Engineering and Technical Teaching Equipment

Automotive Fundamental Electronic Circuits Unit

AV-EC

www.edibon.com
↳PRODUCTS
↳2.- ELECTRONICS



INTRODUCTION

Automotive electronics is the branch of mechatronics focused on the electrical and electronic equipment installed in cars. The importance of electronic systems in cars has been increasing year by year till reaching one of the main parts of the automobiles nowadays.

The electronic systems have replaced a lot of functions performed manually or by mechanical systems, like the fuel injection system, the control of emission gases, the safety system, the checking of the car liquids, the comfort system, the throttle control and a long etc.

The Automotive Fundamental Electronic Circuits Unit, "AV-EC", designed by EDIBON, is a group of the main electronic circuits used in all modern cars today. It offers a good introduction to the automotive electronic systems.

Certificate of Approval of the Quality Management System

European Union Certificate (total safety)

UL and CSA Regulations (All our products are manufactured according to current UL and CSA regulations)

Certificate of Approval of the Environmental Management System

Worlddidac Association Certificate of Membership

GENERAL DESCRIPTION

The Automotive Fundamental Electronic Circuits Unit, "AV-EC", designed by EDIBON, provides a practical solution to the introduction of electronics in the automotive field with a group of common circuits used in the automobiles nowadays.

The circuits included in the "AV-EC" are focused on different functions, such as power supply and speed control of a DC motor, light intensity control of lamps, a DC power supply of a car, pulse generator circuit, spark generator circuit with contact breaker, spark generator with transistorized circuit with induction sensor of Hall sensor and spark generator system semicontrolled and fully controlled by electronic means.

All circuits included in the unit are isolated to understand the function of the circuits separately. Each circuit has different test points accessible through 2 mm standard lab sockets.

The "AV-EC" circuits include a series of faults that can be inserted to different components of each circuit to allow the students to detect and understand common failures of the electronic components.

The "AV-EC" unit is provided with a different set of practical exercises, through which the student will understand how the fundamental electronic circuits used in the automotive field works.

SPECIFICATIONS

The "AV-EC" unit includes the following circuits:

- DC motor circuits:
  - DC motor power supply.
  - DC motor speed control.
- Lamp circuits:
  - Lamp resistance.
  - Light intensity variation.
- DC power supply:
  - Circuit with a car key-switch to supply 12 VDC to the circuit.
- Electronic ignition circuits:
  - Adjustable astable multivibrator circuit with 555IC.
  - Camshaft and crankshaft sensor emulator using electrical signals.
  - Spark generator system controlled electronically and Hall sensor.
- Protoboard plate:
  - Protoboard plate for experimental circuit mounting without soldering.
  - Components to mount an adjustable astable multivibrator circuit with 555IC.



AV-EC detail

Cables and accessories, for normal operation.

Manuals: This unit is supplied with the following manuals: Required services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices manuals.

Additional recommended elements (Not included):

- EMSK. EDIBON Development KIT for Circuits Simulation, Powered by NI LabVIEW™.

Additional recommended elements (only one) (Not included):

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

Additional recommended elements (Not included):

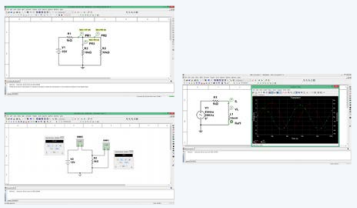
EMSK. EDIBON Development KIT for Circuits Simulation, Powered by NI LabVIEW™

EDIBON Software Development KIT requires:

- NI LabVIEW Student or Multisim Software.
- EDIBON TECHNICAL TEACHING EQUIPMENT.

EDIBON Software Development KIT includes (*):

- Practical exercises to get started with NI Multisim™ environment.
- Practical exercises to get started with EDIBON TECHNICAL TEACHING EQUIPMENT.
- A set of NI Multisim™ circuits to analyze the circuits of the EDIBON TECHNICAL TEACHING EQUIPMENT.



(*) The content may vary depending on the equipment supplied.

