

# I.P.E.S. SYSTEM INFRASTRUCTURE



BIOMEDICAL EQUIPMENT MAINTENANCE TECHNICIAN  
www.elettronicaveneta.com  
34A-E-PL

## POWER SUPPLY mod. PS1-PSU/EV



This power supply unit is housed in a case properly designed and it forms an ergonomic assembly with the module holder Box. Terminals and LEDs for extracting and displaying output voltages are available on the silk-screen-printed fore plate. The outputs of these voltages are also available on DIN connectors set on the right side of the power supply.

This power supply is universal because it can power all the types of modules manufactured by Elettronica Veneta S.p.A.

**The output voltages are:**

**OUTPUT S1: +30 Vcc – 4A**

Rectified and filtered voltage, protected by fuse.  
LED for signalling voltage availability.

**OUTPUT S2: 24 Vca – 4 A**

Voltage protected by fuse. LED for signalling voltage availability.

**OUTPUT S3: +5 Vcc – 2A**

**OUTPUT S4: +12 Vcc – 2A, -12 Vcc – 1A**

Regulated voltages, electronically protected against short-circuits and overloads.  
LED for signalling voltage availability.

**OUTPUT S5: 1.3 Vcc ÷ 24 Vcc, 1A**

Regulated voltage, electronically protected against short-circuits and overloads.

LED for signalling voltage availability.

**OUTPUT ON DIN CONNECTOR: 24 Vca – 0 – 24 Vca, 0.5A**

Voltage protected by fuse.

(Outputs S1 and S2 supply 4 A, individually, and 2 A, when used simultaneously)

**Power supply:** 230 Vca 50 Hz single-phase - 200 VA

(Other voltage and frequency under request)

**Dimensions:** 415 x 185 x 195 mm

**Weight:** 8 kg

## MODULE HOLDER BOX mod. BOX/EV



Optional box for housing the testing modules. Modules are fixed by a plug-in system.

- **Dimensions and weight: 415x400x110 mm - 3 Kg**

## BIOMEDICAL SIGNAL GENERATOR/ACQUISITION AND FAULT INSERTION UNIT

mod. GAU/EV



The **SIGNAL GENERATOR/ACQUISITION and FAULT INSERTION UNIT mod. GAU/EV** is an essential element enabling to use biomedical modules.

It ensures the following functions:

1. **production of physiological signals such as ECG, EEG and EMG, required by module EB-B1/EV**
2. **Acquisition and display of the signals detected and processed by module EB-B1/EV**
3. **Interface with module EB-B2/EV (Printer)**
4. **USB interface with the Personal Computer**
5. **Fault insertion or circuit variations in biomedical modules**

This unit will output electrical signals with waveforms equivalent to the biological ones (ECG, EMG and EEG) that are properly processed and normalized to replace an actual patient.

The output signals enable to perform the experiments with modules more rapidly; they also solve the problem of the noises appearing during actual signal acquisition (ARTEFACTS), which should otherwise be identified and removed.

### 1. PRODUCTION OF PHYSIOLOGICAL AND CONTROL SIGNALS FOR MODULE EB-B1/EV

This section of unit GAU/EV enables to produce electrical signals with waveforms equivalent to the biological ones (ECG, EMG and EEG) that are properly processed and normalized to replace an actual patient. It is used in tests requiring the production of simulated signals coming from the human body. This section can output the three following types of signals:

- Electrocardiogram ECG signal
- Electroencephalogram EEG signal
- Electromyogram EMG signal

Using a Personal Computer via USB interface enables to load the desired specific biological waveform each time.

This function shows to be flexible and useful for the fact that the biological waveform can be loaded from the Personal Computer, and each waveform can be specifically plotted by a simple text editor. Thus waveforms customized with anomalies (ECG with cardiac anomaly, anomalous tracing...) can be output.

This production function of the unit is used for all exercises with acquisition, processing and display of biomedical signals.

#### SIGNALS:

The biological waveforms that can be selected are: ECG1, ECG2, ECG3, EEG, EMG, US1, US2 and US3 (waveforms created by the user).

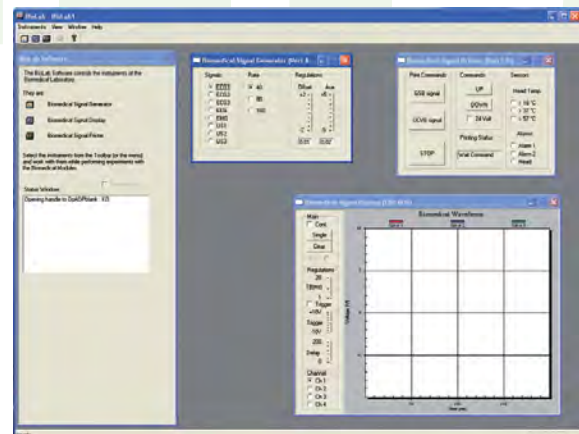
**FREQUENCY:** 40 / 80 / 160 events/min

**AUX:** to adjust the value of AUX input of the generator; each signal can be adjusted between  $-5V$  and  $+5V$ .

Every waveform other than the three or more main forms can be included in the generator as a file by the mere definition of its graphical form through points at regular intervals (time samples), either for standard waveforms and for those with pathologies.

- EEG signal (output 0.1mV)
- EMG signal (output 0.4mV)
- AUXILIARY signal for adjustment
- Pathological waveforms (output 0.1mV)

#### SIGNAL GENERATOR SOFTWARE



The controls of software instruments are the following:

- **Selection of signal to be output:** ECG1, ECG2, ECG3, EEG, EMG, US1, US2, US3
- **Frequency:** 40,80,160 Hz
- **Offset of displayed waveform**

## 2. ACQUISITION AND DISPLAY OF THE SIGNALS DETECTED BY MODULE EB-B1/EV

This section of unit GAU/EV acquires and displays the biomedical data to perform all experiments requiring to display signals such as ECG/EEG/EMG on a monitor.

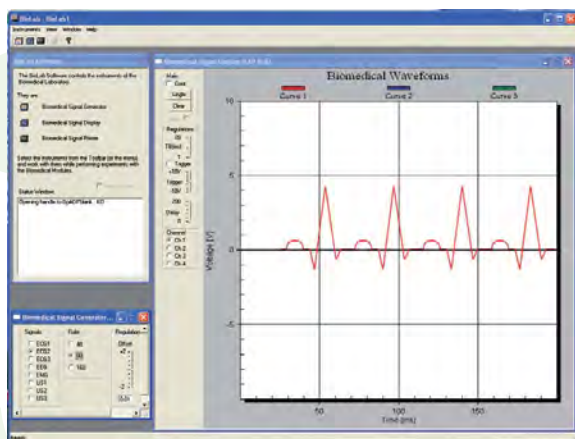
The low frequencies of this type of signals would require a digital oscilloscope with storage.

USB interface with Personal Computer enables to display the biomedical signals acquired from the testing modules after the A/D conversion.

### Main characteristics:

- Analog inputs (-10/10V), conv.12 bit A/D conv.
- Analog outputs (-10/10V), conv.8 bit D/A conv.
- ON/OFF outputs
- ON/OFF inputs

### SOFTWARE FOR DISPLAY OF BIOMEDICAL SIGNALS



The controls of software instruments are the following:

- **CONT**: for continuous display of signal. The signal is acquired and displayed. Every new display replaces the previous one.
- **SING**: to control the display of each signal. The signal is acquired and displayed. The previous signal is not canceled. Different colors are used to distinguish the subsequent displays.
- **CANCEL**: to cancel (eraser icon) the signal displayed by the instrument.
- **TRIG**: to enable or disable the trigger. It is possible to specify a value delay (Del cursor) referred to the trigger moment when acquisition starts.
- **STP**: to set the acquisition start and therefore the duration of the signal having to be displayed.
- **TRG**: to set the trigger value.
- **DEL**: to set a delay after trigger level where the signal acquisition should be made.

Moreover this section includes Analog Outputs and ON/OFF Inputs/Outputs so that unit GAU/EV can also be used in other applications.

(Only analog inputs are used in the experiments with biomedical modules).

## 3. INTERFACE WITH MODULE EB-B2/EV (PRINTER)

This section of unit GAU/EV supplies the interface for the connection of module EB-B2/EV used to print the biomedical signals detected during the experiments (ECG/EEG/EMG).

## 4. USB INTERFACE WITH PERSONAL COMPUTER

The unit is connected to a Personal Computer via USB 2.0 connection.

## 5. FAULT INSERTION OR CIRCUIT VARIATIONS IN BIOMEDICAL MODULES

The testing modules for the study of biomedical signals are connected to the generator/acquisition unit via a 37-pin connector. The connection of this unit to the Personal Computer (via USB connection) enables to interact with all testing modules.

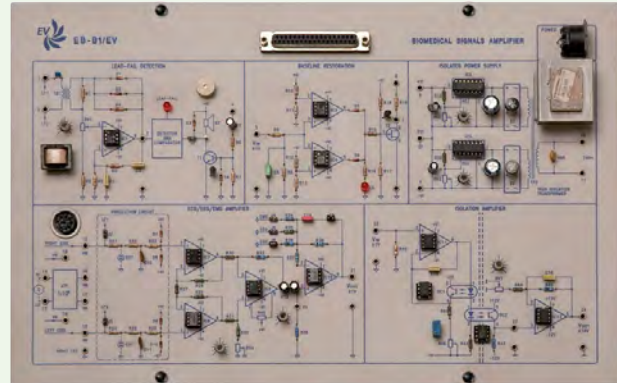
Software SWBB-BX/EV enables the automatic insertion of circuit variations and of fault during the development of computer-assisted lessons.

## EXPERIMENT BOARD

Testing modules are the main devices of IPES system; they enable students to carry out all the programmed exercises including the insertion of faults and variations of circuit parameters, for an efficient educational worthiness.

These modules include a set of circuits already assembled and they are connected with the Personal Computer via interface mod. GAU/EV. These testing modules are directly powered by unit mod. PS1-PSU/EV via a unique connector.

Each module is supplied with a handbook which guides students in theoretical study, in practical tests and in troubleshooting.



## C.B.T. INTERACTIVE MULTIMEDIA SOFTWARE Mod. SW-D-MCMXX/EV Mod. SWBB-BX/EV

It consists of a set of lessons for the modules of Electronics MCMXX/EV and for the modules of Biomedical Equipment EB-BX/EV; each set of lessons includes:

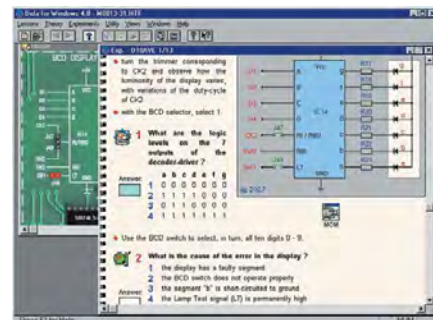
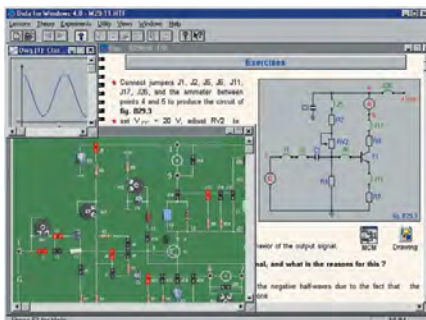
- a series of screens with theoretical explanation of the topic under examination, and a sequence of simulations;
- a guide to exercises that shows circuits, questions, practical exercises, automatic insertion of faults and variations of circuit parameters.

Using this software, students can study and carry out practical tests by themselves, without any additional literature.

The structure of this software, designed for use in Windows environment, is provided with a multimedia graphical interface enabling an easier use of the software, as well as the use of high-definition images and charts with hypertext organization of the topics under examination; before passing to the experimental section students are favoured in understanding concepts by proper simulations included in the theoretical section.

In the subsequent practical section, students will simply select the various functions and answer to the questions appearing in the section concerning exercises, by using the mouse; they can also draw up reports or produce documentary information on laboratory tests that are assessed by the teacher.

All the results are stored in students' PCs, in self-learning mode, and they are automatically sent to teacher's workstation, in laboratory mode.



## LOCAL NETWORK

Data can be exchanged via a Local Area Network. This network consists of a board installed in each PC, of a connecting cable and of the Control Software. It enables to share teacher's archives and/or programs, to use peripheral units connected with teacher's PC and to gather the data of each student automatically.

The network enables the students:

- to use files and data available in teacher's PC
- to use peripheral units connected with teacher's workstation

Using these devices and DATA ACQUISITION/PROCESSING software mod. SW-X/EV the teacher can select the lessons for students and gather their results automatically at the end.

Each networked PC must be equipped with:

- Ethernet card with connection via coaxial cable
- peer-to-peer connection software for sharing archives and peripheral units. The necessary requirements are the simple sharing of teacher's hard disk for class general archives, either when the various lessons concerning the different modules are distributed to the class, and used by students, and when the results attained by various students belonging to different classes are gathered.

## The characteristics of the system are indicated here below:

- teacher has the full control of students' Personal Computers without leaving his/her desk;
- operations can be selected very easily by both teacher and students via a software with icons;
- store and hardware resources of PCs are not used;
- any type of PC, regardless from resources, can be used.

## General Functions:

- EXCHANGING monitor and audio between: teacher and students, teacher and students' groups (max. 8 groups), teacher and the whole class;
- EXCHANGING monitor, keyboard, mouse and audio from student to Teacher;
- Teacher can correct students via a remote control on the PC of each student;
- possibility of splitting the class into 8 separate groups;
- management of archives of students, class, Teachers, with possibility of shifting and assigning students specifying their name, surname and relevant group, by the Teacher;
- audio-video transmission to individual students, to groups or to the whole class;
- videoconference from Teacher to student, from Teacher to a group of students, from Teacher to the whole class;
- inhibition of students' PCs by teacher at his/her discretion;
- cyclical control of students' videos with time assigned by the Teacher.

## Software

### AUDIO-VIDEO-KEYBOARD-MOUSE EXCHANGE

Laboratory performance can be optimized by MULTIMEDIA CLASSROOM NET CONTROL system.

It consists of an advanced educational multimedia software which ensures a wide flexibility in teaching, monitoring and assisting students, compared with what offered by traditional hardware systems; it can control audio-video-keyboard exchange among the various Personal Computers of a classroom and it only needs the PC connection via a standard LAN.



## Technical characteristics

### FUNCTIONS OF VIDEO-KEYBOARD-MOUSE:

- Transmission of screen, of voice and of other multimedia materials from Teacher's PC to a student, to a group of students or to the whole class, in real time. Integrated graphics pointer for illustrations and explanations;
- Possibility of locking and unlocking students' keyboards and mice;
- Teacher can darken the screen and disable keyboard and mouse of a student, of a group of students or of the whole class in order to draw their attention;
- When Teacher's screen is shown on students' monitor, only a part of students' screens can be used so that they can also carry out an exercise while seeing Teacher's directions. Teacher's directions are displayed only on a square of students' monitor, while students can practise their applications.
- Teacher can supervise a student, a group of students or the whole class (simultaneous display of 8 monitors)
- Teacher can use his/her own keyboard and mouse for remote control of any PC of students in order to check the development of their activities. He/she can select a student to perform a presentation, and send the screen and voice of the selected student to the other students. Teacher can authorize the use of his/her own PC to any student.
- Programs can be sent from CDs, DVDs and video files to selected students, in full-screen or partial-screen modes. This transmission does not affect the speed of standard data network with which all PCs are connected.

## Software

### CLASS CONTROL mod. SW-X/EV

This software includes two sections:

- assignment of lessons and acquisition of results
- control of classes of students, processing and saving the results

The first section of this software deals with the control of data connection network.

It is used with the network software installed with an Ethernet card, for a classroom of networked PCs.

This software enables the teacher:

- to assign a specific lesson or group of lessons having to be carried out by each student. Different lessons or groups of lessons can be assigned to each student according to his/her learning level;
- to assign a lesson to be carried out by the whole class;
- to display the current state of the lessons completed, or having to be carried out, for each student;
- to check the answers of each student, in real time.

The second section of this software is used by the teacher to process the results of students' answers.

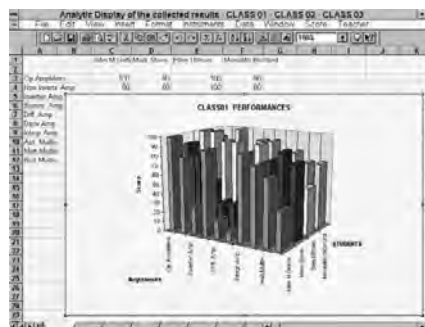
Using this software, a teacher can manage various classes and check the learning level of each student constantly, either in a laboratory with microprocessor control unit and in a multimedia laboratory.

### Main functions:

- Control of 90 classes;
- Control of 32 students per class;
- Entering students' names;
- Automatic data gathering from control units;
- Progressive saving of the results from students' workstations;
- Display of the temporary results concerning previous lesson developments. The teacher can store the last lesson completed as historical result, after a series of previous attempts for completing the same lesson.
- Detailed and summarizing display and printout of students' results. The results of each student or of each class attained for any lesson developed can be displayed and printed.
- Graphic display of the scores for students' answers for an instantaneous overall view of the situation in each class.
- Detailed and summarizing printout of students' results.

Recording the last temporary results as historical record for each student or for each class. Different solutions of the same lesson can be acquired for each student or for each class. Using this option, a teacher can decide when the last result must be saved as the most significant historical result for the student or for the class.

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## EL.VE. EDUCATIONAL AUTHOR SOFTWARE

### AUTHORING SOFTWARE FOR CREATING NEW LESSONS OR MODIFYING THE EXISTING ONES

The software consists of a set of programs that enables to modify the various lessons for modules mod. MCMXX/EV and EB-XX/EV.

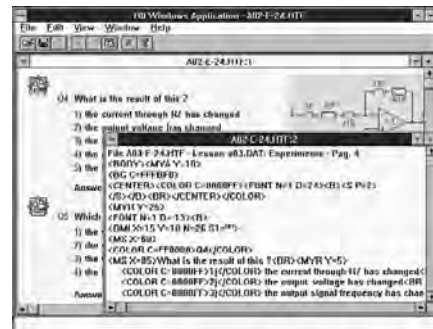
New sections regarding theory and new exercises can also be created.

This software consists of an editor for adding:

- theory pages
- testing pages
- footnotes to these pages

The formatting and general appearance of pages are determined by special markers (tags) that include the information of text layout and style, of the images to be placed in the overall layout of pages, of the content of tables / boxes for data introduction, of links with other pages, of colours of texts and backgrounds.

This program includes a Preview of the page being created or edited. A simple command enables to display the page as it would appear to students during the lesson. This enables to speed up the process of creating educational material considerably.



### EDITOR OF DRAWINGS, DIAGRAMS AND IMAGES

This program is used to plot drawings having to be inserted into the pages of educational material. This tool simplifies the creation of some types of drawings and wiring diagrams; moreover it enables to touch up the images having to be inserted into the pages of the lessons. Images in BMP and JPG format are managed.