

The complete system includes parts 1 to 5 and any part can be supplied individually or additionally. (Power supply + Module (M15) + Kit/s, is the minimum supply).

Available Assembly Kits:

- | | | | |
|----------|--------------------------------------|-----------|-----------------------------------|
| - M1-KIT | Direct Current (D.C.) Circuits. | - M9-KIT | Power Electronics. |
| - M2-KIT | Alternating Current (A.C.) Circuits. | - M10-KIT | Digital Systems and Converters. |
| - M3-KIT | Semiconductors I. | - M11-KIT | Digital Electronics Fundamentals. |
| - M4-KIT | Semiconductors II. | - M12-KIT | Basic Combinational Circuits. |
| - M5-KIT | Power Supplies. | - M13-KIT | Basic Sequential Circuits. |
| - M6-KIT | Oscillators. | - M14-KIT | Optoelectronics. |
| - M7-KIT | Operational Amplifiers. | - M16-KIT | Electric Networks. |
| - M8-KIT | Filters. | | |



GENERAL DESCRIPTION

The purpose of Electronics and Electricity Assembly Kits (M-KITS) is to provide the students with the necessary elements for creating their own circuits.

① Common Elements for all Kits:

FA-CO. Power Supply.

M-15. Components mounting base plate "M15. Development Module".

② Kits, containing each one:

Assembly and practice manuals (8 manuals supplied).

Set of components and wires necessary for mounting the corresponding practice.

After the first assembly, **all the elements are recoverable.**

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: **M../SOF.** Computer Aided Instruction Software Packages (Student Software).

There is a software for each kit.

Gives the students the proper assistance on theoretical knowledge as well as in practice, presenting exercises and questions.

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

Windows based software, simple and easy to use.

Thought for Results Calculation and Analysis, this software computes and plots obtained data.

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

Includes:

5.1) Hardware: DAIB. Data Acquisition Interface Box + DAB. Data Acquisition Board.

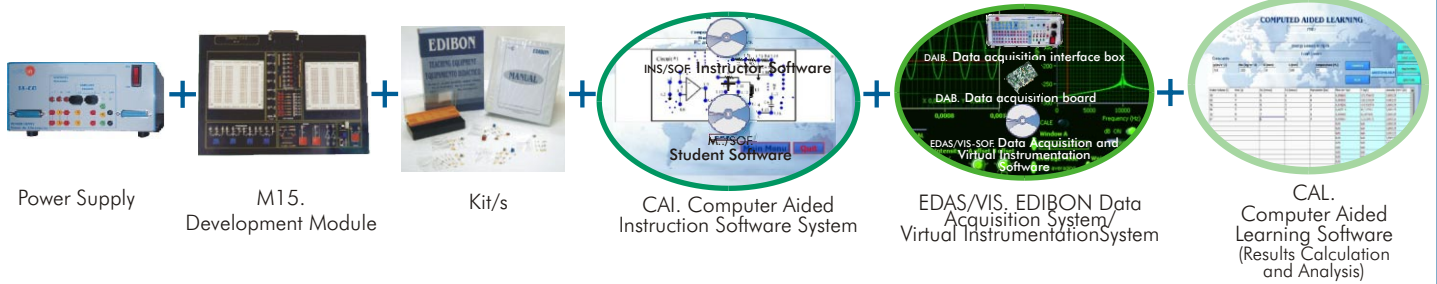
5.2) Software: EDAS/VIS-SOF. Data Acquisition and Virtual Instrumentation Software.

The Complete System includes: ① + ② + ③ + ④ + ⑤

Minimum configuration: ① Power supply + Module (M15) + ② Kit/s.

Some Working possibilities:

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



B) CAI + EDAS/VIS working possibility



C) CAI working possibility



D) CAL working possibility



E) EDAS/VIS working possibility



F) Simplest working possibility



① Common Elements for all Kits

FA-CO. Power Supply

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).

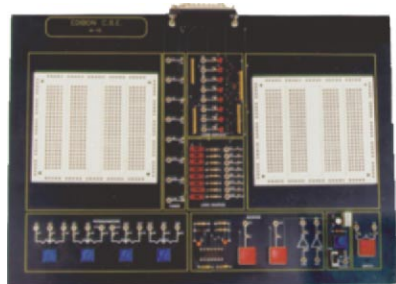
LED's voltage indicators.

Robust construction.

Supply: 110/220V A.C.

Frequency: 50/60 Hz.

FA-CO includes all the requirements for full working with any kit from M1-KIT to M16-KIT.



M15. Development Module

This is a module to build and implement student's own circuits, it consist on:

- Development board.
- Power supply connector.
- Digital visual display unit.
- Logical source.
- Set of potentiometers.
- Pulse generator and inverters.
- Interrupter.
- Clock.

M15. Development Module, includes all the requirements for full working with any kit from M1-KIT to M16-KIT.

② Kits

KITS, containing each one:

Assembly and practice manuals (8 manuals supplied).

Set of components and wires necessary for mounting the corresponding practice. After the first assembly, all the elements are recoverable.

M1-KIT. Direct Current (D.C.) Circuits

Practical Possibilities:

Measurement managing and checking instruments:

- 1.- Electronic instrumentation operation. Use of multimeter.
- 2.- Study of faults in Resistance circuit.

Ohm's Law:

- 3.- Ohm's Law verification.
- 4.- Power calculation.

Resistors: characteristics and types:

- 5.- Resistors measurement. Color code. Ohmmeter.
- 6.- Study of Faults in Resistors circuit.

Resistors association and the Wheatstone Bridge:

- 7.- Voltage and current measurement in a circuit with resistors connected in series.
- 8.- Series/Parallel configuration study.
- 9.- The Wheatstone Bridge.
- 10.- Study of Fault in Series Resistors circuit.
- 11.- Study of Fault in Parallel Resistors circuit.
- 12.- Study of Faults in Wheatstone Bridge circuit.

Kirchoff's laws:

- 13.- Kirchoff's first law.
- 14.- Kirchoff's second law.
- 15.- Fault study using Kirchoff's law.

