx.) = 490 x 330 x 310 mm. Weight: 20 Kg.

More information in: www.edibon.com/products/catalogues/en/units/communications/digital/EMDA-D.pdf

PRACTICAL POSSIBILITIES

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

EMDA/P. **Pulse Modulations Trainer**



SPECIFICATIONS SUMMARY

The 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.
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: 2 Audio signals. 2 Carrier signals.
- 5 Analog Inputs. 10 Analog Outputs. 28 Test points. 2 Controls.

Cables and Accessories, for normal operation.
Manuals: This unit is supplied with 8 manuals.
Dimensions (approx.)= 490 x 330 x 310 mm. Weight: 20 Kg.

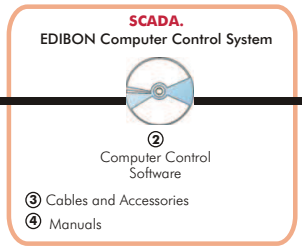
More information in: www.edibon.com/products/catalogues/en/units/communications/digital/EMDA-P.pdf

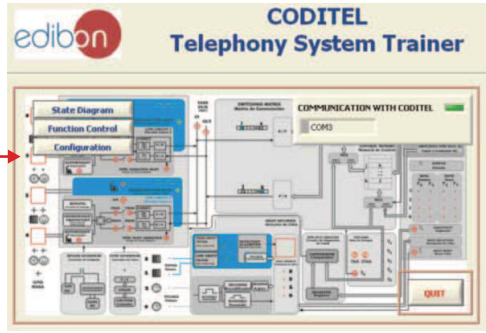
PRACTICAL POSSIBILITIES

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.
6.- Basic principles of Delta modulation and demodulation.
7.- Introduction to the work principle of TDM.
8.- Introduction to the work principle of FDM.

CODITEL. **Telephony Systems Trainer**

① Unit: CODITEL. Telephony Systems Trainer





SPECIFICATIONS SUMMARY

Items supplied as standard

① CODITEL. Trainer:
CODITEL is a digital circuit commutation unit for didactic purposes. Its structure is like a temporal commutator structure with two MIC ways, one inlet way and one outlet way. Basically, it follows the recommendation of the CCITT and of Telephony.
System is mounted on a desktop box. Diagram in the front panel of the unit with the same structure as the real hardware. Provides access to all main signals. Follows all the recommendations of CCITT (Cosultive Comitte International Telephony and Telegraphy). Structure is based on the standard for digital commutation systems. *Time division multiplexing(TDM)* and Pulse code Modulation (PCM) principles.
Communication based on a temporal commutator that supports up to fifteen complete internal communications with two MIC ways, one inlet way and one outlet way. Standard MIC system of 32 channels with dynamic assignament and frame synchronization. 30 channels used for voice transmission and 2 used for signalling and synchronism. Internal hardware consists of two electronics boards: an analog board with all integrated and discrete analog elements and a digital board. Structure integrated with all the internal common elements in a telephone system: subscriber´s line, tone generator, base of times, filtering stage, switching matrix, number decoders and control memory. Functions as battery feed, overvoltage protection, ringing, coding and decoding, supervision, signalling, 2-4 wires conversion and test(BORSCHT functions) covered, in each line. High precision digital tone synthetizer 400 Hz using *Direct Digital Synthetizer* (DDS).
Four commercial receptors (telephones), two used for signaling by pulses and other two for tones.
Switching memory matrix, control memory and base of times implemented with FPGA technology with high stability and fiability. Standard protocol for communication between the PC and the trainer.

② CODITEL/CCSOF. Computer Control and Graphic Visualization Software:
Compatible with actual Windows operating systems. Compatible with the industry standards. In combination with the hardware, Coditel Software is supplied with the system. Coditel software has a user friendly graphical interface that provides totally control and visualization of the telephone system.

③ Cables and Accessories, for normal operation.

④ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = 490 x 330 x 310 mm. Weight: 20 Kg.