Additional recommended elements (only one) (Not included):

EDAS/VIS. EDIBON Data Acquisition System and Virtual Instrumentation

16 Analog inputs (1 block with **12 voltage channels** and 1 block with **2 current channels** (4 connections)).
EDAS/VIS-0.25, sampling velocity 250,000 samples per second.
EDAS/VIS-1.25, sampling velocity 1250,000 samples per second.
2 analog outputs.
24 digital inputs/outputs, configurable as inputs or outputs, with 24 state LED indicators. These digital inputs/outputs are grouped in three ports of eight channels (P0, P1 and P3).
4 digital signal switches 0 - 5 V.
2 analog signal potentiometers 12 V.
Main ON / OFF switch.
Inside: internal power supply of 12 V and 5 V. Potentiometer.

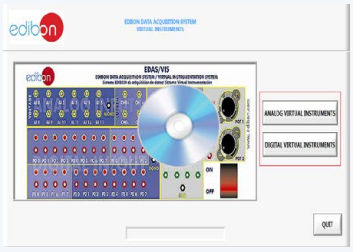


DAB. Data Acquisition Board:
The Data Acquisition board is part of the SCADA system.
For EDAS/VIS-1.25 Version EDIBON Data Acquisition System and Virtual Instrumentation (speed: 1,250,000 samples/s):
PCI Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI.
Analog input:
Number of **channels= 16** single-ended or 8 differential. **Resolution=16 bits**, 1 in 65536.
Sampling rate up to: 1,250,000 S/s (samples per second). Input range (V)= ±10 V.
Data transfers=DMA, interrupts, programmed I/0. Number of DMA channels=6.
Analog output:
Number of **channels=2**. **Resolution=16 bits**, 1 in 65536. **Max. output rate up to: 900 KS/s.**
Output range(V)= ±10 V. Data transfers=DMA, interrupts, programmed I/0.
Digital Input/Output: Number of **channels=24 inputs/outputs**. **Port 0 up to 8 MHz.**
Timing: **Counter/timers=2.** Resolution: Counter/timers: 32 bits.



For EDAS/VIS-0.25 Version EDIBON Data Acquisition System and Virtual Instrumentation (speed: 250,000 samples/s):
Sampling rate up to: 250,000 S/s (samples per second).
Analog output: Max. output rate up to: 10 KS/s.
Digital Input/Output: Number of **channels=24 inputs/outputs**. **Port 0 up 1 MHz.**
Rest of characteristics are the same than EDAS/VIS 1.25 Version.
The Data Acquisition board model may change at any moment, providing the same or better features than those required for the unit.

EDAS/VIS/CCSOF. Computer Control + Data Acquisition + Data Management Software:
Compatible with actual Windows operating systems. Amicable graphical frame.
Configurable software allowing the temporal/frequency representation of the different inputs and outputs. Visualization of a voltage of the circuits on the computer screen.
It allows data store in a file, print screens and reports of the signals at any time.
Measurement, analysis, visualization, representation and report of results.
Set of virtual instruments:
- **Oscilloscope:**
  - **Channels: 12 simultaneous.** Maximum input voltage: 10 V.
  - **All 12 input channels could be scaled** to compare signal with different voltage levels.
  - Maximum sampling velocity: 1000 samples per second.
  - **"Math Menu"** with operations as add, rest, multiplication and division, between any of the 12 oscilloscope channels.
- **Function generator:**
  - **Two independent signal generators**, for sinusoidal, triangular, sawtooth and square.
  - **Channels: 2 (allowing working simultaneously).** Maximum output voltage: 10 V.
  - Maximum output rate: 1000 samples per second.
  - **It includes a graph where an output signal for each channel is shown.**
- **Spectrum analyzer:**
  - **Channels: 12 (simultaneous).** Maximum voltage: 10 V. Digital spectrum analyzer: based on the FFT.
  - Maximum sampling velocity: 1000 samples per second.
- **Multimeter:**
  - **Voltmeter, channels: 12 (simultaneous).** Maximum voltage: 10 V RMS.
  - **Ammeter, channels: 2 (simultaneous).** Maximum ampere: 500 mA RMS per channel.
- **Transient analyzer.**
- **Logic analyzer:**
  - **Number of input channels: 8.** TTL Voltage level.
  - **Clock source: 2 different sources.**
  - This instrument allows receiving as far as 8 digital signal simultaneously.
- **Logic generator:**
  - **Number of transmission channels: 8.** TTL voltage level.
  - This instrument allows generating up to 8 digital simultaneous signals.