Contents:

- Manuals.
- Set of practice wires.
- 1 switch, 2 positions.
- 5 switches, 3 positions.
- 1 red lamp 12V.
- 1 button potentiometer 10K.
- 1 button potentiometer 500 ohms.
- 1 resistance 0 (bridge).
- 2 resistances 1.5K.
- 1 resistance 100 ohms.
- 5 resistances 10K.
- 1 resistance 12K.
- 5 resistances 1K.
- 5 resistances 2.2K.
- 3 resistances 2.7K.
- 1 resistance 33 ohms.
- 2 resistances 330 ohms.
- 4 resistances 4.7K.
- 1 resistance 470K.
- 2 resistances 680 ohms.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M2-KIT. Alternating Current (A.C.) Circuits

Practical Possibilities:

Alternating signal characteristics. Instruments:

- 1.- Waveforms study in A.C.
- 2.- Introduction of anomalies in the Wave form circuit.
- 3.- Study of Faults in the Wave form circuit.
- 4.- Relation between peak values and RMS for sinusoidal waves.
- 5.- Resistance in a sinusoidal alternating current.
- 6.- Measurements using the oscilloscope.
- 7.- Voltage and current phase angles for resistors in sinusoidal alternating current.
- 8.- Sinusoidal A.C. resistors in series.
- 9.- Sinusoidal A.C. resistors in parallel.

Behaviour of A.C. capacitors and inductors:

- 10.- Capacitance with square waveform and a sinusoidal input current.
- 11.- Inductance with square waveform and a sinusoidal input voltage.
- 12.- Reactive reactance, X_c , variations with the frequency.
- 13.- Study of faults in capacitors.
- 14.- Reactive capacitance variations with capacitance.
- 15.- A.C. capacitors in parallel.
- 16.- A.C. capacitors in series.
- 17.- A.C. capacitors as voltage dividers.
- 18.- Inductance in an A.C circuit.
- 19.- Inductive reactance variations with the inductance.
- 20.- Inductors in series in an A.C. circuit.

Basic theorems and capacitance and inductance circuits:

- 21.- A.C. Resistor-Capacitor circuits in series.
- 22.- A.C. Resistor-Capacitor circuits in parallel.
- 23.- A.C. Resistor-Inductor circuits in series.
- 24.- Study of Faults in the Circuit.
- 25.- A.C. Resistor-Inductor circuits in parallel.

RLC Circuits:

- 26.- Resistance-Capacitance Filters.
- 27.- Filters inductive resistance. Low-Pass and High-Pass filters.

Resonance:

- 28.- A.C. L-C Circuits in parallel with low impedance source.
- 29.- Study of Faults in the resonance circuit.
- 30.- A.C. L-C Circuits in parallel with high impedance source.
- 31.- Circuit frequency response and bandwidth.
- 32.- A.C. R-L-C Circuits in series.
- 33.- Study of Faults in the resonance circuit.

The transformer:

- 34.- The transformer.
- 35.- The transformer with load.
- 36.- Current measurement in the secondary transformer with charge.

Contents:

- Manuals.
Set of practice wires.
3 coils 100 mH.
4 coils 10 mH.
3 coils 68 mH.
1 ceramic capacitor 220 pF.
1 ceramic capacitor 470 pF.
3 capacitors POLY 100 nF.
1 capacitor POLY 10 nF.
1 capacitor POLY 1 nF.
1 capacitor POLY 220 nF.
2 capacitors POLY 22 nF.
1 capacitor POLY 470 nF.
1 capacitor POLY 47 nF.
1 variable capacitor 5.5-65 pF.
9 switches, 2 positions.
8 switches, 3 positions.
1 resistance 10 ohms.
3 resistances 100 ohms.
1 resistance 100K.
9 resistances 10K.
13 resistances 1K.
7 resistances 2.2K.
1 resistance 270 ohms.
1 resistance 3.3K.
4 resistances 330 ohms.
5 resistance 4.7K.
3 resistances 470 ohms.
4 resistances 680 ohms.
1 transformer 2.8 VA.
1 red lamp 12V. direct current.
1 button potentiometer 10K.
1 button potentiometer 500 ohms.
1 resistance 0 (bridge).
2 resistances 1.5K.
1 resistance 12K.
3 resistances 2.7K.
1 resistance 33 ohms.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M3-KIT. Semiconductors I

Practical Possibilities:

Characteristics of the PN junction:

- 1.- Study of the diode.
- 2.- Fault Study in Diodes.

The diode as a Rectifier element:

- 3.- Half wave rectifier.
- 4.- Study of faults in Rectifier circuit.
- 5.- Bridge rectifier.
- 6.- Study of faults in bridge rectifier.

The Zener diode:

- 7.- Voltage regulator with a Zener diode.
- 8.- Study of faults in Zener circuit.

Study and characteristics of the transistor:

- 9.- Study of the transistor.
- 10.- Study of fault in the transistor.

Transistor characteristics operating as a switch:

- 11.- Study of the transistor as a switch.

Common emitter amplifier:

- 12.- Study of the common emitter NPN amplifier.
- 13.- Fault study in Amplifier circuit.
- 14.- Study of the common emitter PNP amplifier.

Contents:

- Manuals.
Set of practice wires.
1 I.C. LM358.
1 ceramic capacitor 2.2 nF.
1 bypass ceramic capacitor 100 nF.
1 capacitor ELCO 10 μ F.
1 capacitor ELCO 100 μ F.
3 multi-layer capacitors 1 μ F.
1 capacitor POLY 1 nF.
5 switches, 2 positions.
1 switch, 2 positions.
4 diodes 1N4001.
4 diodes 1N4148.
2 red led diodes.
1 ZENER diode 5V.
1 ZENER diode 6V.
2 button potentiometers 10K.
1 resistance 1.5K.
8 resistances 10K.
2 resistances 120K.
1 resistance 12K.
5 resistances 1K.
1 resistance 2.2M.
3 resistances 22 ohms.
1 resistance 22K.
1 resistance 270K.
1 resistance 27K.
1 resistance 3.9K.
1 resistance 4.7K.
1 resistance 470 ohms.
1 resistance 7.5K.
6 transistors.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M4-KIT. Semiconductors II

Practical Possibilities:

Complementary transistors pair:

- 1.- Complementary transistors pair.
- 2.- Transistors pair with alternating signal.
- 3.- Fault study of the complementary Transistor pair.