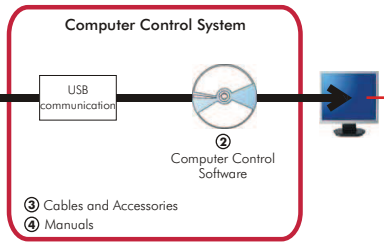
More information in: www.edibon.com/products/catalogues/en/units/communications/telephony/CODITEL.pdf

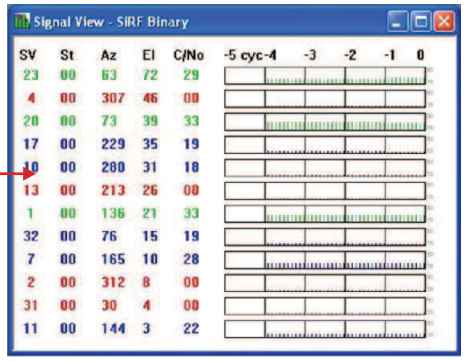
PRACTICAL POSSIBILITIES

1.- To study the main actions and signals involved in a digital commutation.
2.- To study the dynamic channel assignment and temporal switching.
3.- To study the standards for audio conversion.
4.- To establish of a communication between some channels step by step.
5.- Visual monitoring of the main states that a line goes through during a call.
6.- To configure lines as only receiver, transmitter, receiver / transmitter.
7.- To test of the conversion from 2 to 4 wires.
8.- To study the electric stages when the user makes actions over the telephone.
9.- To study the signals involved when dialing by pulses.
10.- To study the signals involved when dialing by tones.
11.- To study the tone signal.

EGPS. **GPS Trainer**

①Unit: EGPS. GPS Trainer





SPECIFICATIONS SUMMARY

Items supplied as standard

① EGPS. Trainer:

The EGPS unit is the GPS trainer designed by EDIBON to study the basic concepts about global positioning.

This unit allows to acquire solid formation about the operation mode of a GPS receiver without any previous knowledge.

The EGPS unit allows the student to learn, in a simple and practical way, the basic terms and concepts used in global positioning systems such as trilateration, GPS starting modes, geographic Azimuth, etc.

The unit mainly consists of two elements: the unit-interface, which includes the GPS receiver element with a series of status indicators and the antenna in charge of the satellites signals reception.

Metallic box with handles.

The communication between the unit and the PC is through a USB communication connector.

The EGPS has a set of LEDs to indicate the unit status:

Switch and indicator of the unit status.

Tracking and positioning status indicators.

Active antenna with amplifier incorporated and magnetic base to be fixed to metallic elements.

Technical data:

Receptor 20 channels L1 Band (1575,42MHz).

RF sensibility reception:

Adquistion (cold start): 144 dBm.

Adquistion (hot start): 155 dBm.

Navigation: 157 dBm.

Tracking: 159 dBm.

Acquisition times:

Hot<1 sec.

Warm<36 sec.

Cold<38 sec.

Reacquisition<1 sec.

Precision:

Horizontal CEP<2.5 m.

Horizontal (2dRMS)<5.5 m.

Vertical VEP<2m.

Speed < 0.01 m/s.

Antenna RF with magnetic base.

USB communication connector.

② EGPS/CCSOF. Computer Control Software:

Compatible with the current Windows operative systems. Intuitive and friendly environment.

Easy to use software to control and monitor the EGPS receiver. It uses the serial protocol of the National Marine Electronics Association (NMEA) version 1.83 to communicate with the unit.

③ Cables and Accessories, for normal operation.

④ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = 310 x 220 x 180 mm. Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/communications/appliedcommunications/EGPS.pdf

PRACTICAL POSSIBILITIES

1.- Study the operation principle of a GPS receiver.

2.- Determination of the GPS state.

3.- Configuration of the communication parameters.

4.- Study of the signal-to-noise ratio (SNR).

5.- Study of NMEA sentences.

6.- Study of geographic Azimuth.

7.- Basic concepts about navigation.

8.- Measurement of longitude, latitude and altitude.

9.- Study of the time.

10.- Study of the DOP effect.

11.- Advanced concepts about the GPS receiver.

Others units:

EAN. **Antenna Trainer**

ESA. **Satellite Trainer**

EMI. **Microwave Trainer**

EBL. **Bluetooth Trainer**

ETM. **Cellular Mobile Trainer**

ERA. **Radar Trainer**