EXERCISES AND PRACTICAL POSSIBILITIES

1.- PWM DC Motor speed adjusting Characteristics of gear systems.
2.- Analysis of a DC motor power supply fault.
3.- 555 astable multivibrator.
4.- Analysis of a 555 timer fault.
5.- Light intensity adjunsting by PWM.
6.- CKP and CMP hall and inductive simulated sensors.
7.- Spark generation circuit.
8.- Spark generation circuit with faults.

Additional practical possibilities:

DC motor circuits:

9.- Switching the DC motor power supply.
10.- Adjusting the DC voltage to control the motor speed.
11.- Analysis of a DC motor power supply fault.

Lamp circuits:

12.- Lamp resistance.
13.- Light intensity variation.

DC power supply:

14.- Circuit with a car key-switch to supply 12 VDC to the circuit.

Electronic ignition circuits:

15.- Study of the function of the 555 integrated circuit (timer).
16.- Analysis of a 555 timer fault.
17.- Spark generator system controlled electronically and Hall sensor.
18.- Analysis of a faulty spark generator system controlled electronically and hall sensor.
19.- Spark generator system totally electronically controlled.

- Several other exercises can be done and designed by the user.

REQUIRED SERVICES

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

DIMENSIONS AND WEIGHTS

AV-EC:

- Dimensions: 640 x 320 x 330 mm approx.
  (25.19 x 12.59 x 12.99 inches approx.)
- Weight: 10 Kg approx.
  (22 pounds approx.)

REQUIRED ELEMENTS (Not included)

- Oscilloscope.

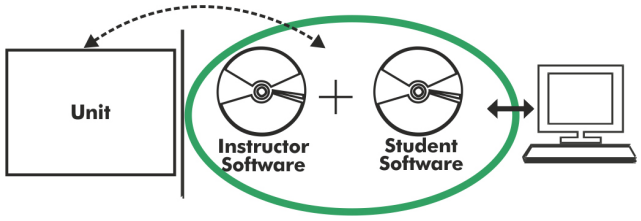
ADDITIONAL RECOMMENDED ELEMENTS (Not included)

- EMSK. EDIBON Software Development KIT for simulation of electrical and electric circuits, Powered by NI LabVIEW.

Recommended (only one):

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

AV-EC/ICAI. Interactive Computer Aided Instruction Software:



With no physical connection between unit and computer, **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF)**. Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

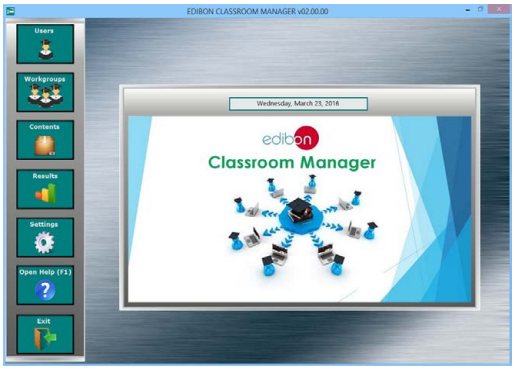
Instructor Software

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).

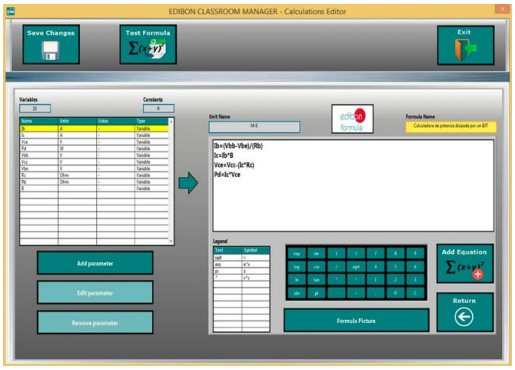
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