Darlington configuration:

- 4.- Darlington configuration.
- 5.- Fault study of the Darlington configuration.

Differential amplifier:

- 6.- Differential amplifier.
- 7.- Fault study in the differential amplifier.

Study and characteristics of the JFET transistor:

- 8.- JFET characteristics.
- 9.- Fault study with the JFET transistor.

Analog switch:

- 10.- Analog switch.

Multistage Amplifier. Direct coupling:

- 11.- Amplifier coupled directly.
- 12.- Fault study of an amplifier coupled directly.

Contents:

Manuals.
 Set of practice wires.
 3 ceramic capacitors 1 μ F.
 1 ceramic capacitor 100 pF.
 1 bypass ceramic capacitor 100 nF.
 3 capacitors ELCO. 100 μ F.
 5 switches, 2 positions.
 5 diodes.
 1 button potentiometer 10K.
 2 button potentiometers 1K.
 1 button potentiometer 5K.
 1 resistance 1.5K.
 4 resistances 100 ohms.
 2 resistances 100K.
 8 resistances 10K.
 1 resistance 11K.
 2 resistances 12K.
 6 resistances 1K.
 1 resistance 1M.
 2 resistances 4.7K.
 3 resistances 47K.
 1 resistance 560 ohms.
 7 transistors.
 1 transistor BC557.
 2 transistors BF256A.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M5-KIT. Power Supplies

Practical Possibilities:

Rectification:

- 1.- Rectification.
- 2.- Bridge rectifier.

Fixed voltage sources:

- 3.- Power supply with the Zener diode.
- 4.- Stabilization through Zener and Transistor.
- 5.- Fault study in "Stabilization through Zener and Transistor".
- 6.- Protection against overcurrents.
- 7.- Protection against overvoltages.
- 8.- Study of fault "Protection against overcurrents".

Symmetrical voltage power sources:

- 9.- Symmetrical source; 78XX regulator.
- 10.- Symmetrical source; 79XX regulator.

Voltage regulators with integrated circuits:

- 11.- Adjustable regulator; LM317.
- 12.- Study of fault in adjustable LM317 regulator.
- 13.- Adjustable L200 regulator.
- 14.- Fault study in adjustable L200 regulator.

Introduction to switched power supplies:

- 15.- Switching technique.
- 16.- Switching technique. PWM.
- 17.- Switching technique. Boost.

Contents:

Manuals.
 Set of practice wires.
 3 coils 100 μ Hz.
 1 I.C. LM2575T.
 1 I.C. LM2577T.
 1 I.C. LM358.
 1 I.C. NE555.
 2 bypass ceramic capacitors 100nF.
 1 capacitor 1000 μ F.
 3 capacitors 470 μ F.
 1 multi-layer capacitor 1 μ F.
 1 capacitor POLY 10 nF.
 1 capacitor POLY 330 nF.
 3 capacitors TANTALO 10 μ F.
 4 switches 2 positions.
 7 diodes.
 1 diode 1N4148.
 3 diodes SB140.
 2 diodes ZENER 8.2V.
 1 fuse 1 A.
 2 fuse supports C.I.
 1 button potentiometer 10K.
 2 button potentiometers 1K.
 2 button potentiometers 500K.
 1 button potentiometer 5K.
 1 radiator.
 1 regulator.
 1 regulator 7912.
 1 regulator L200.
 1 regulator LM317.
 1 resistance 1 ohms.
 2 resistances 100 ohms.
 2 resistances 100K.
 1 resistance 12 ohms.
 2 resistances 1K.
 2 resistances 2.2K.
 1 resistance 2.7 ohms.
 1 resistance 220 ohms.
 1 resistance 2K.
 1 resistance 330 ohms.
 1 resistance 5.1 ohms.
 1 resistance 560 ohms.
 1 thyristor C106.
 1 transistor BC547.
 1 transistor mosfet.
 2 transistors TIP121.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M6-KIT. Oscillators

Practical Possibilities:

Oscillators, RC and LC Nets:

- 1.- RC net oscillator.
- 2.- LC net oscillator.
- 3.- Faults study with RC and LC Net oscillators.

Wien bridge oscillator:

- 4.- Wien Bridge.
- 5.- Fault study in the Wien bridge oscillator.

Colpitts oscillator, Hartley oscillator:

- 6.- Colpitts oscillator.
- 7.- Hartley oscillator.
- 8.- Faults study with the Colpitts oscillator.

Astable multivibrator:

- 9.- Astable multivibrator.
- 10.- Fault study with an Astable multivibrator.

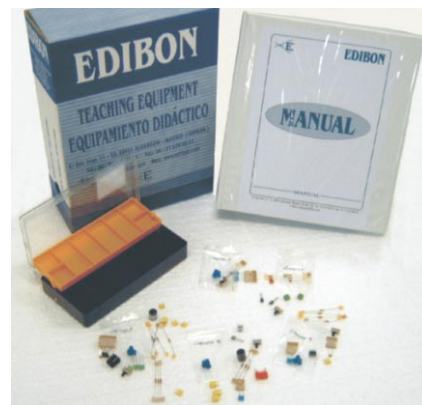
555 TIMER:

- 11.- 555 timer.
- 12.- 555 timer fault study.

Contents:

- Manuals.
Set of practice wires.
2 coils 10mH.
1 coil 1mH 5MM.
1 I.C. NE555.
1 I.C. TL072.
3 bypass ceramic capacitors 100 nF.
4 capacitors POLY 1 μ F.
8 capacitors POLY 100 nF.
5 capacitors POLY 10 nF.
1 capacitor POLY 2.2 nF.
2 capacitors POLY 4.7 nF.
2 diodes.
2 button potentiometers 1K.
1 button potentiometer 500K.
1 button potentiometer 5K.
2 resistances 0.
2 resistances 100K.
4 resistances 10K.
2 resistances 15K.
2 resistances 1K.
1 resistance 1M.
6 resistances 2.2K.
1 resistance 220K.
2 resistances 22K.
2 resistances 470 ohms.
3 transistors.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M7-KIT. Operational Amplifiers

Practical Possibilities:

Operational amplifier characteristics:

- 1.- Operational amplifier study.
- 2.- Closed-loop output compensation voltage.
- 3.- Operational amplifier fault study.

The inverting amplifier:

- 4.- Inverting amplifier study.
- 5.- Inverting amplifier fault study.

The non-inverting amplifier:

- 6.- Study of the non-inverting amplifier.
- 7.- Voltage follower.
- 8.- Fault study in the non-inverting amplifier.

The adder amplifier:

- 9.- Adding amplifier study.
- 10.- Fault study in the adding amplifier.

The differential amplifier:

- 11.- Differential amplifier study.
- 12.- Differential amplifier fault study.

Comparators:

- 13.- Comparator study.
- 14.- Comparators fault study.

Contents:

- Manuals.
Set of practice wires.
1 I.C. LM318.
1 I.C. OP07.
6 I.C. UA741 operational amplifier.
16 bypass ceramic capacitors 100nF.
6 switches, 2 positions.
2 button potentiometers 100K.
1 button potentiometer 50K.
2 button potentiometers 5K.
1 vertical multi-turn potentiometer 10K.
1 resistance 100 ohms.
6 resistances 100K.
3 resistances 10K.
2 resistances 15K.
2 resistances 1K.
2 resistances 200K.
1 resistance 300K.
3 resistances 30K.
2 resistances 50K.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M8-KIT. Filters

Practical Possibilities:

RC and LC filter responses:

- 1.- Frequency response.
- 2.- Low-pass filter.
- 3.- High-pass filter.
- 4.- LC Circuit.
- 5.- Study of Error in Low-pass filter.
- 6.- Study of Error in High-pass filter.

T-shaped Filter:

- 7.- Filter with double T link.
- 8.- Generator circuit of the signal S1.
- 9.- Study of Error in RC filter with double T.

Active filters:

- 10.- Low-pass filter.
- 11.- Low-pass filter with load and operational amplifier.
- 12.- High-pass filter.
- 13.- High-pass filter with load and operational amplifier.
- 14.- The attenuation is cumulative.
- 15.- Use of Operational Amplifier.
- 16.- Study of Faults in filters.

Association of filters:

- 17.- Behaviour of the filter.
- 18.- Filter of distorted signal.
- 19.- Filter in cascade; low pass filter and high pass filter.
- 20.- Filter in parallel.
- 21.- Study of Error in filters.

Contents:

- Manuals.
Set of practice wires.
1 I.C. TL071.
1 I.C. TL072.
1 I.C. TL084.
1 capacitor POLY 1 μ F.
10 capacitors POLY 100nF.
4 capacitors POLY 10nF.
5 capacitors POLY 1nF.
5 capacitors POLY 2.2nF.
1 capacitor POLY 4.7nF.
4 switches, 2 positions.
4 diodes 1N4148.
1 button potentiometer 1K.
3 resistances 100K.
9 resistances 10K.
1 resistance 12K.
9 resistances 15K.
1 resistance 1K.
1 resistance 1M.
4 resistances 2.2K.
1 resistance 2.7K.
1 resistance 220K.
1 resistance 22K.
4 resistances 27K.
13 resistances 3.3K.
2 resistances 3.9K.
3 resistances 4.7K.
2 transistors.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M9-KIT. Power Electronics

Practical Possibilities:

The bipolar power transistor:

- 1.- Study of the power transistor.
- 2.- Study of faults in the power transistor.

The MOSFET transistor:

- 3.- Study of the MOSFET transistor.
- 4.- Study of faults in the MOSFET transistor.

The thyristor:

- 5.- Study of the thyristor.
- 6.- Study of error of the thyristor.

The UJT transistor and trigger circuits of the thyristor:

- 7.- Study of the trigger circuits of the thyristor.
- 8.- Study of insulation circuits.

The TRIAC:

- 9.- Study of the TRIAC.
- 10.- Practical assembly of the TRIAC.

Contents:

- Manuals.
Set of practice wires.
1 I.C. 4N33.
1 I.C. LM311.
1 I.C. NE555.
3 bypass ceramic capacitors 100nF 50V.
2 multi-layer capacitors 1 μ F 25V.
3 switches 2 positions.
2 DIAC.
4 diodes 1N4001.
1 diode 1N4148.
4 diodes ZENER 15V.
1 diode ZENER 8.2V.
1 photo-resistance.
1 red lamp 12V. direct current.
4 button potentiometers 100K.
1 button potentiometer 10K.
1 button potentiometer 5K.
2 resistances 1 ohm.
1 resistance 1.8K.
2 resistances 100 ohms.
1 resistance 100K.
1 resistance 10K.
1 resistance 120 ohms.
1 resistance 15K.
6 resistances 1K.
1 resistance 2.2K.
1 resistance 220 ohms.
3 resistances 390 ohms.
3 resistances 4.7K.
1 resistance 47 ohms.
2 thyristors.
1 pulse transformer.
1 transistor BC327.
1 MOSFET transistor.
2 transistors.
1 transistor VN10LM.
2 TRIAC.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M10-KIT. Digital Systems and Converters

Practical Possibilities:

Analog switching. The bistable, astable and monostable family:

- 1.- Characteristics of an analog switch chip.
- 2.- Study of errors in the Analog Multiplexer.
- 3.- Study of errors in the Analog Multiplexer.
- 4.- Characteristics of an S-R type Latch Integrated circuit.
- 5.- Error study in the bistable.
- 6.- Characteristics of an integrated astable circuit.
- 7.- Error study in the astable.
- 8.- Characteristics of an integrated Monostable circuit.

Behaviour of Binary/BCD Counters & 7-segments Displays:

- 9.- Characteristics of Binary UP/DOWN Counter 74LS193 and 7-Segment Display.
- 10.- Error study in the binary counter.
- 11.- Characteristics of the BCD UP/DOWN counter and 7-Segment Display.
- 12.- Error study in the BCD counter.

Comparators and analog integrators:

- 13.- Characteristics of an analog comparator.
- 14.- Analog integrator.
- 15.- Error study in the analog integrator.
- 16.- Triangular wave generation.

A/D and D/A conversion:

- 17.- D/A Converter.
- 18.- A/D Converter.

Applications:

- 19.- Random number generator.
- 20.- Measuring the time between two events.

Contents:

- Manuals.
Set of practice wires.
1 array 7 resistance 100 ohms. (Encapsulated DIP 14).
1 I.C. 74ALS00.
1 I.C. 74HC14.
1 I.C. 74LS123.
1 I.C. 74LS192.
1 I.C. 74LS193.
1 I.C. 74LS279.
1 I.C. AD 558.
1 I.C. ADG508ACJ.
1 I.C. CA3140.
1 I.C. HEF4543BP.
1 I.C. LM311.
2 I.C. NE555.
2 ceramic capacitors 10nF.
22 bypass ceramic capacitors 100nF 50V.
4 capacitors ELCO. 100 µF.
1 capacitor ELCO. 33 µF.
1 multi-layer capacitor 68nF.
1 capacitor POLY 1.5 µF.
2 capacitors POLY 1 µF, RASTER 5mm.
1 capacitor POLY 100nF.
1 capacitor POLY 33nF.
1 capacitor tantaló 68 µF.
1 elbow connector.
15 switches, 2 positions.
8 LED red diodes .
1 display 7 segments common cathode.
13 button potentiometers 10K.
1 button potentiometer 500 ohms.
1 button potentiometer 5K.
2 push buttons 1 CIR.
5 resistances 100 ohms.
2 resistances 100K.
2 resistances 1K.
1 resistance 1M.
1 resistance 22K.
8 resistances 300 ohms.
2 resistances 4.7K.
1 resistance 600 ohms.
4 transistors.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M11-KIT. Digital Electronics Fundamentals

Practical Possibilities:

Numbers systems:

- 1.- Voltage measurement in a circuit of SOURCES.
- 2.- Fault study in the circuit.

Logical circuits:

- 3.- Logical Diode.
- 4.- Fault study in sources.
- 5.- Logic with transistor and diodes.
- 6.- Fault study in transistor/diode circuit.

TTL gates:

- 7.- Basic function gates.
- 8.- Study of faults in TTL circuit.
- 9.- Study of faults in Logic Gates.

CMOS gates:

- 10.- Basic function gates.
- 11.- Study of faults in CMOS circuit.

Boolean Algebra and logical functions:

- 12.- Study of use of the circuit.

Open collector gates:

- 13.- Study of the use of the circuit.

Others types of integrated gates:

- 14.- Study of simple operations with a Schmitt Trigger inverter.
- 15.- Operation study of a three-state buffer.
- 16.- Study of fault in the circuit.

Contents:

- Manuals.
Set of practice wires.
2 array 8 resistances 330 ohms. (Encapsulated DIP 16).
1 I.C. 4001BP.
1 I.C. 74LS00.
1 I.C. 74LS04.
1 I.C. 74LS07.
1 I.C. 74LS08.
1 I.C. 74LS126.
1 I.C. 74LS14.
1 I.C. 74LS28.
1 I.C. 74LS32.
1 I.C. 74LS86.
1 I.C. TP4011B.
12 bypass ceramic capacitors 100nF 50V.
6 switches, 2 positions.
4 switches, 2 positions.
2 diodes 1N4148.
2 diodes BAT 85.
12 LED red diodes.
1 button potentiometer 5K.
95 test points.
1 resistance 100 ohms.
12 resistances 10K.
3 resistances 1K.
4 resistances 330 ohms.
2 resistances 4.7K.
1 switch 8 ways.
5 transistors.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M12-KIT. Basic Combinational Circuits

Practical Possibilities:

Encoders:

- 1.- Study of an encoder.
- 2.- Fault study in the encoder.

Decoders:

- 3.- Study of a decoder.
- 4.- Fault study in the decoder.

Multiplexers:

- 5.- Study of a multiplexer.
- 6.- Study of errors in the multiplexers.

Demultiplexers:

- 7.- Study of a demultiplexer.
- 8.- Study of errors in demultiplexers.

Digital Comparators:

- 9.- Study of a comparator.
- 10.- Study of errors in a comparator.

Arithmetic and logic operations:

- 11.- Study of an adder.
- 12.- Study of error in the arithmetic and logic operations.
- 13.- Study of a parity generator.
- 14.- Study of error in the Parity generator.

Contents:

Manuals.
 Set of practice wires.
 3 array 4 individual resistances 3 ohms.
 1 I.C. 74HC14.
 2 I.C. 74HC193.
 1 I.C. 74LS139.
 1 I.C. 74LS148.
 1 I.C. 74LS151.
 1 I.C. 74LS280.
 1 I.C. 74LS283.
 1 I.C. 74LS48.
 1 I.C. 74LS85.
 10 bypass ceramic capacitors 100nF.
 10 switches 2 positions.
 1 switch 2 positions.
 2 diodes.
 19 LED red diodes .
 4 push buttons 1 CIR.
 7 resistances 10K.
 7 resistances 330 ohms.
 4 resistances 4.7K.
 7 transistors.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M13-KIT. Basic Sequential Circuits

Practical Possibilities:

Bistables:

- 1.- Bistables.
- 2.- Bistable S-R using NAND gates.
- 3.- Practical performance.
- 4.- Study of error in the Bistables.

Shift registers:

- 5.- Shift registers.
- 6.- Study of faults of the Shift registers.

Counters:

- 7.- Practice of the Counters.
- 8.- Study of faults of the Counters.

Synchronised sequential circuits:

- 9.- Practice of the Synchronised.
- 10.- Study of errors of the Synchronised sequential circuits.

Memories:

- 11.- Exercises.

Contents:

Manuals.
 Set of practice wires.
 1 array 4 individual resistances 10K.
 1 array 8 resistances 10K.
 1 array 8 resistances 330 ohms.
 1 I.C. 74HC14.
 1 I.C. 74LS04.
 1 I.C. 74LS08.
 2 I.C. 74LS112.
 1 I.C. 74LS279.
 1 I.C. 74LS74.
 1 I.C. 74LS86.
 10 switches 1 CIR, 2 positions.
 12 LED red diodes .
 1 push button 1 CIR.
 1 resistance 100 ohms.
 17 resistances 10K.
 12 transistors.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M14-KIT. Optoelectronics

Practical Possibilities:

Light transmitters and liquid crystal display (LCD):

- 1.- Light transmitters.
- 2.- Bargraph.
- 3.- LCD display and 7-segment display.
- 4.- Fault study in light transmitters and liquid crystal display.

Photo-conducting cells:

- 5.- Light dependent resistors.
- 6.- Alarm.
- 7.- Fault study on the photo-conducting cell.

Fibre optics:

- 8.- Fibre optics practice.
- 9.- Fault study using fibre optics.

Infrared:

- 10.- Circuit with infrared diodes.
- 11.- Fault study of the infrared diodes.

Contents:

Manuals.
 Set of practice wires.
 1 array 7 resistances 470 ohms. (Encapsulated DIP 14).
 1 BARGRAPH.
 2 I.C. 74LS390.
 1 I.C. HEF4543.
 1 I.C. LM311.
 1 I.C. LM3914.
 1 I.C. TL072.
 1 I.C. TL074.
 1 printed circuit EBC14-35-95.
 1 capacitor ELCO 2.2 μ F.
 1 capacitor POLY 1 μ F.
 2 capacitors POLY 100nF.
 8 switches 1 CIR, 2 positions.
 1 LED yellow diode.
 1 LED red diode.
 1 display 7 segments common cathode.
 1 photoreceptor.
 1 phototransmitter.
 1 LCD.
 1 LDR NORP-12.
 2 button potentiometers 100K.
 1 button potentiometer 10K.
 1 button potentiometer 5K.
 1 push button 1 CIR.
 1 infrared receptor.
 2 resistances 100 ohms.
 6 resistances 100K.
 10 resistances 10K.
 1 resistance 11K.
 2 resistances 1K.
 1 resistance 1M.
 1 resistance 2.2K.
 1 resistance 2.2M.
 1 resistance 220K.
 3 resistances 330 ohms.
 1 resistance 470K.
 2 resistances 560 ohms.
 1 resistance 5K.
 2 SWEET SPOT.
 2 fibre optic terminals.
 1 infrared transmitter.
 1 buzzer.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".



M16-KIT. Electric Networks

Practical Possibilities:

Ohm's law:

- 1.- Calculation of the internal resistance of a continuous source.
- 2.- Error study in an internal resistance.
- 3.- Internal resistance calculation of an alternating source.

Electrical power:

- 4.- Power transferred by a DC source to load.
- 5.- Power transferred to a load by an AC source.

Power supplies combination:

- 6.- DC+DC assembly.
- 7.- Error study in the circuit, DC assembly.
- 8.- DC+AC assembly.

Thévenin's and Norton's theorems:

- 9.- Thévenin and Norton equivalent circuits. Conversion. Kirchoff's laws.

Superposition theorem:

- 10.- Application of the Superposition theorem.
- 11.- Error study in the Superposition circuit. Component values modifications.

Star-triangle transformation:

- 12.- Resistance measurement between terminals. Delta|Y configurations.

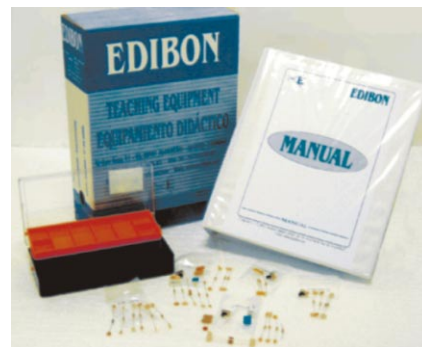
Wheatstone bridge:

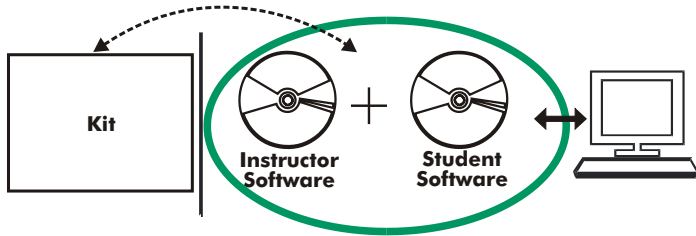
- 13.- Calibration of a Wheatstone bridge fed by a DC source.
- 14.- Error study in the Wheatstone bridge circuit.
- 15.- Wheatstone bridge calibration fed by an AC source.

Contents:

Manuals.
 Set of practice wires.
 1 coil 1mHr.
 1 ceramic capacitor 10nF.
 1 ceramic capacitor 47nF.
 4 switches 1 CIR, 2 positions.
 1 button potentiometer 10K.
 1 resistance 1 W.
 2 resistances 2.2K.
 2 resistances 4.7K.
 8 resistances 1K.
 1 resistance 1.5K.
 2 resistances 10K.
 2 resistances 100W.
 1 resistances 3.3K.
 2 resistances 330.
 3 resistances 470.
 1 resistance 6.8K.
 1 resistance 680.
 2 resistances 220.

Note: This set of components will be adjusted for making the indicated "Practical Possibilities".





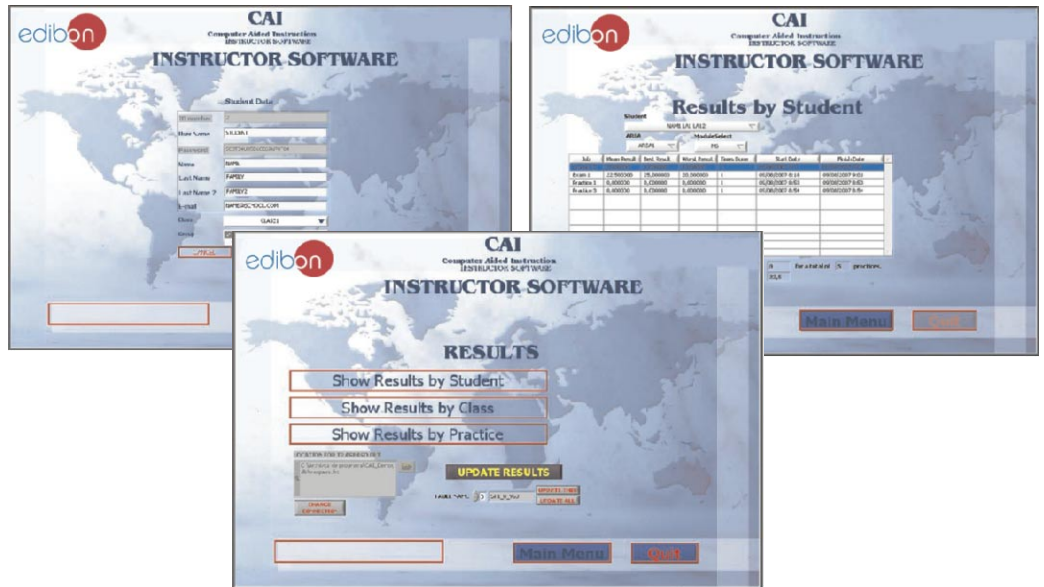
With no physical connection between the kit and the computer, this complete package consists on an Instructor Software (INS./SOF) totally integrated with the Student Software (M../SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of 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.

This complete system includes INS./SOF + M../SOF.

3.1) 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.

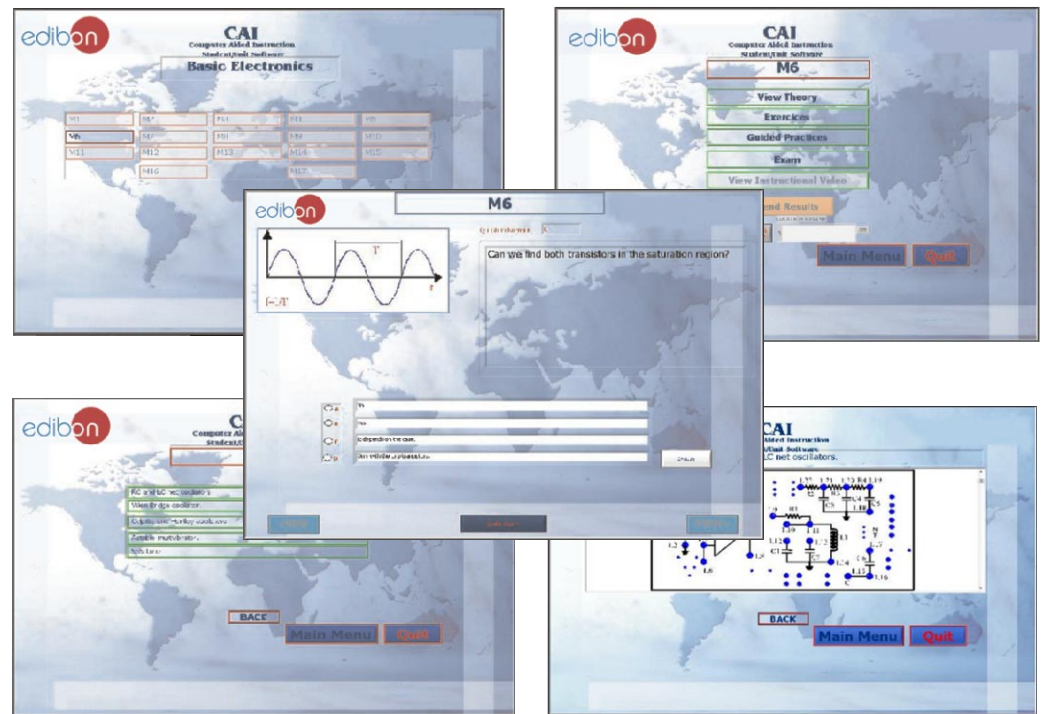
The Instructor Software is the same for all the kits, and working in network configuration, allows controlling all the students in the classroom.



3.2) **M../SOF. Computer Aided Instruction Software Packages (Student Software)**.

It explains how to run the experiments. Each Kit 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 kits, showing how to complete the exercises and practices.
 - Exams:** set of questions presented to test the obtained knowledge.



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

Available Student Software Packages:

- | | | |
|---|---|--------------------------------------|
| -M1/SOF. Direct Current (D.C.) Circuits. | -M7/SOF. Operational Amplifiers. | -M13/SOF. Basic Sequential Circuits. |
| -M2/SOF. Alternating Current (A.C.) Circuits. | -M8/SOF. Filters. | -M14/SOF. Optoelectronics. |
| -M3/SOF. Semiconductors I. | -M9/SOF. Power Electronics. | -M16/SOF. Electric Networks. |
| -M4/SOF. Semiconductors II. | -M10/SOF. Digital Systems and Converters. | |
| -M5/SOF. Power Supplies. | -M11/SOF. Digital Electronics Fundamentals. | |
| -M6/SOF. Oscillators. | -M12/SOF. Basic Combinational Circuits. | |

④ 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*.

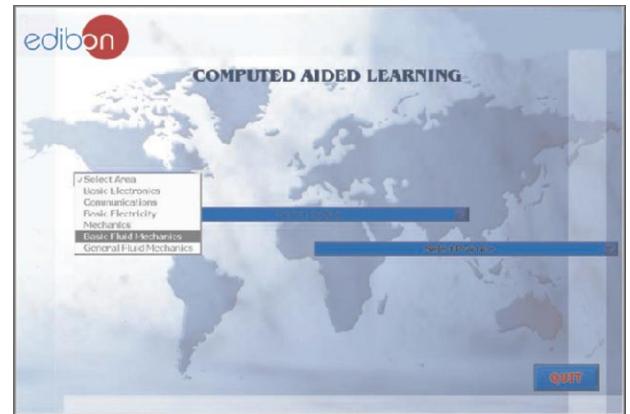
On the Basic Electronics Area, it can be used with the M1 to M18 modules and with M1-KIT to M16-KIT Assembly Kits. These modules/Kits cover every subject in Basic Electricity and Electronics, both analog and digital.

*Although only the purchased areas will be activated and ready to use.

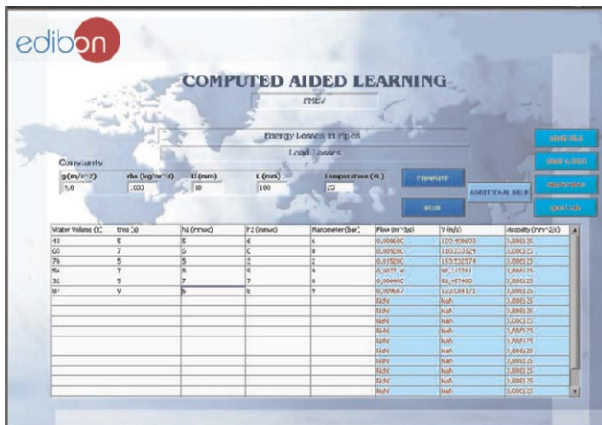
CAL is a class assistant that helps in making the necessary calculations to extract the right conclusions from data obtained during the experimental practices.

With a single click, CAL computes the value of all the variables involved.

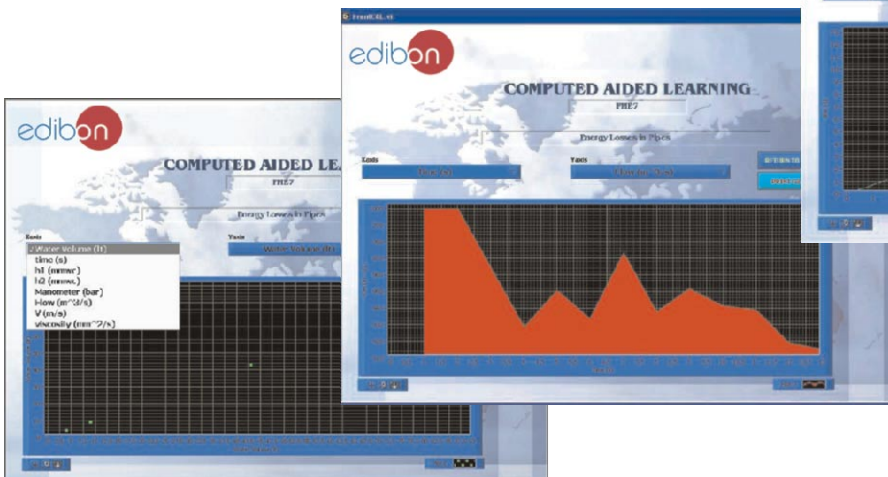
Also, CAL gives the option of plotting and printing the results.



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:

Quantity	Symbol	Value
characteristic impedance of vacuum	$Z_0 = \mu_0 c$	376.730 313 461... Ω
electric constant (permittivity of free space)	$\epsilon_0 = 1/(\mu_0 c^2)$	8.854 187 817... $\times 10^{-12} \text{ F m}^{-1}$
magnetic constant (permeability of free space)	μ_0	$4\pi \times 10^{-7} \text{ N A}^{-2}$ 1.2566 370 614... $\times 10^{-6} \text{ N A}^{-2}$
Newtonian constant of gravitation	G	$6.6742(10) \times 10^{-11} \frac{\text{m}^3}{\text{kg} \cdot \text{s}^2}$
Planck's constant	h	6.626 0693(11) $\times 10^{-34} \text{ J s}$
Dirac's constant	$\hbar = h/(2\pi)$	1.054 571 68(18) $\times 10^{-34} \text{ J s}$

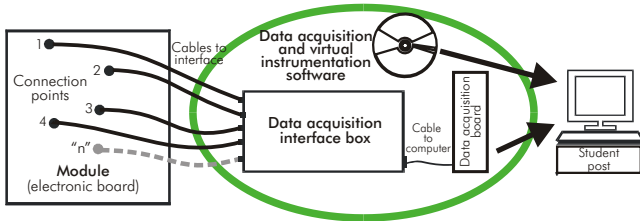
It provides a handy option to avoid using different reference sources while in progress. For example: the values of Physical constants, their symbols and right names, conversion factors...

Integral
$\int \cos \omega t \, dt = \frac{1}{\omega} \sin \omega t$
$\int t^n \, dt = \frac{t^{n+1}}{n+1}, n \neq -1$
$\int \frac{dt}{t} = \ln t $
$\int e^t \, dt = e^t$
$\int e^{at} \, dt = \frac{e^{at}}{a}$

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

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

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



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

We easily connect the Data Acquisition Interface Box (DAIB) to the Modules/Kits 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/Kit), 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/O. 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/O.

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:**

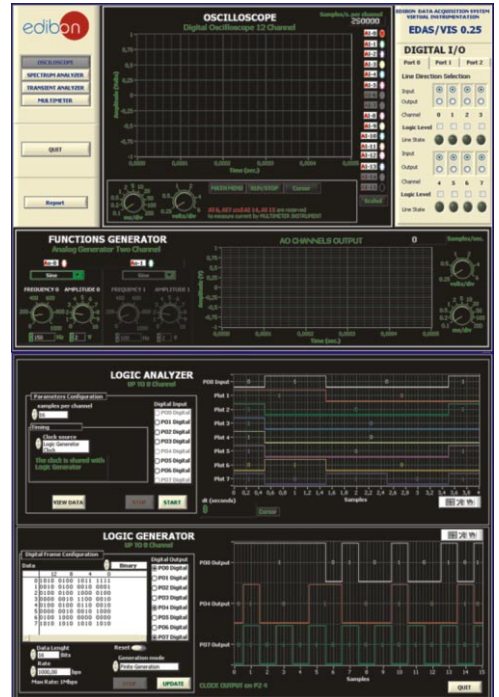
Number of transmission channels: 8. TTL voltage level.

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 electronics boards. One EDAS/VIS is needed for each student work post. The EDAS/VIS allows to work with several basic electronics 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/electronics/electronickits/EDAS-VIS.pdf

REQUIRED SERVICES

Electrical power supply needed for FA-CO: single-phase, 220V/50Hz or 110V/60 Hz.
For using CAI, CAL and/or EDAS/VIS a Computer (PC) is required.

DIMENSIONS AND WEIGHTS

- Dimensions of each Kit: 300 x 300 x 200 mm. approx.
- FA-CO dimensions: 225 x 205 x 100 mm. approx. Weight: 2 Kg. approx.
- M15 dimensions: 300 x 210 x 45 mm. approx. Weight: 300 gr. approx.

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



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