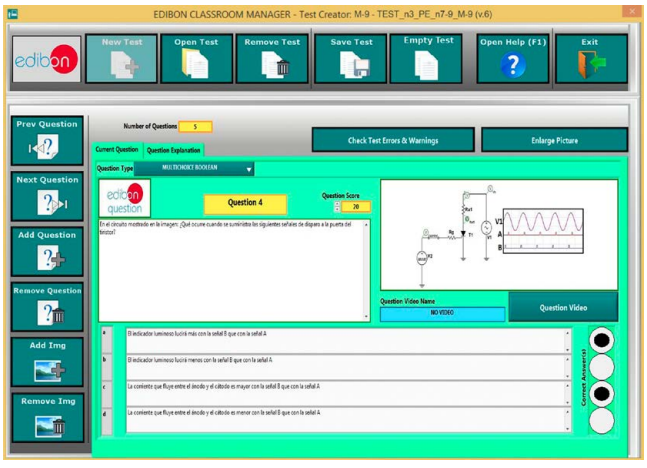
- **User Data Base Management.**
- **Administration and assignment of Workgroup, Task and Training sessions.**
- **Creation and Integration of Practical Exercises and Multimedia Resources.**
- **Custom Design of Evaluation Methods.**
- **Creation and assignment of Formulas & Equations.**
- **Equation System Solver Engine.**
- **Updatable Contents.**
- **Report generation, User Progression Monitoring and Statistics.**



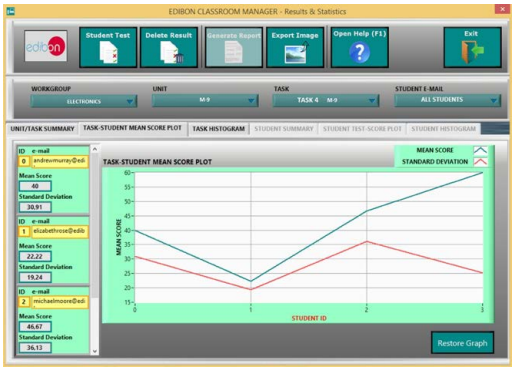
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question



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

Optional

Student Software

- ESL-SOF. EDIBON Student Labsoft (Student Software).

ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session. Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

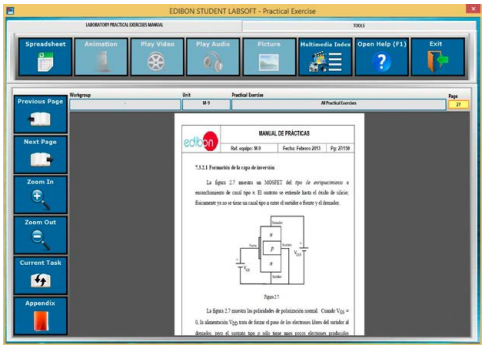
Innovative features:

- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge and progression.**
- **Test self-correction.**
- **Calculations computing and plotting.**
- **Equation System Solver Engine.**
- **User Monitoring Learning & Printable Reports.**
- **Multimedia-Supported auxiliary resources.**

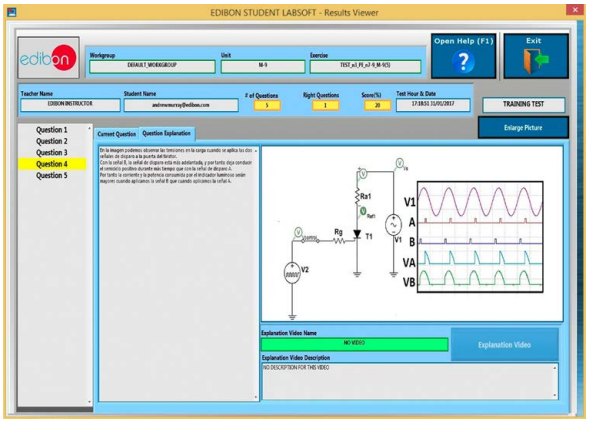
For more information see **ICAI** catalogue. Click on the following link:
www.edibon.com/en/interactive-computer-aided-instruction-software



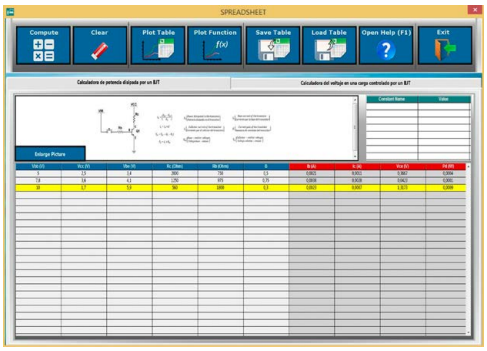
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



EPE. EDIBON Practical Exercise Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

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

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REPRESENTATIVE: