



CATALOGUE No. 21-C
**TELECOMMUNICATIONS
AND TELEMATICS**

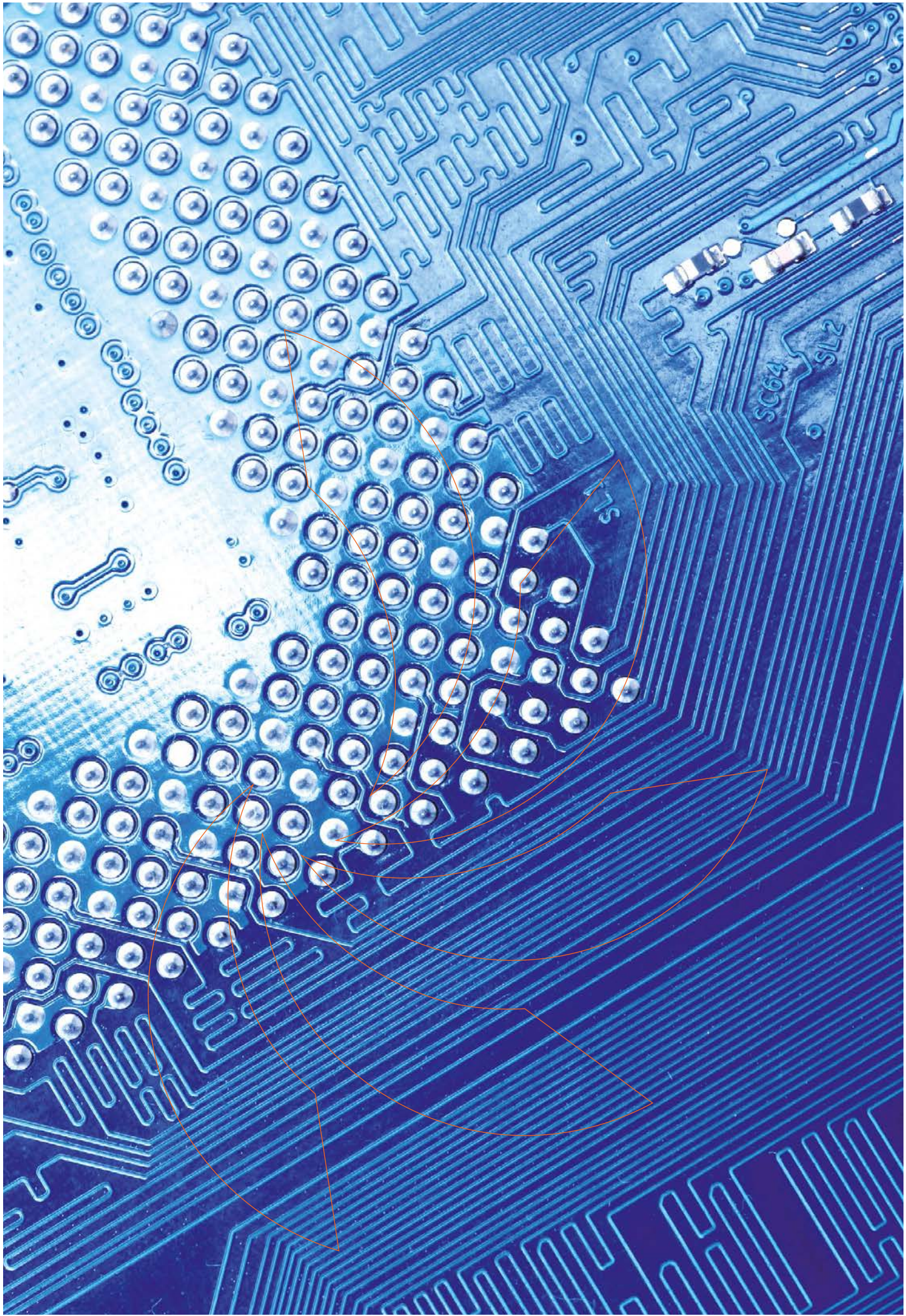


CATALOGUE No. 21-C
**TELECOMMUNICATIONS
AND TELEMATICS**

**Telecommunications
and Telematics**

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www.elettronicaveneta.com

21C-E
Rel. L21



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ANTENNA MEASURING SYSTEM
MICROSTRIP LABORATORY
MICROWAVE LABORATORY
SATELLITE COMMUNICATION SYSTEM
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VIDEO GENERATOR
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MOD. PS1-PSU/EV
MOD. PSLC/EV
MOD. PS3-C/EV
MOD. BOX/EV
MOD. VG1/EV
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Note: The catalog is constantly updated. Please send any suggestion you have to export@elettronicaveneta.com. We would also like to remind you that, due to the continuous technological upgrades, the described products may be subjected to design and/or technical modifications. Nevertheless, we guarantee that the educational content of our equipment remains unchanged.



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GENERAL INTRODUCTION

ELETTRONICA VENETA S.p.A. has been designing and manufacturing educational equipment since 1963. This equipment, covering the different fields of technology, fulfils two important educational objectives:

- to facilitate the learning process of the student by means of real systems which illustrate practically the important aspects of the theory learned in the classroom.
- to simplify the work of the teacher enabling the demonstration of the real, practical applications of the theory learned.

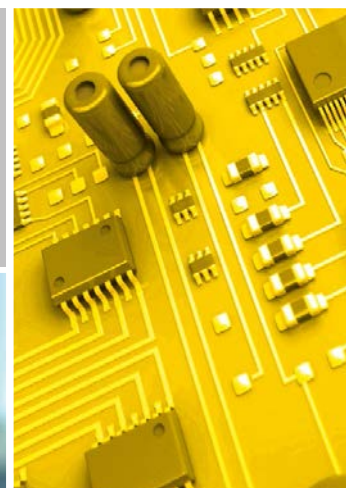
Increasing the efficiency of the didactic process improves and simplifies the integration of young students into the world of employment and justifies the material and human investments made in schools throughout the world.

ELETTRONICA VENETA S.p.A. operates on an international level and takes into consideration the training programmes and cultures of each specific country. In order to meet different requirements, we offer flexible systems which ensure maximum compliance with the latest technologies, technological advances and the professional profile requirements of local industry.

The proposed laboratories and training equipment are suitable for regular school education as well as ongoing post-diploma training courses and professional re-qualification.

Our training equipment covers most of the technological sectors included in the training programmes of vocational schools, technical institutes and universities, both national and international.

ELETTRONICA VENETA S.p.A. headquarters is located in the green fields of the Veneto region, not far from Venice, and constitute a centre for equipment design and development suited to the training needs of all professional and technical profiles. The modern premises integrates R&D laboratories, a production plant and a fully equipped teacher training centre.



The integration of these efficient training systems into local school structures ensures high-quality, state-of-the-art training programmes which meet the diverse professional expectations of the student and the technological requirements of industry and research within their specific local contexts.

The ISO 9001 (Quality System Certification) obtained in 1998 and updated in application of the latest edition of the International Standard, is further testament to the quality-driven organisation of **ELETTRONICA VENETA S.p.A.** aimed at providing top standard equipment, training and service.

PRESENTATION

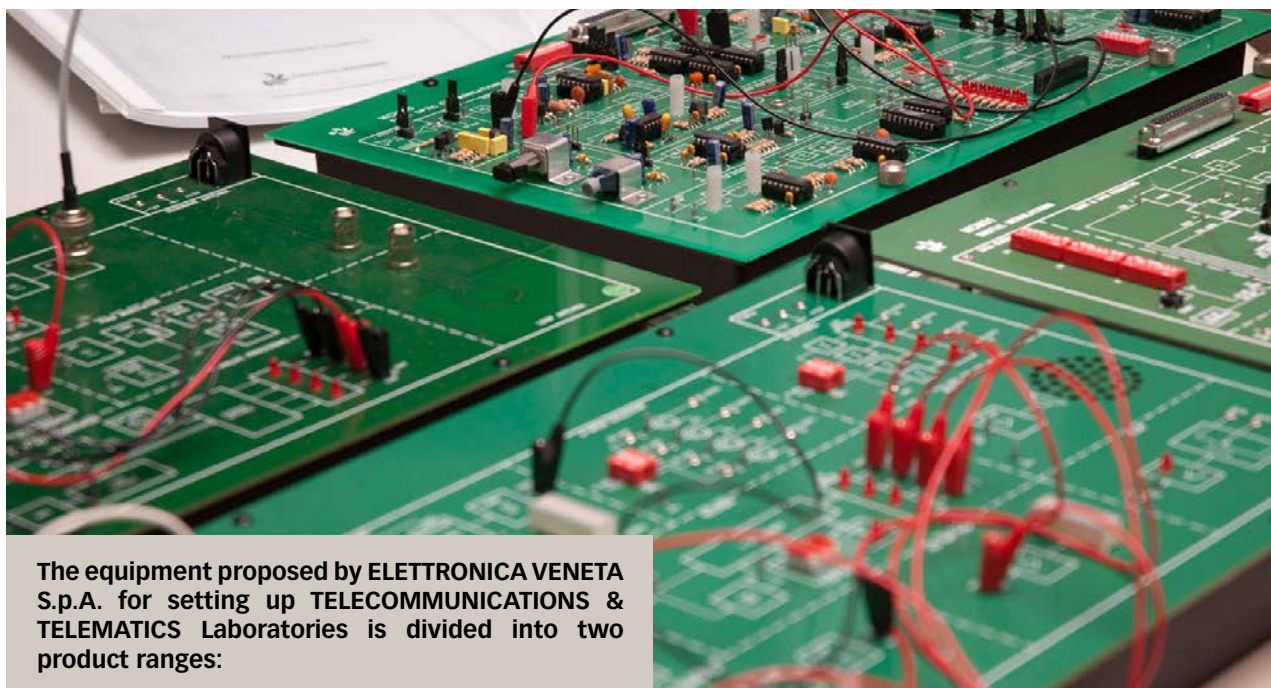
Major technological developments in telecommunications in recent years have led to a large scale deployment of equipment containing evermore sophisticated electronic circuits.

From this reality stems the need to create skilled professionals adequately trained in the basics of telecommunication technology as well as in its more advanced applications. In view of the technological advancements and the evolution of electronic components, ongoing theoretical, experimental and practical upgrading of skilled workers is essential.

For training purposes, access to modular and flexible systems which can be adapted to diverse and continuously varying needs is necessary in order to meet these demands.

ELETTRONICA VENETA S.p.A. has developed tailor made systems and solutions for training and research purposes, by designing a range of equipment for the theoretical and practical analysis of all topics related to telecommunications and telematics, from the basic concepts through to more complex applications.

The various topics are covered exhaustively and constitute a complete training program which includes both a theoretical introduction and practical experiments starting from BASIC TELECOMMUNICATIONS and progressing on to the more advanced technologies of TELEMATICS.



The equipment proposed by **ELETTRONICA VENETA S.p.A.** for setting up **TELECOMMUNICATIONS & TELEMATICS Laboratories** is divided into two product ranges:

- INTERACTIVE PRACTICAL LABORATORY FOR THE STUDY OF BASIC TELECOMMUNICATIONS
I.P.E.S. SYSTEM
- WORK STATIONS FOR ADVANCED EXPERIMENTATION
M.P.T. SYSTEM
TRAINERS AND HI END SYSTEMS





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TELECOMMUNICATION BASIC I.P.E.S. System

BT

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INTERACTIVE PRACTICAL LABORATORY FOR THE STUDY OF GENERAL ELECTRONICS I.P.E.S. SYSTEM

Aim:

- Basic training in radio electronics and digital communications

Equipment:

- Computerised or manual work stations with sets of experiments boards
- Computer Based Training with interactive multimedia lessons
- Insertion of circuit parameter variations and non-destructive faults

I.P.E.S. SYSTEM INTERACTIVE PRACTICAL LABORATORY



INTRODUCTION

Qualified, skilled technicians capable of solving the installation and maintenance problems of electronic equipment are in ever-increasing demand and their associated training is a growing requirement in educational establishments. This type of training is also suited for personnel re-qualification and updating courses.

The I.P.E.S. system was designed with these needs in mind and enables the set up of both theoretical and practical courses where time is limited. The exercises can be performed in manual mode or with the aid of a computer. Courses begin with the study of basic electronics and progress through to advanced technologies which depend on electronics: industrial electronics, telecommunications, biomedical electronics, autotronics, consumer electronics, hydronics, etc...

THE MAIN FEATURES OF THE SYSTEM ARE:

- shorter training times
- self-learning through both theoretical study and practical exercises
- updating courses in various technological fields, supported with new modules which are under continuous development to keep in step with technological evolution
- exercises using components, devices and electronic circuits corresponding to those used in the real industrial world, providing an ideal base for understanding the theory
- circuit configurations that can be changed, either manually or under computer control in order to encourage an inductive learning method
- insertion of faults into circuits and troubleshooting methods

THE MAIN ADVANTAGES OF THIS TYPE OF LEARNING ARE:

- it can be carried out individually (self learning) or in a laboratory environment (guided by a teacher).
- self-assessment of the level of learning, or assessment by the lecturer, can be achieved in real time - in the laboratory, comparing the outcome with previous results
- tailor - made training courses, in content and duration, can be set up extremely quickly and simply, to meet any requirement. These courses may have different starting and finishing levels depending on the students' previous training and the objectives to be reached
- the use of networked computers allows this system to be extended to users who are not necessarily in the same place, but who may be at other locations.
(REMOTE TRAINING AND LEARNING)

I.P.E.S. INTERACTIVE WORKSTATION

POWER SUPPLY mod. PSLC/EV

**MULTIMEDIA
CBT SOFTWARE**
mod. SWD-MCMXX/EV



EXPERIMENT BOARD
mod. MCMXX/EV

INTERACTIVE CONTROL UNIT mod. SIS3-U/EV
connected to PERSONAL COMPUTER

The laboratory consists of a set of student workstations connected to the teacher workstation via:

- **LOCAL DATA NETWORK**
- **AUDIO-VIDEO-KEYBOARD-MOUSE EXCHANGE**
- **CLASSROOM MANAGEMENT SOFTWARE - mod. SW-X/EV**

The specific experiment board is connected to the Interactive Control Unit mod. SIS3-U/EV which is interfaced to the PC via a USB connection.

The front surface of the experiment board shows the screen-printed circuit diagrams, the measurement points and the jumper connections for circuit modifications while the hard cover on the rear surface acts as component and circuit protection and tabletop support. The experiment board is connected to the Interactive Control Unit mod. SIS3-U/EV and to the Power Supply mod. PSLC/EV which supplies all the voltages required for its operation.

Each board is supplied with a set of interactive lessons, which can be carried out with a specific software and PC and which guide the student through the theory and the practical experiments, including fault insertion and circuit variation by means of the Interactive Control Unit mod. SIS3-U/EV.

Below is a list of the components which make up the structure of the I.P.E.S. Lab and of all the topics covered by the experiment boards of the I.P.E.S. system for the study of Telecommunications:

- **INFRASTRUCTURE**
- **ANALOG COMMUNICATIONS EXPERIMENT BOARDS**
- **RADIO COMMUNICATIONS EXPERIMENT BOARDS**
- **DIGITAL COMMUNICATIONS EXPERIMENT BOARDS**
- **FIBRE OPTICS EXPERIMENT BOARDS**



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I.P.E.S. LABORATORY SET-UP

**INFRASTRUCTURE****BT 7****EXPERIMENT BOARDS****BT 14**

I.P.E.S. SYSTEM INFRASTRUCTURE



POWER SUPPLY mod. PSLC/UV

It supplies the voltages necessary for the power supply of the experiment boards.

The supplied voltage and current values are screen printed on the front side. These voltages are available on a DIN connector located on the right hand side of the unit and are supplied directly to the experiment board by means of a standard cable.

The supplied voltages are:

OUTPUT 1: +1.3 Vdc ÷ +24 Vdc, 1A

Stabilized voltage, electronically protected against short-circuits and overloads. Rotating switch on the left hand side to select the variable voltage

OUTPUT 2: 24 Vac – 0 – 24 Vac, 0.5A

Fuse protected

OUTPUT 3: +5 Vdc – 2 A

OUTPUT 4: +12 Vdc – 2 A

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

OUTPUT 5: -12 Vdc – 1A

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

* **Main supply:** 115/230 Vac, $\pm 10\%$, 50/60 Hz.

* **Maximum power:** 150 VA

* **Dimensions:** 385 x 105 x 130 mm



INTERACTIVE CONTROL UNIT mod. SIS3-U/UV

The Interactive Control Unit mod. SIS3-U/UV has a USB connection to the PC and a multipin connection to the experiment board.

It constitutes the interface between the PC and the experiment board, enabling the insertion of 24 faults or circuit parameter variations. The power is supplied directly by the PC to which it is connected.

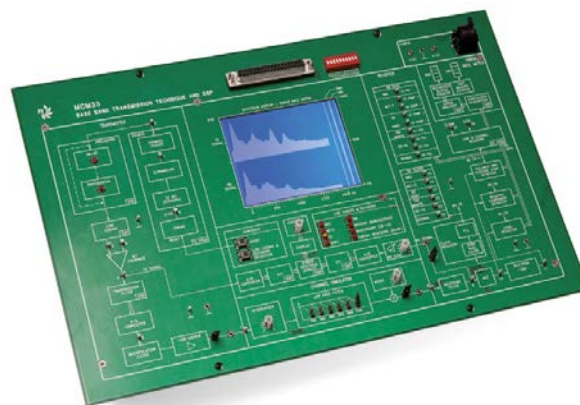


TELECOMMUNICATIONS EXPERIMENT BOARDS

The experiment boards are the fundamental units of the I.P.E.S. system, enabling the student to perform all the exercises and experiments contained in the courseware, including the insertion of faults and circuit parameter variations.

The boards contain a set of pre-assembled components which are divided into functional circuit blocks. The experiments and circuits are set up using bridging plugs and connection cables. The interactive experiments can be performed either in manual mode, by means of the on-board DIP-switches and a printed manual, or in computerised mode, with the Interface Control Unit mod. SIS3-U/EV, a PC and course software.

All boards are powered directly by the Power Supply Unit mod. PSLC/EV and are supplied with their specific courseware which guides the student through the theory, the practical experiments and troubleshooting.



INTERACTIVE MULTIMEDIA CBT SOFTWARE mod. SW-D-MCMXX/EV

The software consists of a number of lessons for each MCMXX/EV experiment board and includes:

- The theoretical explanation of the relevant topic and a series of simulations
- A guide to the exercises with circuit illustrations, questions, practical experiments, automatic fault insertion and circuit parameter variation.

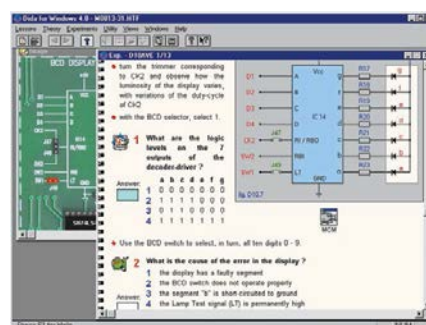
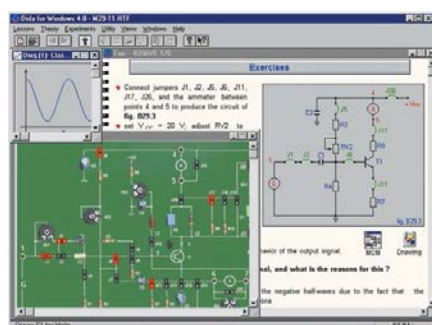
This software allows the student to study the specific topic and to perform the experiments autonomously, without the need of additional documentation.

The software structure, designed to run under a Windows environment, is a multimedia graphic interface with a hypertextual organisation of the relevant topics and high definition images and graphics.

The simulations included in the first section help to understand the theoretical concepts before progressing to the practical experiments.

During the practical experiment stage, the student simply selects the various functions with the mouse and answers the questions in the associated exercise section. The student can also create reports or document laboratory tests which will subsequently be evaluated by the teacher.

In self-learning mode, all the results are filed on the student PC while in laboratory mode (Classroom Management Software mod. SW-X/EV is required) they are automatically sent to the teacher's workstation.



LOCAL NETWORK

Data can be exchanged through a Local Area Network.

This network consists of an interface card installed in each PC, a connection cable and the management software.

It enables file sharing between teacher and student workstations.

The network enables the students:

- to use files and data stored on the teacher's PC.
- to use peripheral units connected
- to the teacher's workstation.

Using the classroom management software mod. SW-X/EV, the teacher can select the student assignments and automatically collect the final results.

Each network connected PC must be equipped with:

- Ethernet network card with UTP cable connection
- Peer-to-peer software for sharing files and peripheral units. The only requirement is the sharing of the teacher's hard disk for the class database, both for the distribution to the class and use of the various lessons associated with the different experiment boards as well as for the collection of the students' results.

AUDIO-VIDEO-KEYBOARD-MOUSE EXCHANGE SOFTWARE

The laboratory performance can be optimised by adding the MULTIMEDIA CLASSROOM NET CONTROL system. This consists of an advanced multimedia educational software which provides greater flexibility in teaching, monitoring and assisting students than traditional hardware systems. It manages the audio, video and keyboard exchange between classroom computers and requires only that the PC's be connected to each other by means of a standard LAN network.

The characteristics of the system are the following:

- The teacher has total control of the student PC's without having to leave his desk.
- Very simple, user-friendly operation for both teacher and students by means of an icon-based software.
- Does not use the PC memory and hard disc resources.
- Has no minimum PC requirements (any PC can be used).



General Functions:

- Monitor and audio EXCHANGE between:
 - Teacher and student
 - Teacher and groups of students (max. 8 groups)
 - Teacher and the whole classroom
- Monitor, keyboard, mouse and audio EXCHANGE from student to teacher.
- The teacher can correct the students by remote control of each student's PC.
- File management: students, classes, teachers with possibility of moving and allocating students by name, surname and group as decided by the teacher.
- Audio-video transmission to single students, groups or the whole class.
- Video-conferencing between:
 - Teacher and student
 - Teacher and group of students
 - Teacher and the whole class
- Disabling of the student PC's, at the discretion of the teacher.
- Periodic control of the students' screen at time intervals determined by the teacher.

Technical specifications

VIDEO - KEYBOARD - MOUSE FUNCTIONS:

- Real time transmission of the screen, voice and other multimedia material from the teacher's PC to a student, a group or to the whole class. Integrated graphic pointer for illustrations and explanations.
- Disable/Enable student keyboard and mouse.
- The teacher can shut down the screen and disable the keyboard and mouse of a single student, a group or the whole class in order to get their attention.
- The teacher's screen can be transmitted to only a portion of the student's screen thus allowing the teacher to give instructions at the same time that the student is performing the exercises. One frame shows the teacher's instructions while the rest of the screen is dedicated to the specific student experiment application.
- The teacher can monitor a single screen, a group of screens or all the students' screens (simultaneous screening of 8 monitors).
- The teacher can use his/her keyboard and mouse to remotely control any student PC in order to assist them in their work. The teacher can select a student to give a presentation and transmit his/her screen and voice to the other students. The teacher can authorise any student to access his/her PC.
- CD/DVD programmes and video files can be transmitted to selected students in full or partial screen mode. Transmission does not effect the speed of the standard data network via which all the PC's are connected.

CLASSROOM MANAGEMENT SOFTWARE mod. SW-X/EV

The software is divided into two parts:

- Lesson assignment and result collection
- Management of student classrooms, processing and filing of results

The first part of this software deals with data network connection management.

It is used with the network software installed with the Ethernet card in a classroom of networked PC's.

Using this software, the teacher can:

- Assign each student the specific lesson or set of lessons to be completed. Each student can be assigned a different lesson or set of lessons based on their specific level of preparation.
- Assign a lesson to the whole class
- Display the current stage of the lessons completed and those yet to be executed by each student
- Monitor the results of each student in real time

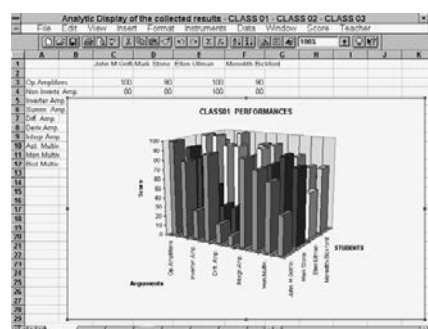
The second part of this software is used by the teacher for processing the results of the students' answers.

It allows the teacher to manage various classes and to constantly monitor the students' progress, either in a microprocessor-controlled laboratory set up or a multimedia one.

The main features are:

- Management of 90 classes.
- Management of 32 students per class.
- Entry of students' names.
- Automatic data collection from the control units.
- Progressive storage of results collected from the student workstations.
- Display of the temporary results of the progress of previous lessons. The teacher can save the reference results of the last of a series of previous attempts at executing the same lesson.
- Detailed and summarised display and printout of the students' results: the results of each student or of each class achieved for each completed lesson.
- Graphic display of the marks obtained by the students, providing an instantaneous, comprehensive evaluation of each class.
- Recording of the last temporary results obtained as reference for each student or for each class. Different results obtained for the same lesson can be collected. The teacher can then decide which result to save as the most significant reference for the student and the class.

| | Operational Ampl. | Non Inverting Ampl. | Inverting Ampl. | Summer Ampl. | Differential Ampl. |
|--------------------|-------------------|---------------------|-----------------|--------------|--------------------|
| CLASS01 | | | | | |
| John M. Gatto | 100 | 80 | 100 | 80 | 30 |
| Mark Stone | 80 | 60 | 70 | 100 | 80 |
| John Utman | 70 | 100 | 80 | 100 | 100 |
| Heavenly Buckford | 40 | 40 | 80 | 10 | 100 |
| AVERAGE | 72.5 | 70 | 82.5 | 72.5 | 77.5 |
| CLASS02 | | | | | |
| Mark Gatto | 100 | 80 | 100 | 80 | 30 |
| Conrad Maria | 80 | 60 | 70 | 100 | 80 |
| John Utman | 70 | 100 | 80 | 100 | 100 |
| Mark Vercia | 40 | 40 | 80 | 10 | 100 |
| Carl Long | 30 | 20 | 40 | 80 | 20 |
| John Mito | 10 | 30 | 20 | 100 | 80 |
| AVERAGE | 55 | 55 | 65 | 75 | 65 |
| CLASS03 | | | | | |
| Angel Tomasi | 80 | 20 | 50 | 100 | 100 |
| Jack Leo Fernandez | 60 | 60 | 70 | 80 | 60 |
| Anna Anthony Gatt | 70 | 100 | 30 | 100 | 20 |
| Daria Vercia | 40 | 40 | 10 | 10 | 100 |
| Chris Sinton | 30 | 20 | 80 | 80 | 20 |
| Charles Cabana | 10 | 10 | 30 | 100 | 40 |
| AVERAGE | 45 | 45 | 45 | 75 | 60 |



EL.VE. SOFTWARE - EDUCATIONAL EDITING SOFTWARE

EDITING SOFTWARE FOR CREATING NEW LESSONS OR MODIFYING EXISTING ONES

This software includes a set of programmes for modifying the various lessons for the experiment boards mod. MCMXX/EV. New theoretical or practical sections can either be added or created.

It includes an editor for inserting:

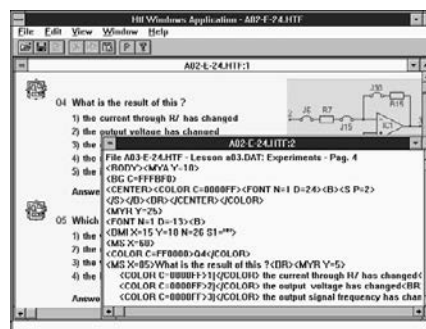
- the theory pages
- the experiment pages
- the notes to the theory and experiment pages

The page is formatted and the general appearance is determined by means of special marker commands (tags) which contain indications on the layout and style of the text, on the images to be placed in the overall page layout, on the content of the tables for data insertion and links with other pages, on the text and background colour.

The program contains a Pre-View of the page being created or modified. With a single command, it is possible to view the page as it would appear to the student during the lesson, thus considerably accelerating the creation of teaching material.

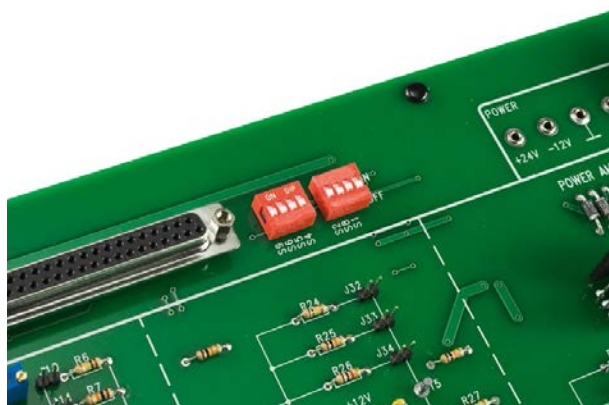
MANUAL MODE

All MCMXX/EV boards include a number of on-board micro-switches for circuit parameter variation and fault insertion, enabling the same lessons to be conducted without the need of the CBT software and interface control unit. In this case, the boards are supplied with a comprehensive, printed theoretical and experimental manual.



DRAWING, DIAGRAMME AND IMAGE EDITING

This program is used to create drawings which can be added to the pages of the training manuals. It simplifies the creation of some types of drawings and circuit diagrams and also enables modification of the images which are added to the lesson pages. The program can read images in BMP and JPG format.





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EXPERIMENT BOARDS

ANALOG COMMUNICATIONS

| | | |
|--|----------|-------|
| ANALOG COMMUNICATIONS I (Tuned circuits) | MCM20/EV | BT 15 |
| ANALOG COMMUNICATIONS II (Modulations) | MCM21/EV | BT 16 |
| AM-FM RADIORECEIVER | MCM22/EV | BT 17 |
| FM STEREO & PLL TRANSMITTER | MCM23/EV | BT 18 |

RADIO COMMUNICATIONS

| | | |
|--|------------|-------|
| RADIO TRANSMITTER AM/SSB/FM/REMOTE CONTROL | MCM24/EV | BT 19 |
| PHASE MODULATION | MCM24PM/EV | BT 20 |
| RADIO RECEIVER AM/SSB/FM/REMOTE CONTROL | MCM25/EV | BT 21 |

DIGITAL COMMUNICATIONS

| | | |
|---|----------|-------|
| PULSE MODULATION | MCM30/EV | BT 22 |
| DIGITAL MODULATION | MCM31/EV | BT 23 |
| 4-CHANNEL PCM/TDM MULTIPLEXER | MCM32/EV | BT 24 |
| BASE BAND AND DSP TRANSMISSION TECHNIQUES | MCM33/EV | BT 25 |

FIBER OPTICS

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TELEPHONE

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| ELECTRONIC TELEPHONE | MCM50/EV | BT 27 |
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MCM20/EV

ANALOG COMMUNICATIONS I (Tuned Circuits)

INTRODUCTION

MCM20/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S. It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM20/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM20/EV

Experiment board for studying the techniques used in analog transmissions. The module enables the student to set-up, check, measure and troubleshoot the following circuits and analog communications systems:

TRAINING PROGRAM

- Resistive attenuators
- Cascade attenuators
- RLC circuits: impedance, resonant frequency, bandwidth
- Series and parallel RLC circuits
- Coupling of tuned circuits: by means of capacitance
- Coupling of tuned circuits: by means of mutual inductance
- Passive filters: constant-K and M-shunt; "T" and "π" networks low-pass, high-pass, band-pass, band-rejection filters
- Narrow-band ceramic filters: passband and impedance crystal filter
- Impedance matching networks: LC networks with two and three impedances
- Impedance matching networks: networks with autotransformer
- Crystal oscillator: operation and frequency stability
- Class-C modulator: analysis of the biasing network and of the wave forms
- Impedance matching between transmitter and load; network calibrating
- Modulation index
- Measurement of modulator linearity
- Ferrite antenna with adjustable-tuning sub-circuit
- Calibration of matching between transmitter and antenna
- Troubleshooting

TECHNICAL SPECIFICATION

- Resonant circuits, coupling, autotransformer: frequency 400-500 kHz
- Tuned circuit coupling: by means of (variable) capacitance and mutual inductance
- Crystal filter: frequency 1 MHz
- VCO: Frequency: 400-500/1500 kHz, Adjustable amplitude 0-2Vpp, Output impedance 50 Ohm, Frequency Modulation signal input
- Sweep: Adjustable frequency deviation, Output for X-axis oscilloscope
- Crystal oscillator: frequency 1 MHz



- AM transmitter: Frequency 1 MHz, Modulation 100%, Output amplitude 30Vpp over 1 kOhm, Ferrite antenna with adjustable tuning
- Fault simulation: possibility to insert 6 faults
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers
- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagra
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT
- NOT INCLUDED -**

**POWER SUPPLY
±12 Vdc - 0.5A**

INCLUDED

**STUDENT HANDBOOK: THEORY AND EXERCISES
TEACHER HANDBOOK: WIRING DIAGRAMS
AND SOLUTIONS OF EXERCISES**



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM20/EV**

MCM21/EV

ANALOG COMMUNICATIONS II (Modulations)

INTRODUCTION

MCM21/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S. It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM21/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM21/EV

Experiment board for studying of the active circuits used in analog telecommunications.

This board, together with mod. MCM20/EV, creates a complete system for experiments on the techniques used in analog transmissions.



TRAINING PROGRAM

- Amplitude modulation: modulation index; linearity measurement
- Envelope detector and synchronous AM demodulator
- Super heterodyne AM receiver with AGC
- Single side-band modulation (SSB)
- Narrow-band ceramic filters
- Generation of upper (USB) and lower (LSB) side-band
- Product detector
- Frequency Modulation
- Modulation index and linearity
- Foster-Seeley FM demodulator
- Ratio discriminator
- Automatic Frequency Control (AFC)
- Superheterodyne FM receiver with AFC
- Tuned amplifiers: Frequency gain and response, Transformer and autotransformer impedance matching, Stability, Alignment, Neutralization
- I.F. amplifier with envelope detector and Automatic Gain Control
- Frequency mixer with Mosfet Dual Gate; use in superheterodyne receivers
- Spectrum analysis of the AM/SSB/FM signal
- Troubleshooting

- Envelope detector with variable R-C filter
- FM demodulator: Foster-Seeley, ratio discriminator, frequency 400-500 kHz
- Automatic Frequency Control
- FM demodulator
- Fault simulation: Possibility to insert 8 faults
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers
- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT
- NOT INCLUDED -**

**POWER SUPPLY
±12 Vdc - 0.5A**

INCLUDED

**STUDENT HANDBOOK: THEORY AND EXERCISES
TEACHER HANDBOOK: WIRING DIAGRAMS
AND SOLUTIONS OF EXERCISES**



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM21/EV**

MCM22/EV

(AM-FM RADIORECEIVER)

INTRODUCTION

MCM22/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S.

It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM22/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM22/EV

Experiment board for understanding the theory and practice of active circuits used in analog telecommunications related to AM/FM receivers.

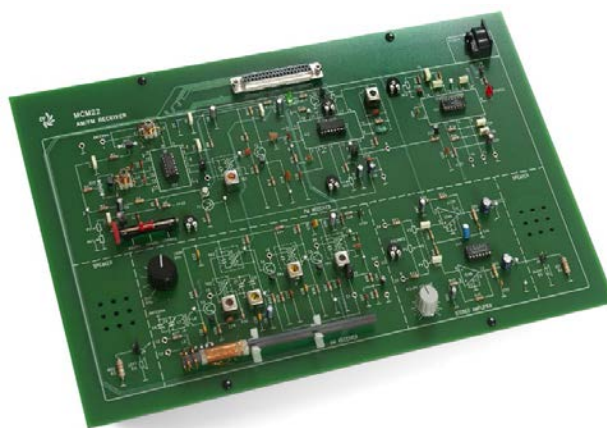
This board, with the mod. MCM23/EV, creates a complete system for studying the techniques used in analog FM stereo transmissions.

TRAINING PROGRAM

- Operation of a superheterodyne AM radio receiver:
 - FRO converter
 - I.F. amplifier
 - Diode envelope detector
 - Automatic Gain Control
- Calibration of the FRO and IF stages
- Receiver alignment
- Measurements of frequency gain and response of tuned amplifiers
- Operation of FM receiver:
 - Mixer
 - Local oscillator
 - Automatic Frequency Control
 - Intermediate Frequency amplifier
 - FM detector
- Operation of stereo decoder
- De-emphasis circuits
- Audio stereo amplifier: measurements of frequency power and response
- Troubleshooting

TECHNICAL SPECIFICATION

- AM receiver:
 - Reception range: 520-1600 kHz with continuous tuning
 - Intermediate frequency: 455 kHz
 - Automatic Gain Control
 - Ferrite antenna
- FM receiver
 - Reception range: 88-108 MHz with continuous tuning
 - Tuning circuits and FRO filters: varicap-diode type
 - Intermediate frequency: 10.7 MHz, with ceramic filter
 - Stereo decoder: pilot frequency detection 19 kHz
 - LED indication of stereo signal
- Stereo decoder: 19-kHz pilot frequency recognition, Stereo signal signaling via Led, Regulation trimmer
- Audio stereo amplifier: 2x1 Watt, Provided loudspeakers, Output volume regulation, Output dummy load, 8 Ohm impedance, Selection via jumper of the output load, Balance control



- Fault simulation: Possibility to insert 10 faults
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers
- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT**
- NOT INCLUDED -

POWER SUPPLY
+12 Vdc - 0.5A

INCLUDED

STUDENT HANDBOOK: THEORY AND EXERCISES
**TEACHER HANDBOOK: WIRING DIAGRAMS
AND SOLUTIONS OF EXERCISES**



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM22/EV**

MCM23/EV

(FM STEREO & PLL TRANSMITTER)

INTRODUCTION

MCM23/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S.

It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM23/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM23/EV

Experiment board for understanding the theory and practice of active filters, synthesizer and VCO used in analog telecommunications related to FM transmitters with stereo coder.

TRAINING PROGRAM

- PLL operation
- Structure of the frequency synthesizers:
 - Quartz reference oscillator;
 - VCO;
 - Phase comparator
 - Low-pass loop filter
 - Prescaler; programmable frequency dividers
 - Digital conversion mixer
- Direct-synthesis synthesizers, with Prescaler, with frequency conversion
- Transfer function and transient response
- Lock range and capture range
- Frequency resolution of the synthesizer
- Lock indication circuit
- Operation of synthesized FM transmitter
- Operation of stereo coder:
 - Pilot tone generator
 - Stereo multiplex
- Troubleshooting

TECHNICAL SPECIFICATION

- Reference oscillator: 100 kHz, crystal-type
- Local oscillator for conversion mixer: 1 MHz, crystal-type
- Reference frequency: 10 kHz, 100 kHz
- Output frequency of direct synthesizer: 10-700 kHz in steps of 10 or 100 kHz
- Output frequency of synthesizer with prescaler: 100-700 kHz in steps of 100 kHz
- Output frequency of synthesizer with conversion mixer: 1100-1300 kHz in steps of 100 kHz
- FM transmission frequency: 90 / 100 MHz
- Carrier generator: frequency synthesizer
- Carrier frequency choice: using rotary selectors
- Modulation: by means of varicap diodes
- RF output power: 50 mW
- RF output impedance: 50 Ohm



- Pilot tone frequency of stereophonic signal: 19 kHz
- Sine wave generators: 600 Hz and 1200 Hz synchronous with pilot tone
- Fault simulation: Possibility to insert 10 faults
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers
- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT
- NOT INCLUDED -**

**POWER SUPPLY
+12 Vdc - 0.5A**

INCLUDED

**STUDENT HANDBOOK: THEORY AND EXERCISES
TEACHER HANDBOOK: WIRING DIAGRAMS
AND SOLUTIONS OF EXERCISES**



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM23/EV**

MCM24/EV

(RADIO TRANSMITTER AM/SSB/FM/REMOTE CONTROL)

INTRODUCTION

MCM24/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S. It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM24/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM24/EV

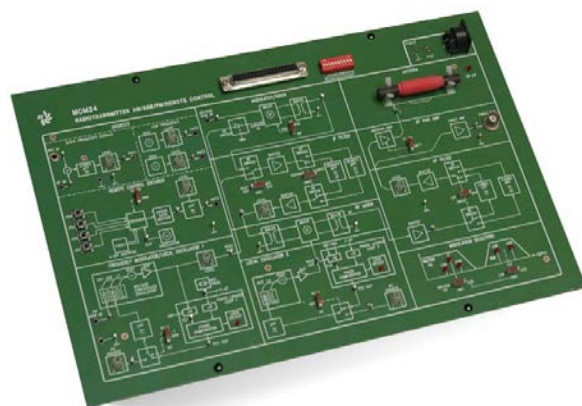
Experiment board for the study of AM, DSB, SSB (LSB and USB), FM transmitter and a 4-channel radio control transmitter. It contains all the pre-assembled electronic components needed to construct the experiment circuits and divided into functional blocks which can be interconnected and modified by means of supplied jumpers and connection cables. The training program can be extended to cover phase modulation with experiment board MCM24PM/EV, while experiment board MCM24/EV and MCM25/EV can be used together to set up a radio communication link.

TRAINING PROGRAM

- Low frequency processor (low pass filter, level matcher, tone generator for testing)
- Modulation techniques for the following transmissions:
 - AM
 - DSB (Double Side Band, with balanced modulator)
 - SSB (LSB and USB, using quartz filter)
 - FM (VCO using varicap diode)
 - Of logic states (coder for 4-channel radiocontrol)
- Local oscillator
- Conversion mixer
- RF amplifier
- Radio (antenna)/cable transmission
- Calibration and measurement of all stages and the whole module
- Troubleshooting
- System test and measurement

TECHNICAL SPECIFICATION

- AM/DSB/FM/radiocontrol channel in MW band
- SSB channel in 80 m SW band (3-4 MHz)
- 2-tone generator: 1000 and 2000 Hz
Adj. input for external microphone and BF signal
- Coder: 9 input line (4 Data and 5 Address)
- 2 Local oscillators: manual frequency control (DC voltage) or automatic (PLL)
- 2 LED's for PLL locking and 5 LED's for selected modulation
- IF/RF testing point: low impedance (50 Ohm) for spectrum analyzer connection
- RF output power: 40mW, adjustable
- Tuned ferrite antenna in MW band
- RF output impedance: 50 Ohm (BNC, antenna or cable)
- Fault simulation: Possibility to insert 10 faults
- Test and interconnection points, Ø 2 mm



- Rapid modifications to circuits using jumpers
- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT**
- NOT INCLUDED -

POWER SUPPLY
+12 Vdc - 0.5A

**MCM25/EV - NOT INCLUDED -
(RADIO RECEIVER
AM/SSB/FM/REMOTE CONTROL)**



INCLUDED

STUDENT HANDBOOK: THEORY AND EXERCISES
**TEACHER HANDBOOK:
SOLUTIONS OF EXERCISES**



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM24/EV**

**MCM24PM/EV
PHASE MODULATION**



MCM24PM/EV

PHASE MODULATION (PM)

INTRODUCTION

Mod. MCM24PM/EV is an optional add-on module to AM/SSB/FM/Radio receiver and Radio transmitter module mod. MCM24/EV that allows the study of phase modulation (PM).

MCM24PM/EV

This experiment board expands the training programme of mod. MCM24/EV to include the study of phase modulation. This board must be used in conjunction with mod. MCM24/EV through which it is also powered.



TRAINING PROGRAM

- Phase modulation (PM)
- Frequency modulation (FM) carried out with a phase modulator and an integrator circuit
- Calibration and measurement of all the module stages
- Assembling a frequency-modulation transmitter by using module mod. MCM24/EV (**necessary optional module**)
- Assembling a complete communication system by using AM/SSB/FM Radio receiver / Radio control MCM25/EV (**optional module**)

TECHNICAL SPECIFICATION

- RF and modulator connectors input: BNC
- RF output connector: BNC
- MW PM channel band
- Phase modulation carried out with capacitive control of a tuned circuit
- Integrator circuit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 190 X 120 X 50 mm

REQUIRED



MCM24/EV
- NOT INCLUDED -

POWER SUPPLY
+12 Vdc - 0.1A
(from MCM24/EV)

INCLUDED

STUDENT HANDBOOK: THEORY AND EXERCISES



OPTIONAL

MCM25/EV - NOT INCLUDED -
(RADIO RECEIVER
AM/SSB/FM/REMOTE CONTROL)



MCM25/EV

(RADIO RECEIVER AM/SSB/FM/ REMOTE CONTROL)

INTRODUCTION

MCM25/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S.

It consists of a set of components and circuits for performing experiments.

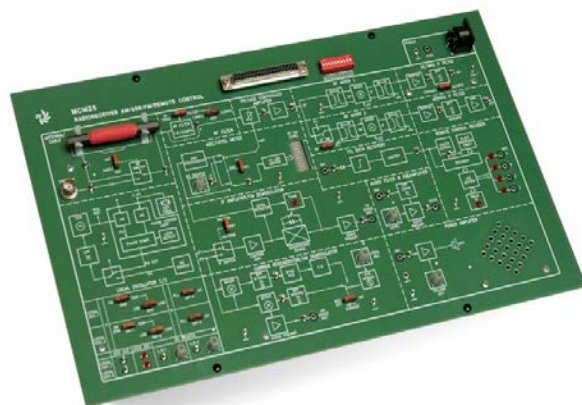
The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM25/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM25/EV

Experiment board for the study of AM, DSB, SSB (LSB and USB), FM receiver and a 4-channel radio control receiver. It contains all the pre-assembled electronic components needed to construct the experiment circuits and divided into functional blocks which can be interconnected and modified by means of supplied jumpers and connection cables.

Experiment boards MCM24/EV and MCM25/EV can be used together to set up a radio communication link.



TRAINING PROGRAM

- Block diagram of a superheterodyne receiver
- Demodulation techniques for AM, DSB, SSB, FM and logic states transmissions
- Radio (antenna)/cable reception
- Received signal field strength meter
- Received code meter from radio control via Led
- Local oscillator
- PLL Circuit (Phase Locked Loop)
- Frequency synthesis with PLL
- Carrier suppressor regeneration
- Change of tuning frequency
- IF conversion mixer
- IF filter
- IF amplifier
- AGC (Automatic Gain Control)
- Output AF amplifier
- Calibration and measurement of all stages and the whole module
- Troubleshooting
- System test and measurement
- Use of the spectrum analyzer

- Loudspeaker included
- Fault simulation: 10 faults can be inserted
- Interconnection and test points with \varnothing 2 mm
- Quick changes in circuits via Microswitches
- 37-pin connector for connection with control unit SIS3-U/EV
- 8-way connector for connection with power supply unit
- Printed circuit with protective coating and silk-screen-printed synoptic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

TECHNICAL SPECIFICATION

- AM/DSB receiver in Medium Wave (MW) band
- SSB receiver in 80-m SW band (3-4 MHz)
- FM receiver in Medium Wave (MW) band
- Radio-control receiver in Medium Wave (MW) band
- Decoder: 9 output lines (4 Data lines and 5 Address lines)
- 2 Local Oscillators: manual frequency control (direct voltage variation) or automatic frequency control (PLL frequency synthesis)
- Warning LEDs: 2 LEDs for PLL lock, 1 LED for tuning, 1 LED for valid Coding and 1 LED bar for the intensity of received signal
- Characteristic of IF/RF test points: low impedance (50 Ω), compatible for connection with spectrum analyzer
- MW band tuned receiving antenna of ferrite
- Input BNC connector for outdoor antenna or cable

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT**
- NOT INCLUDED -

POWER SUPPLY
+12 Vdc - 0.5A

**MCM24/EV - NOT INCLUDED -
(RADIO TRANSMITTER
AM/SSB/FM/REMOTE CONTROL)**



INCLUDED

STUDENT HANDBOOK: THEORY AND EXERCISES
**TEACHER HANDBOOK:
SOLUTIONS OF EXERCISES**



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM25/EV**

MCM30/EV

(PULSE MODULATION)

INTRODUCTION

MCM30/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S.

It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM30/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM30/EV

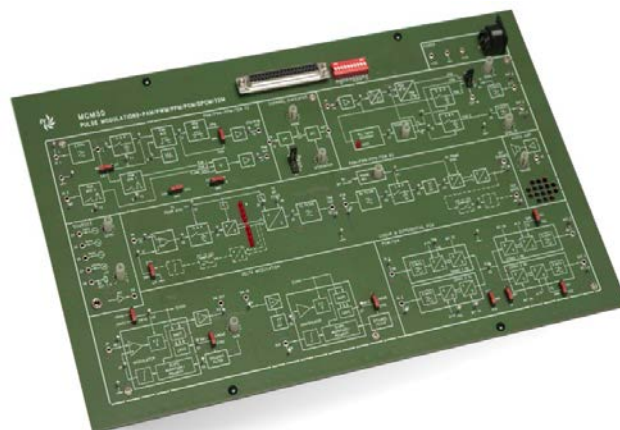
Experiment board for the study of pulse modulation transmitters and receivers: PAM (Pulse Amplitude Modulation), PWM (Pulse Width Modulation), PPM (Pulse Position Modulation), PCM (Pulse Code Modulation), PAM-TDM and PCM-TDM (Linear, Delta and Adaptive Modulation). It contains all the pre-assembled electronic components needed to construct the experiment circuits and divided into functional blocks which can be interconnected and modified by means of supplied jumpers and connection cables.

TRAINING PROGRAM

- Analog signal sampling: sampling theorem, sampled signal spectrum, sampling frequency
- Reconstruction of the analog signal starting from samples
- Pulse modulation:
 - PAM (Pulse Amplitude Modulation)
 - PPM (Pulse Position Modulation)
 - PWM (Pulse Width Modulation)
- Signal digital coding: PCM/DELTA
- Time division multiplexing (TDM) of PAM and PCM signals
- Communication systems using PAM, PPM, PWM, Linear and Adaptive DELTA, PCM, multi-channel PAM and PCM
- Optimum sampling point in reception
- Effects of the transmission medium and noise
- Voice transmission
- Troubleshooting

TECHNICAL SPECIFICATION

- Sampling frequency: 8 kHz
- Low-pass filters: active, 4-pole; cut-off frequency 3.4 kHz
- PLL reception clock recovery
- Signal sampler in reception: with adjustment of the sampling pulse phase
- 2 PCM CODECs with "A" and "μ" coding
- 2 CVSD with syllabic filter: 16- and 32-kHz clock frequency
- Channel simulator: adjustable attenuation and bandwidth (5/10/20/40/100 kHz)
- Noise generator: adjustable amplitude
- 1-kHz synchronous generator with clocks, for easier wave form examination
- Microphone and loudspeaker: included
- Fault simulation: Possibility to insert 10 faults
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers



- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT**
- NOT INCLUDED -

POWER SUPPLY
±12 Vdc - 0.5A

INCLUDED

STUDENT HANDBOOK: THEORY AND EXERCISES
**TEACHER HANDBOOK: WIRING DIAGRAMS
AND SOLUTIONS OF EXERCISES**



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM30/EV**

MCM31/EV

(DIGITAL MODULATION)

INTRODUCTION

MCM31/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S.

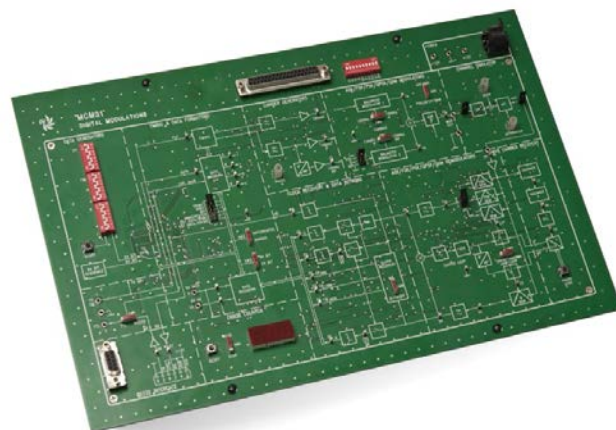
It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM31/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM31/EV

Experiment board for the study of digital modulation transmitters and receivers: ASK (Amplitude Shift Keying), FSK (Frequency Shift Keying), PSK (Phase Shift Keying), QPSK (Quadrature Phase Shift Keying) and QAM (Quadrature Amplitude Modulation). It contains all the pre-assembled electronic components needed to construct the experiment circuits and divided into functional blocks which can be interconnected and modified by means of supplied jumpers and connection cables.



TRAINING PROGRAM

- ASK-FSK-PSK-QPSK-QAM signal generation
- Absolute and differential PSK and QPSK
- Data signal coding: NRZ, Manchester, Dibit, Tribit
- ASK-FSK-PSK-QPSK-QAM signal demodulation
- Asynchronous and synchronous demodulation
- Carrier recovery: PLL and with Costas Loop circuit
- Examination of the constellation diagrams of PSK, QPSK and QAM signals
- Error rate measurement (BER)
- Creation of modems for data transfer
- Data transfer via USB/RS232C serial port
- Effects of the transmission channel and noise
- Troubleshooting

- Noise generator: adjustable amplitude
- Rapid modifications to circuits using jumpers
- Fault simulation: Possibility to insert 10 faults
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers
- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

TECHNICAL SPECIFICATION

- Data rate: 300/600/1200/1800 bit/s
- Data format: synchronous and asynchronous
- Data interface: TTL and V24/RS232C
- Data patterns:
 - Programmable 24-bit
 - Pseudo-random 64-bit
 - External data
- Data coders: Manchester; 1-bit differential; Dibit; Tribit; 2-bit differential
- Sine carriers: 1200Hz, 0/90°; 1800 Hz
- Analogue signals synchronous with digital signals, for easier wave form examination
- Error rate meter with numerical digital display
- Interface for constellation diagram
- Channel simulator: adjustable attenuation

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT**
- NOT INCLUDED -

POWER SUPPLY
±12 Vdc - 0.5A

INCLUDED

STUDENT HANDBOOK: THEORY AND EXERCISES
TEACHER HANDBOOK: WIRING DIAGRAMS AND SOLUTIONS OF EXERCISES



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM31/EV**

MCM32/EV

(4-CHANNEL PCM/TDM MULTIPLEXER)

INTRODUCTION

MCM32/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S.

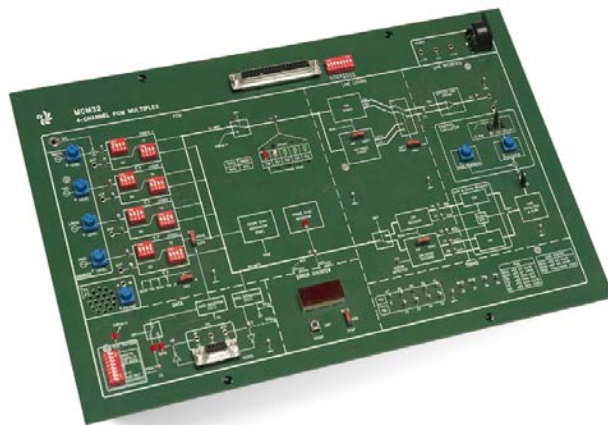
It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM32/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM32/EV

Experiment board for measurements and troubleshooting on advanced digital communications systems, consisting of a 4-channel PCM multiplex. It contains all the pre-assembled electronic components needed to construct the experiment circuits and divided into functional blocks which can be interconnected and modified by means of supplied jumpers and connection cables. A complete bi-directional communication channel can be set up by combining 2 MCM32/EV experiment boards and 2 computers.



TRAINING PROGRAM

- 4-channel PCM/TDM transmission system
- Construction of PCM frame
- Transmission of 64 Kb/s through voice channel
- Operation of AMI/HDB3/CMI coders
- Transmission and reception circuits
- Characteristics of the transmission channel and noise
- Line equalization and ALBO circuit
- Clock recovery
- AMI/HDB3/CMI decoders
- Recovery of the frame synchronism
- Time switching of PCM channels
- Noise effect and error rate measurements
- Eye diagram
- Multi-channel PCM connections, with simultaneous voice and data transmission
- PC connection by means of RS232C/USB interface
- Interconnection between 2 Personal Computers using 2 experiment boards mod. MCM32/EV

- Sine wave generators: synchronous 0.5/1/1.5/2 kHz with timers
- Microphone and loudspeaker included
- Fault simulation: Possibility to insert 8 faults
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers
- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT**
- NOT INCLUDED -

POWER SUPPLY
±12 Vdc - 0.5A

TECHNICAL SPECIFICATION

- Frame type: 5 time slots, 4 for voice and 1 for synchronism
- Tx/Rx time slot assignment: programmable
- Frame duration: 125 µs
- Time slot duration: 25 µs
- Data stream through voice channel: 64 Kb/s
- Data interface: TTL and V24/RS232C
- Line coders: AMI (Alternate Mark Inversion), HDB3 (High Density Bipolar) and CMI (Coded Mark Inversion)
- Error detector for AMI/HDB3 code violation
- Data patterns: 320-64Kb/s; 0/1; 1/0 and 4x1/4x0; 64-bit pseudo-random
- Bit error meter with digital display
- Channel simulator: attenuation, passband and variable noise

INCLUDED

STUDENT HANDBOOK: THEORY AND EXERCISES
TEACHER HANDBOOK: WIRING DIAGRAMS AND SOLUTIONS OF EXERCISES



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM32/EV**

MCM33/EV

(BASE BAND AND DSP TRANSMISSION TECHNIQUES)

INTRODUCTION

MCM33/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S.

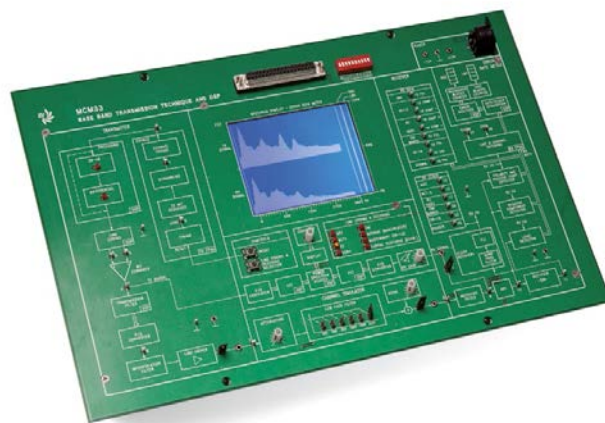
It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM33/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM33/EV

Experiment board for a complete course in base band transmission techniques. It contains all the pre-assembled electronic components needed to construct the experiment circuits and divided into functional blocks which can be interconnected and modified by means of supplied jumpers and connection cables.



TRAINING PROGRAM

- Discrete input source
- Channel coding (error control)
- Line coding and precoding importance
- Transmission and reception filter (spectrum modeling)
- Effects of the characteristic of the transmission line
- Intersymbol interference
- Eye diagram
- Data extraction
- Synchronism recovery
- Sampling of the received signalling pulses
- Error rate calculation
- Analysis of the Fourier spectrum of the signal present in the main points of the transmission and reception system, to observe the characterization and the modifications of the same spectrum
- Digital Signal Processing: description of the schematic diagram and operating modes of a specific microprocessor for digital signal processing
- Troubleshooting

- Spectrum display: TX/RX signals after the transmission line with LCD graphic display 160x128 dot pixels
- Fault simulation: Possibility to insert 10 faults
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers
- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

TECHNICAL SPECIFICATION

- Discrete input generator
- Channel encoder and decoder with cyclic redundancy code
- Line encoder and decoder with section of:
 - precoding: differential, scrambling, 3B-4B
 - coding: NRZ, RZ, CMI, HDB3, Manchester, MLT-3, 2B-1Q, 2-binary
- 10 LED's indicating precoding and line coding
- Transmission and reception filter (spectrum modeling)
- Transmission line simulator: band width, attenuation and variable noise generator
- Timing circuits, numeric processing and filtering with FPGA and DSP devices
- BER measurements: bar LED's on the display indicating lost blocks and recovered blocks

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT**
- NOT INCLUDED -

POWER SUPPLY
±12 Vdc - 0.5A

INCLUDED

STUDENT HANDBOOK: THEORY AND EXERCISES
**TEACHER HANDBOOK: WIRING DIAGRAMS
AND SOLUTIONS OF EXERCISES**



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM33/EV**



MCM40/EV

(FIBER OPTICS)

INTRODUCTION

MCM40/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S.

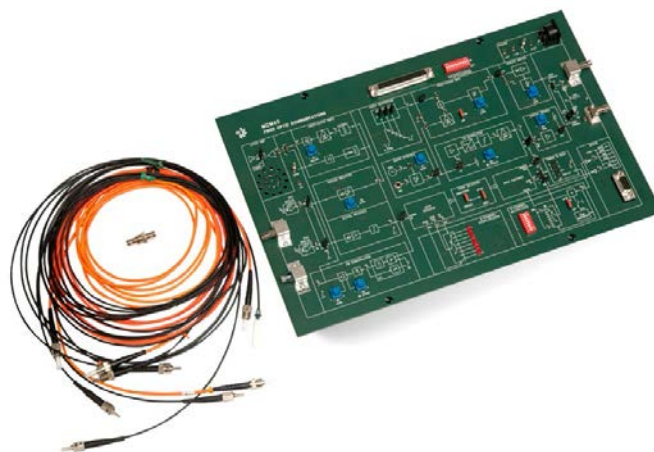
It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM40/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM40/EV

Experiment board for creating, checking, measuring and troubleshooting communications systems which use optical fibers. It contains all the pre-assembled electronic components needed to construct the experiment circuits and divided into functional blocks which can be interconnected and modified by means of supplied jumpers and connection cables.



TRAINING PROGRAM

- Characteristics of the fibers: structure; method of propagation; numerical aperture; modal and chromatic dispersion; attenuation; bandwidth
- Optical sources and detectors: LED and Laser diodes; photodiodes and avalanche photodiodes
- Optical connectors and coupling systems
- Digital and analog driving (Intensity Modulation IM) of the LED
- Response of the photodetector
- Attenuation in optical fibers
- Analog and digital communications systems
- Data coding/decoding: Manchester, Biphasic Mark, Biphasic Space
- Data transmission/reception with TDM
- Transmission/reception of analog signals in FM
- Transmission/reception of video+audio signals
- PCs interconnections by means of RS232/USB interface
- Troubleshooting

- Video/audio demultiplexer: audio demodulator (FM 5.5 MHz); video amplifier; 0.5W audio amplifier with loudspeaker
- Fault simulation: Possibility to insert 10 faults
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers
- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

TECHNICAL SPECIFICATION

- Electrical interfaces: TTL, V24/RS232C, Analog (1Vpp, 7 MHz band)
- Signal sources: TTL generator, Data generator, (0/1/0&1/4x0&4x1), Audio generator, Microphone, 5 pattern video generator
- Data codecs: NRZ; Manchester; Biphasic Mark/Space
- 8-channel TDM data multiplexer/demultiplexer
- Video+audio multiplexer: audio modulator (FM 5.5 MHz) and audio+video combiner
- Optical sources: 660- and 820nm LEDs
- 5 optical cables: plastic fibers, 1m and 5m; step-index, 200/230µm, 3m; graded-index, 50/125µm, 3m; single-mode, 10/125µm, 3m
- Detectors: 660nm- and 820nm PIN photodiodes
- Reception circuits: transimpedance amplifier; PLL FM demodulator

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT
- NOT INCLUDED -**

**POWER SUPPLY
±12 Vdc - 0.5A**

INCLUDED

**STUDENT HANDBOOK: THEORY AND EXERCISES
TEACHER HANDBOOK: WIRING DIAGRAMS
AND SOLUTIONS OF EXERCISES**



OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM40/EV**

MCM50/EV

(ELECTRONIC TELEPHONE)

INTRODUCTION

MCM50/EV is one of the experiment boards that constitute the Interactive Practical Electronics System – I.P.E.S.

It consists of a set of components and circuits for performing experiments.

The lessons included in this module can be developed in:

- **Standard mode:** using the switches of the equipment and consulting the handbook;
- **Computerized mode:** the interactive software version of the handbook - SW-D-MCM50/EV - interfaced to the module via Control Unit SIS3-U/EV, is used. This software inserts circuit variations and faults automatically enabling the development of lessons even without teacher's assistance.

MCM50/EV

Experiment board for creating, checking, measuring and troubleshooting telephone circuits such as: DTMF and Pulse signalling and a switching matrix simulating a telephone exchange and public network. It contains all the pre-assembled electronic components needed to construct the experiment circuits and divided into functional blocks which can be interconnected and modified by means of supplied jumpers and connection cables. Using PCM switching and transmission system Trainer mod. PCM/EV enables to carry out a communication between two electronic telephone sets mod. MCM50/EV.



TRAINING PROGRAM

- Public Exchange working:
 - Signalling way out
 - Generation of signalling
- Signalling generated by the public exchange:
 - Power supply: Exchange battery, Chokes and feed resistors
 - Calling
- Telephone signalling systems:
 - Combinatory disk
 - Decade keyboard (PULSE)
 - Dual Tone Multifrequency signalling (DTMF)
- Telephone operation with pulse and multifrequency selection:
 - Calling circuits (Buzzer)
 - Selection circuits (Dialing)
 - Phone circuits (Speech)
- Reception and decoding of DTMF signals through active filters
- Use of custom integrated circuits
- Establishment of a call and line circuit connections
- Connecting phones in derivation
- Troubleshooting

- 37-pin connector to the fault insertion unit
- 8-wire connector to the power supply unit
- Printed circuit board with protective treatment and mimic diagram
- Module equipped with ABS protection on its lower side

Dimensions: 386 x 248 x 60 mm

TECHNICAL SPECIFICATION

- 1 complete electronic telephone set with pulse and DTMF signalling.
- Public Exchange simulator with:
 - Battery circuit 24 V DC
 - Current loop detector through Line Sense relay
 - Call generator (Ring)
- DTMF decoder made with active filters
- Fault simulator (8 different faults simulated)
- Test and interconnection points, Ø 2 mm
- Rapid modifications to circuits using jumpers

REQUIRED



**PSLC/EV
POWER SUPPLY UNIT
- NOT INCLUDED -**

POWER SUPPLY
±12 Vdc - 0.5A/
24 Vac - 0.1 A

INCLUDED

STUDENT HANDBOOK: THEORY AND EXERCISES
**TEACHER HANDBOOK: WIRING DIAGRAMS
AND SOLUTIONS OF EXERCISES**

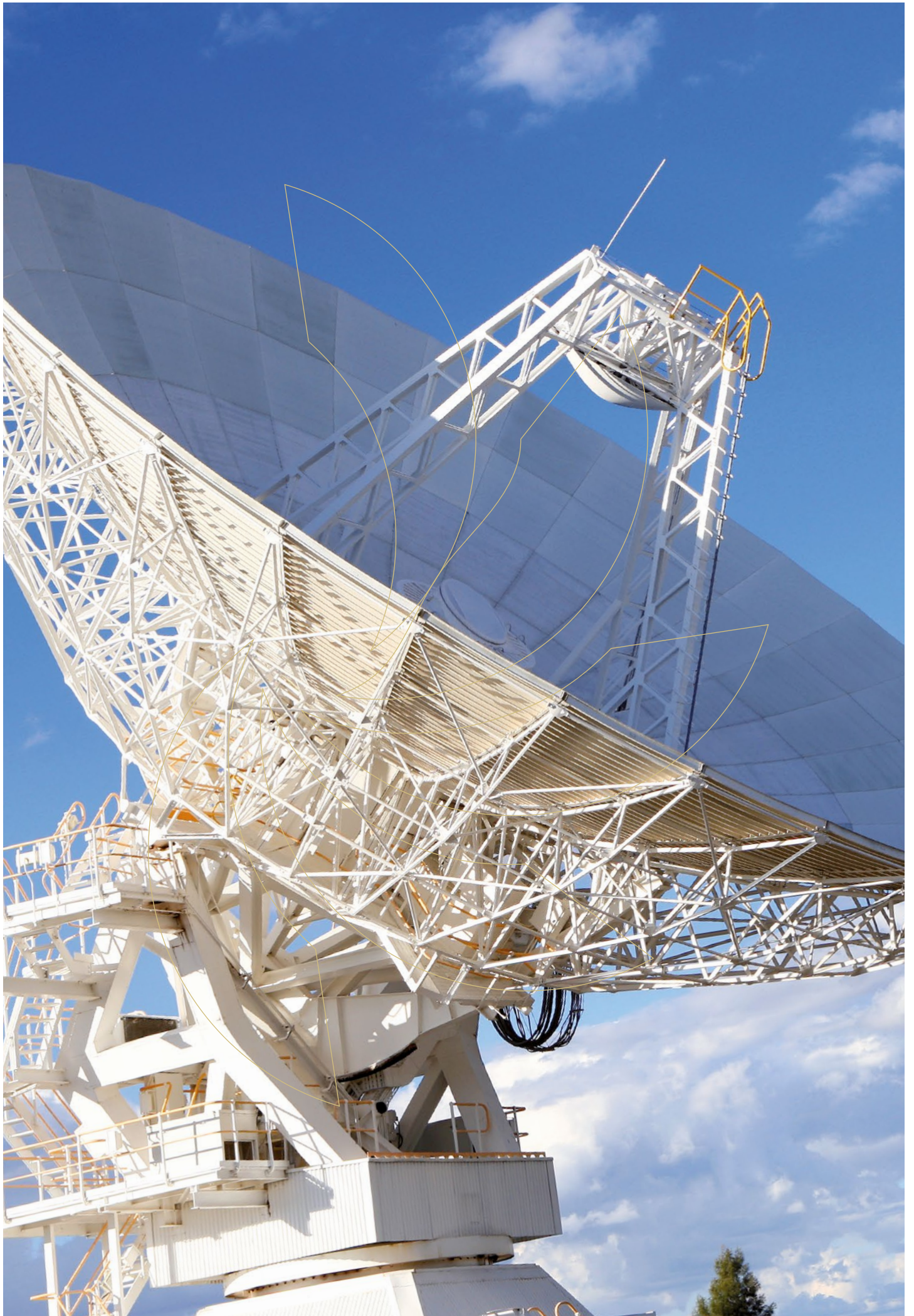


OPTIONAL

PERSONAL COMPUTER



**FAULT INSERTION UNIT SIS3-U/EV AND
MULTIMEDIA SOFTWARE SW-D-MCM50/EV**



21-C



M.P.T. SYSTEM TRAINERS AND HI END SYSTEMS

ST

www.elettronicaveneta.com

Aim:

- Professional training on advanced Telecommunications systems

Equipment:

- Stand Alone Workstations with set of Experiment boards (Modules). Trainers and Hi End Systems
- Fault simulation and Troubleshooting

M.P.T. SYSTEM TRAINERS AND HI END SYSTEMS



RADAR Trainer



M-STRIP Trainer



MICROWAVE Trainer

INTRODUCTION

Qualified, skilled technicians capable of solving the installation and maintenance problems of telecommunications equipment are in ever-increasing demand and their associated training is a growing requirement in educational establishments. The lab solutions and training equipment presented in this section meet the above training requirements as well as those of personnel re-qualification and refresher courses. The products proposed in this section enable the advanced study of the topics previously covered with the simpler, more basic training modules.

STAND ALONE WORK STATIONS (M.P.T)

The stand alone work stations include:

- **A power supply unit**
- **A module-holder box**
- **Experiment modules**
- **Theoretical/experimental manuals**
- **Computerised system for data generation and acquisition**

The front surface of the experiment modules show the circuit diagram, the block diagram, the circuit being examined and the test points. The components are mounted on the back, protected by a transparent covering allowing visual inspection of the devices and circuits. The boards are provided with connection cables for carrying out the experiments.

TRAINING PROGRAM

The training systems contained in this section enable the acquisition of the following skills:

- **Circuit analysis and use of consumer and professional equipment**
- **Use of professional instruments for quality analysis, performance, testing and troubleshooting**
- **Equipment design, installation and configuration**

TRAINER

Trainers are defined as didactic equipment based on commercial products of consumer or professional use and housed in a special mechanical structure with specific functional features.

They are suitable for training requirements of individuals or groups, for students and for those in need of professional re-qualification. The trainers ensure continuous updating in the new technologies applied to telecommunications.

The trainers are integrated educational systems for the theoretical and experimental learning of applied technologies. The equipment is mounted in a structure complete with power supply and constitutes a compact and functional set including:

- The electronic and mechanical circuits
- A detailed mimic diagram with functional blocks, test points and displays
- A panel with test points
- A fault simulator. The faults are inserted by means of switches protected behind a key-locked cover
- Pilot LED's and ancillary circuits

ADVANCED SYSTEMS

Apart from the trainers, this section also proposes Advanced Systems which are real, professional equipment and devices suitably modified for training purposes.

The Advanced Systems can be defined as typical examples of typical professional equipment used in the field of telecommunications.

This technologically advanced equipment of industrial design bridges the gap between the world of education and the reality of the industrial world.

MAIN ADVANTAGES

These products provide the following advantages:

- Shorter training times
- Self-learning through both theoretical study and practical exercises
- Continuous updating of existing laboratories in tune with technological advancements
- Practical experiments performed with components, devices and electronic circuits corresponding to those used in the real industrial world, providing an ideal base for understanding the theory
- Insertion of faults into circuits and troubleshooting methods

21-C



TELECOMMUNICATIONS AND TELEMATICS

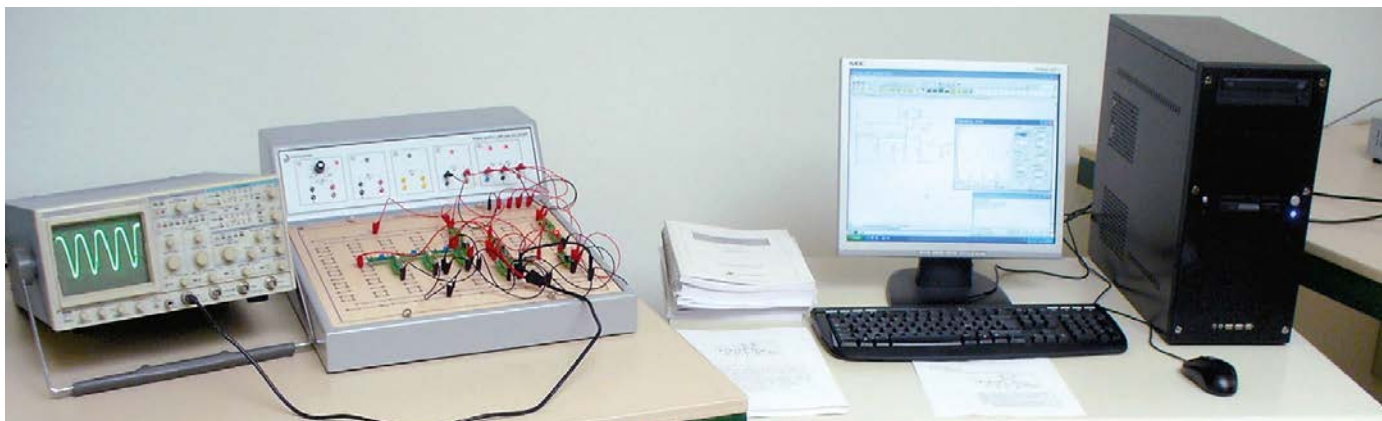
TELECOMMUNICATIONS LABORATORY COMPOSITION M.P.T. System - Trainers and Advanced Systems

| | |
|---|-------|
| STAND-ALONE WORKING STATIONS FOR THE ADVANCED EXPERIMENTATION M.P.T. SYSTEM | ST 6 |
| AUDIO-VIDEO TRAINER | ST 16 |
| TECHNOLOGIES AND SYSTEMS RF/MW/FO COMMUNICATION | ST 22 |
| RADAR LABORATORY | ST 53 |
| PSTN NETWORK AND TRANSMISSION SYSTEMS | ST 63 |

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21C-E-ST

STAND-ALONE WORKSTATIONS FOR ADVANCED EXPERIMENTATION M.P.T. SYSTEM



INTRODUCTION

The stand alone work stations are intended for the theoretical and experimental study of all topics relevant to Telecommunications technology.

These modules and equipment are used to study the real applications of the circuits analysed in the previous basic telecommunications courses.

The proposed equipment and systems enable the set up of a modular training program capable of meeting the very specific and advanced training requirements.

The systems proposed are important examples of typical equipment used in the field of telecommunications. They employ the same technology and the same devices used in industrial systems. Their only difference and advantage is their specific design intended for training purposes.

This technologically advanced equipment of industrial design bridges the gap between the world of education and the reality of the industrial world.

All the modules and equipment share the following features:

Flexibility: Different programs, tailor-made for different levels of training, can be developed with the same equipment. The equipment can be upgraded with subsequent modules to meet the latest technological advancements in the field.

High technological and educational content: Modern technology is translated into clear and functional didactic concepts.

Courseware: Exhaustive texts guide the student through both the theoretical concepts and the experimental exercises.

Software: Educational software for data acquisition and editing allows control and evaluation of processes.

The computerised work station for professional electronics consists of:

- **Power supply unit**
- **Module holder box**
- **Experiment modules**
- **Theoretical/Experimental manuals**
- **Data generation and acquisition system**

The front surface of the experiment modules show the circuit diagram, the block diagram, the circuit being examined and the test points. The components are mounted on the back, protected by a transparent covering allowing visual inspection of the devices and circuits. The boards are provided with connection cables for carrying out the experiments.

The proposed software can be used or new programs can be developed to create the ideal interface with the experiment module being used.

STAND-ALONE WORKSTATIONS FOR ADVANCED EXPERIMENTATION - M.P.T. SYSTEM

INFRASTRUCTURE



ST

POWER SUPPLY UNIT MOD. PS1-PSU/EV

The power supply is enclosed within a metal housing and together with the module holder box creates an ergonomic tabletop unit. On the front panel are sockets for voltage output and LED voltage indicators. The voltages are also available on DIN connectors located on the right hand side of the unit. This power supply unit is universal as it supplies the voltages necessary for the entire range of experiment boards manufactured by Elettronica Veneta S.p.A..

The supplied voltages are:

OUTPUT S1: +30 Vdc – 4A

Rectified, filtered fuse protected voltage.
Voltage indicator LED.

OUTPUT S2: 24 Vac – 4A

Fuse protected . Voltage indicator LED.

OUTPUT S3: +5 Vdc – 2A

OUTPUT S4: +12 Vdc – 2A, -12 Vdc – 1A

Stabilized voltage, electronically protected from short-circuits and overloads. Voltage indicator LED.

OUTPUT S5: 1.3 Vdc ÷ 24 Vdc, 1A

Stabilized voltage, electronically protected from short-circuits and overloads. Voltage indicator LED.

OUTPUT ON DIN CONNECTOR: 24 Vac – 0 – 24 Vac, 0.5A

Fuse protected voltage.

(Outputs S1 and S2 supply 4A separately and 2A if used simultaneously)

- Power supply: 115/230 Vac, $\pm 10\%$, 50/60 Hz
- Max power: 150 VA
- Dimensions: 415x185x195 mm - Weight: 8 kg

MODULE HOLDER BOX MOD. BOX/EV

Support for housing the experiment boards which are fixed to the frame by means of a "Plug-in" system.

Dimensions and weight: 415 x 400 x 110 mm – 3 kg.

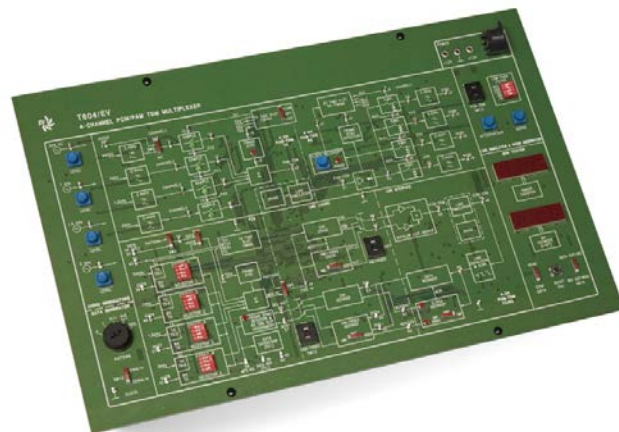


STAND-ALONE WORKSTATIONS FOR ADVANCED EXPERIMENTATION M.P.T. SYSTEM STAND-ALONE MODULES

| | | |
|---------------------------------------|---------|-------|
| 4-CHANNEL PCM/PAM TDM MULTIPLEXER | T604/EV | TS 9 |
| PCM/TDM TELEPHONY | T605/EV | TS 10 |
| VOICE MODEM | T606/EV | TS 11 |
| BASEBAND MODEM | T607/EV | TS 12 |
| 2-CHANNEL FDM MULTIPLEXER | T609/EV | TS 13 |
| FOURIER SYNTHESIS & SPECTRUM ANALYSIS | T610/EV | TS 14 |
| OPTICAL FIBERS | T611/EV | TS 15 |

4-CHANNEL PCM/PAM TDM MULTIPLEXER

Mod. T604/EV



ST

This module includes a multiplexer and a de-multiplexer: thanks to the exercises that can be carried out, these devices enable the theoretical study of multiplexing techniques using PAM and PCM coding. Four users are necessary to show the different techniques, whereas a BER tester can assess the transmission quality.

TRAINING PROGRAM

- Time Division Multiplexing (TDM)
- Transmission systems of four PAM and PCM channels
- Assembling 4-channel links
- PAM frames realized by:
 - insertion of frame synchronism
 - use of voice fast frame
 - use of slow frame for educational purposes and visual analysis of time multiplex
- PCM frame realized by:
 - time-slot assignation
 - insertion of voice data
 - insertion of frame synchronism
 - insertion of data flow at 64 kbps on one of voice channels
 - generation of fixed and random data sequences
 - AMI / HDB3 / CMI line coding
 - measurements of Bit Error Rate
 - characteristic of eye pattern
 - simultaneous voice and data transmission
- Transmission circuits
- Characteristics of transmission line
- Noise characteristics
- Reception circuits
- Line equalization
- Bit clock regeneration
- Extraction of frame synchronism
- Noise effect

TECHNICAL SPECIFICATION

- Characteristics of TDM Frame:
 - 5 time slots: four for voice, one for synchronism
 - Frame length: 125 μ s
 - Time slot length: 25 μ s
- PAM multiplexing frequency:
 - 40 kHz: standard operating mode
 - 0.5 Hz (slow): for displaying time division multiplex on LEDs

- Cable transmitter circuit
- PLL clock regenerator
- Low-pass filters: cutoff frequency of 3.4 kHz
- Bit clock: 320 kHz (PCM)
- Flow data rate that can be inserted in one of PCM channels:
 - 64 kbit/s, in synchronous mode
 - 16 kbit/s, in asynchronous mode
- Line coders/decoders:
 - AMI-RZ (Alternate Mark Inversion, Return-to-Zero)
 - HDB3 (High Density Bipolar)
 - CMI (Coded Mark Inversion)
- Signal equalizer for transmission line
- Clock regenerators
- Test signal generators:
 - 4 synchronous sinusoidal signals: 0.5-1-1.5-2 kHz
 - 1 data sequence: baud rate of 320 or 64 kbit/s, selectable sequence (fixed 0 or 1, alternate 1/0, alternate 4x1/4x0), pseudorandom sequence
- 2 digital displays:
 - counter of transmitted bits
 - counter of wrong bits for BER (Bit error Rate) measurement
- Noise generator of adjustable amplitude
- Artificial line:
 - adjustable attenuation
 - selectable cutoff frequency

Dimensions: 386 x 248 x 60 mm

REQUIRED



**PS1-PSU/EV
POWER SUPPLY UNIT
- NOT INCLUDED -**

**POWER SUPPLY
 ± 12 Vdc – 0.5A**

SUPPLIED WITH

**THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION**



OPTIONAL

**MODULE HOLDER BOX - BOX/EV
- NOT INCLUDED -**



PCM/TDM TELEPHONY

Mod. T605/EV



This module is designed for the theoretical study, supported by exercises, concerning telephony using multiplex with PCM-TDM coding. It is equipped with all the functions of a telephone exchange used in a communication system on PSTN (Public Switched Telephone Network) line.

TRAINING PROGRAM

- Basics of telephony
- Telephone and power, (Pulse/DTMF) dialling and communication signals
- User interface (SLIC):
 - B (Battery powered): telephone set powered by the exchange
 - O (Overvoltage protection): protection against overvoltages from the line
 - R (Ringing): control of ringing current
 - S (Supervision): detection of off-hook handset and of multifrequency dialling pulses or tones
 - H (Hybrid): conversion from 2 to 4 wires. and vice versa
 - T (Testing): level of signals; characteristics of line
- CODEC:
 - channel filter 300-3400 Hz in transmission and reception
 - 64 kb/s PCM encoding/decoding
 - transmission and reception Time Slot assignment and frame insertion at 2048 kbps (standard E1)
- Simultaneous communication of more users:
 - analog multiplex: FDM
 - digital multiplex: PCM-TDM
- Digital switched matrix:
- CEPT interface and HDB3 coding
- Line interface
- Line signal conversion: unipolar-bipolar
- Timing and exchange tones
- Data transmission on switched line via 2 modules mod. T606/EV (**not included**)

- 4 user jacks for the connection of max. 4 users for PSTN Networks, including SLIC, CODEC, Digital Switch and Line Interface
- Display of transmission and reception time slots and frames
- Artificial line simulator with controls of attenuation and noise generator
- PC-interfaceable control microprocessor
- Synchronization system for displaying time slots on oscilloscope
- LEDs of state indication:
 - Signalling: Clock Loss, BER, Frame Sync, Multi-Frame Sync
 - Incoming calls
 - Switch Hook detection
 - DTMF binary code and Line signalling
- 1 interface for connection with supervision PC
- 1 supervision software for programming exchange operating parameters: it must be installed in **1 PC (not included)**

Dimensions: 386 x 248 x 60 mm

REQUIRED



PS1-PSU/EV
POWER SUPPLY UNIT
- NOT INCLUDED -

POWER SUPPLY
 $\pm 12 \text{ Vdc} - 0.5\text{A}$
 $24 \text{ Vac} - 0.1\text{A}$

SUPPLIED WITH

THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION



SUPERVISION AND PROGRAMMING SOFTWARE FOR EXCHANGE
OPERATING PARAMETERS

OPTIONAL

PERSONAL COMPUTER



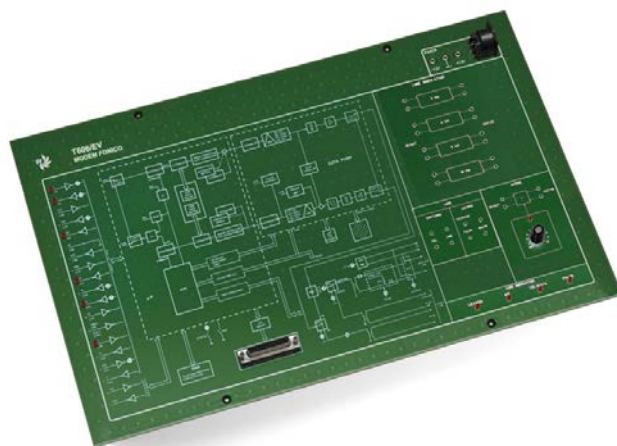
2 VOICE MODEMS MOD. T606/EV

MODULE HOLDER BOX - BOX/EV
- NOT INCLUDED -



VOICE MODEM

Mod. T606/EV



ST

This module is a modem designed for the theoretical study, supported by exercises, concerning digital modulations and data transmission on (Public and Private 2W/4W) Voice line. A complete data transmission system must include 2 modules mod. T606/EV and an optional module mod. T605/EV.

The complete data transmission system includes:

- 2 voice modems mod. T606/EV forming the data transmission system
- 1 module of TDM/PCM telephony mod. T605/EV operating as a PSTN switching and transmission exchange

TRAINING PROGRAM

- International standards
- Modulation and coding techniques
- Description and operation of serial interface circuits V24/RS232C
- Modem operation and programming
- Modes of use of AT commands
- Automatic call in AT(Hayes) and V25bis modes
- Operation and use of MNP4/V42 error correction and of MNP5/V42bis data compression
- Waveforms in test points
- Examining constellation diagrams
- Half-duplex and full-duplex, 2-wire and 4-wire links
- Synchronous and asynchronous communication
- Automatic back-up on switched line
- Checking modem operation via interface (loop 2) and line (loop 3) tests
- Remote control of loops: ITU-T recomm. V.54
- Programming the remote modem
- File Transfer applications: Xmodem, Kermit, etc... protocols
- Line and noise effect on the link
- Measuring Bit Error Rate

TECHNICAL SPECIFICATION

- Voice modem complying with ITU-T V24/V28, EIA RS232C, MNP4/V42 and MNP5/V42bis
- Full-duplex operation on switched and dedicated 2/4-wire lines
- Synchronous and asynchronous serial data
- V54 diagnostics, with local loop3 and local and remote loop2
- Automatic call by AT/V25bis commands
- Completely programmable from PC and from remote modem
- Automatic control of Back-up links
- 1 artificial line simulator: artificial line (2/4/8/16 km) and noise generator with level control
- Interface for oscilloscope (X-Y axes) for displaying constellation diagram (max. 128 points)
- LEDs of state indication: data lines and control of serial port
- 1 RS232C/USB interface for connection with PC/Terminal **(not included)**, provided with interconnection leads

Dimensions: 386 x 248 x 60 mm

REQUIRED



PS1-PSU/EV
POWER SUPPLY UNIT
- NOT INCLUDED -

POWER SUPPLY
± 12 Vdc – 0.5A

SUPPLIED WITH

THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION



OPTIONAL

PERSONAL COMPUTER



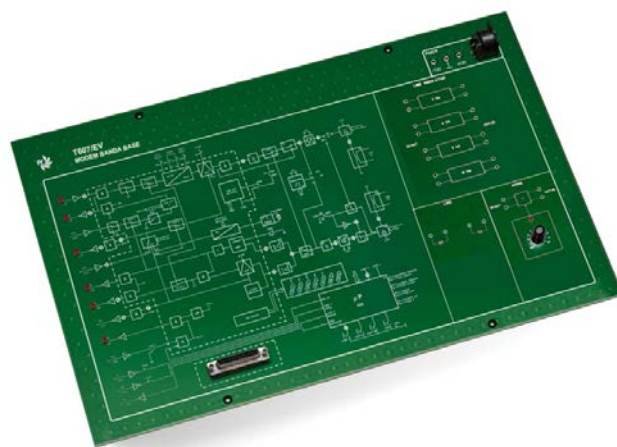
1 MODULE OF TDM/PCM TELEPHONY
MOD. T605/EV

MODULE HOLDER BOX - BOX/EV
- NOT INCLUDED -



BASEBAND MODEM

Mod. T607/EV



This module is a modem designed for the theoretical study, supported by exercises, concerning baseband coding techniques and data transmission on (2W/4W) dedicated line. A complete data transmission system must include 2 modules mod. T607/EV.

The complete data transmission system includes:

- 2 baseband modems mod. T607/EV forming the data transmission system

TRAINING PROGRAM

- International standards
- Modulation and coding techniques
- Structure and characteristics of telephone lines and network
- Description and operation of serial interface circuits V24/RS232C
- Modem operation and programming
- Waveforms in test points
- Synchronous and asynchronous communication
- Link structure: dedicated line, half-duplex and full-duplex, 2-wire and 4-wire, point-to-point and multi-point
- Checking modem operation via interface (loop 2) and line (loop 3) tests
- Remote control of loops complying with ITU-T recomm. V.54
- Line and noise effect on the link
- Measuring Bit Error Rate

TECHNICAL SPECIFICATION

- Baseband modem complying with ITU-T V24/V28 and with EIA RS232C
- Programmable baud rate
- Synchronous and asynchronous serial data
- Full-duplex operation on 4-wire line, half-duplex operation on 2-wire line
- Programmable C105/106 (RTS/CTS) delay
- Selectable transmission level
- Programmable equalizer
- Complying with ITU-T V.54 for enabling local and remote loop
- 1 artificial line simulator:
 - artificial line of 2/4/8/16 km
 - noise generator with level control
 - 1 two-output data generator
- LEDs of state indication: data lines and control of serial port
- 1 RS232C/USB interface for connection with PC/Terminal **(not included)**, provided with interconnection leads

Dimensions: 386 x 123 x 40 mm

REQUIRED



POWER SUPPLY
PS1-PSU/EV
- NOT INCLUDED -

POWER SUPPLY
 ± 12 Vdc – 0.5A

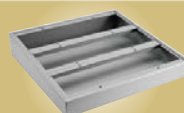
SUPPLIED WITH

THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION



OPTIONAL

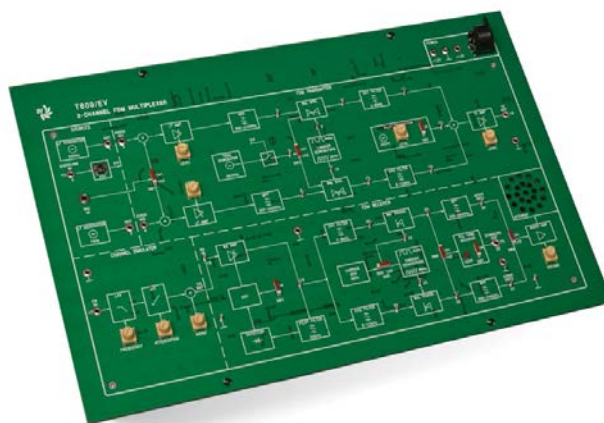
PERSONAL COMPUTER



MODULE HOLDER BOX - BOX/EV
- NOT INCLUDED -

2-CHANNEL FDM MULTIPLEXER

Mod. T609/EV



ST

This module consists of a multiplexer and demultiplexer enabling the theoretical study of Frequency Division Multiplexing (FDM) by means of practical exercises.

It employs two users and a pilot signal for the transmission of digital information to demonstrate how it is possible to combine several data on one single line.

TRAINING PROGRAM

- Frequency Division Multiplexing
- 2 audio channel FDM communication system with digital information transmission
- Transmission section:
 - Phone band and microphone amplifiers
 - Phone band filters
 - Carrier generators
 - Balanced modulators
 - Channel filters
 - Pilot signal generators
 - High frequency combiner
 - Transmission amplifier
- Artificial telephone line and noise generator
- Receiving section:
 - Broad band amplifier
 - Automatic level control
 - Channel filters
 - Carrier generators
 - Balanced demodulators
 - Voice band filters
 - Voice band amplifiers and loudspeakers
 - Digital information reception
- Frequency response of the filters
- Frequency response of the connection
- Effects of the telephone line and noise

TECHNICAL SPECIFICATIONS:

- Signal generators:
 - carrier of channel 1 (4 kHz) and channel 2 (8 kHz)
 - out of range warning tone
 - pilot tone at 32 kHz
 - audio signals: 500 and 1000 kHz, synchronous with carriers and adjustable in amplitude
 - noise with level adjustment
- Transmitted audio band 300 to 3400 Hz
- Low pass filter: Chebyshev and 8-pole type
- Channel filters:
 - channel 1: 4 - 8 kHz
 - channel 2: 8 - 12 kHz
- Frequency multiplexing technique: Single Side Band (upper) and Suppressed Carrier (SSB-SC)
- Signalling transmission and reception circuits
- Microphone and amplified loudspeaker with volume control

Dimensions: 386 x 248 x 60 mm

REQUIRED



**POWER SUPPLY
PS1-PSU/EV**
- NOT INCLUDED -

POWER SUPPLY
 $\pm 12 \text{ Vdc} - 0.5\text{A}$

SUPPLIED WITH

THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION



OPTIONAL

MODULE HOLDER BOX - BOX/EV
- NOT INCLUDED -



FOURIER SYNTHESIS & SPECTRUM ANALYSIS

Mod. T610/EV



The module enables the theoretical study, with the help of the exercises, of the signal synthesis according to the Fourier method. The module includes ten sine generators (1 fundamental + 9 harmonics) with quartz control, a continue D.C. voltage source and an 11-input adder stage. There's a Spectrum visualizer and a simulated transmission line with selectable cut-off frequency.

TRAINING PROGRAM

- Study of the Fourier Synthesis in the time domain and its frequency relation:
 - Measurements with spectral analysis
 - Relationship between amplitude, frequency and phase of each signal
 - Modification of the frequency spectrum with transmission line
- Signal synthesis by summing the fundamental, 9 harmonics and DC component. Each harmonic is selectable as: +sin, -sin, +cos and -cos
- Waveform generation:
 - Square
 - Triangle
 - Ramp
 - Pulse
 - Rectified sine
 - AM
 - Others

TECHNICAL SPECIFICATIONS:

- Frequency of the fundamentals: 1 kHz
- Frequency of the harmonics: 2-3-4-5-6-7-8-9-10 kHz
- Frequency generators with:
 - Quartz reference
 - Synchronous generated frequencies
- Phase of each sine wave selectable as: 0° (sin), 90° (cosine), 180° (-sin), 270° (-cosine)
- Amplitude of each sine-wave adjustable on 2 ranges: from 0 to 1 Vpp or from 0 to 10 Vpp
- Simulated transmission line with selectable cut-off frequency
- Test points for:
 - Every generated frequency, and
 - Periodical signal obtained by the Fourier Synthesis
- Spectrum visualizer: it allows the spectral analysis of the synthesized periodical signal and the linear representation of the X and Y axes
- LEDs for signaling the presence of each generated frequency
- Amplitude of the D.C. component: adjustable from -10 V to +10 V
- Adder stage with 11 inputs
- Audio amplifier with speaker

Dimensions: 386 x 248 x 60 mm

REQUIRED



**POWER SUPPLY
PS1-PSU/EV
- NOT INCLUDED -**

**POWER SUPPLY
± 12 Vdc – 0.5A**

SUPPLIED WITH

**THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION**



OPTIONAL

**MODULE HOLDER BOX - BOX/EV
- NOT INCLUDED -**



FIBER OPTICS

Mod. T611/EV

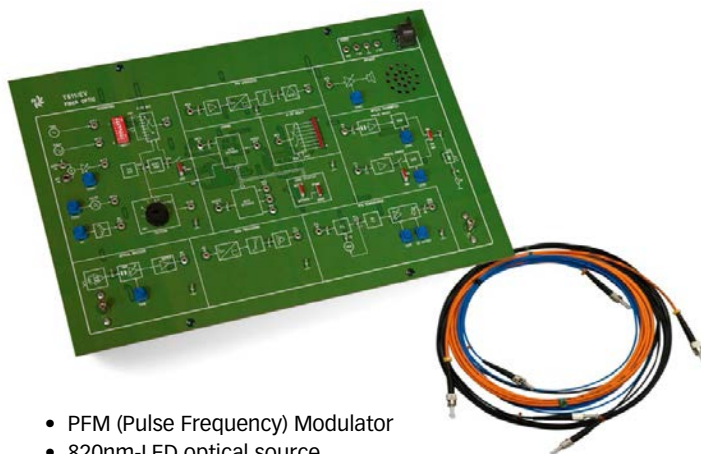
This module consists of a transmitter and a receiver for optical fibers. It also includes some auxiliary circuits for assembling different typical applications of this technology. Optional module mod. T611-L/EV must be used to add a Laser transmitter, together with its own receiver. Optional module mod. T611-W/EV (as well as mod. T611-L/EV) must be used to add two WDMs and to assemble a bidirectional system on a unique optical fiber. Professional measurements can be carried out only by optional Optical Instruments mod. T611-I/EV.

TRAINING PROGRAM

- Optical fibers: constructional structure, light propagation in optical fibers, modal dispersion, chromatic dispersion, attenuation, bandwidth
- Sources: Led and Laser
- Optical detectors: PIN and avalanche photodiodes
- Optical-fiber communication system for analog, digital and DC source
- Video transmission system
- Bidirectional transmission system with one/two fiber/s
- Used components:
 - digital/analog transmitters/receivers
 - WDM (Wavelength Division Multiplexer)
- Characteristics of components:
 - digital and linear driving
 - characteristic curves of the optical source
 - bias current
 - emitted power adjustment
 - "Optical power/current" curve of the source
 - operating point of the LED
 - Laser diode: characteristics and driving, automatic control of the emitted power
 - waveform of the transmitted signal
 - detector responsivity
 - characteristics and biasing of avalanche photodiode
 - receiver saturation
 - modal dispersion
 - linearity of the connection
 - frequency response of the connection
 - dimensioning of the connection
 - power margin
- Measurements on optical fibers:
 - Optical power received
 - Attenuation of passive components and of optical cables

TECHNICAL SPECIFICATION

- Input for external microphone (mic included)
- Amplified loudspeaker with volume control
- Generators of DC signal, audio signal of 1 kHz, sine wave, Data Pattern (0; 0/1; 4x0/4x1)
- Input/output stages for TTL/DC analog/digital signals
- 8-channel TDM (Time Division Multiplexing) data multiplexer
- Data coders: NRZ, Manchester, Biphase (Mark / Space)



- PFM (Pulse Frequency) Modulator
- 820nm-LED optical source
- Optical receiver with photodiode
- Optical cables with ST-ST connectors:
 - 2 graded-index 62.5/125 optical cables of 3 m
 - 1 step-index 9/125 optical cable of 3 m
 - 1 step-index 200/230 optical cable of 3 m
 - 1 optical cable of 3 m of plastic 1000
- Video kit (optional mod. T611-V/EV):
 - LCD colour Video Monitor
 - Video bar generator
- Module with 1300nm LASER source including monitoring photodiode for Automatic Power Control (APC) and optical receiver (optional mod. T611-L/EV)
- WDM (Wavelength Division Multiplexing) Multiplexer and Demultiplexer (optional mod. T611-W/EV)
- Optical instruments (optional mod. T611-I/EV):
 - Optical Power Source: portable for professional use, Double light (850 and 1300 nm), ST Connector
 - Professional hand held optical power meter, triple measurement band (850, 1300 and 1500 nm), ST connector, LCD display, absolute (dBm)/relative (dB) measure

Dimensions: 386 x 248 x 60 mm

REQUIRED



PS1-PSU/EV
POWER SUPPLY UNIT
- NOT INCLUDED -

POWER SUPPLY
+ 5 Vcc – 0.2A
± 12 Vcc – 0.5A

SUPPLIED WITH

THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION



OPTIONAL

VIDEO KIT MOD. T611-V/EV



RTX LASER MODULE MOD. T611-L/EV

WDM MODULE MOD. T611-W/EV



OPTICAL INSTRUMENTS MOD. T611-I/EV

MODULE HOLDER BOX - BOX/EV
- NOT INCLUDED -

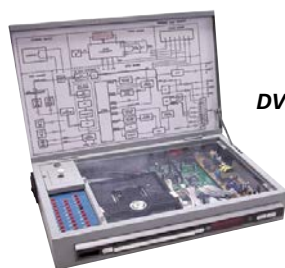




AUDIO-VIDEO TRAINERS

| | | |
|---|----------------------|--------------|
| INTRODUCTION | | ST 17 |
| HI-FI AUDIO AMPLIFIER TRAINER | MOD. M800/EV | ST 18 |
| STEREO AM/FM RECEIVER TRAINER | MOD. M510/EV | ST 19 |
| COMPACT MULTISTANDARD LCD TV TRAINER | MOD. M26-E/EV | ST 20 |
| DVD & HOME THEATRE TRAINER | MOD. M520/EV | ST 21 |

AUDIO-VIDEO TRAINER



DVD Trainer



Stereo AM/FM receiver Trainer



LCD TV Trainer

INTRODUCTION

Qualified, skilled technicians capable of solving the installation and maintenance problems of telecommunications equipment are in ever-increasing demand and their associated training is a growing requirement in educational establishments.

The lab solutions and training equipment presented in this section meet the above training requirements as well as those of personnel re-qualification and refresher courses.

The products proposed in this section enable the advanced study of the topics previously covered with the I.P.E.S. system with the addition of advanced experiments on the following topics:

- **Processing of audio and video signals**
- **Coding of signals recorded on different devices**
- **Reception of radio and TV signals**

TRAINER

Trainers are defined as didactic equipment based on commercial products of consumer or professional use and housed in a special mechanical structure with specific functional features. They are suitable for training requirements of individuals or groups. The equipment is mounted in a structure complete with power supply and constitutes a compact and functional set including:

- **The electronic and mechanical circuits**
- **A detailed mimic diagram with functional blocks, test points and displays**
- **A panel with test points**
- **A fault simulator. The faults are inserted by means of switches protected behind a key-locked cover**
- **Pilot LED's and ancillary circuits**

TRAINING PROGRAM

The training systems contained in this section enable the acquisition of the following skills:

- Circuit analysis and use of consumer and professional equipment
- Use of professional instruments
- Installation, configuration and maintenance

MAIN ADVANTAGES

These products provide the following advantages:

- Shorter training times
- Self-learning through both theoretical study and practical exercises
- Continuous updating of existing laboratories in tune with technological advancements
- Practical experiments performed with components, devices and electronic circuits corresponding to those used in the real industrial world, providing an ideal base for understanding the theory
- Insertion of faults into circuits and troubleshooting methods

EDUBOX

The EduBox is the first ever educational system for the study of commercial devices, designed by Elettronica Veneta, and applied to trainers.

It is an integrated system enabling the theoretical and experimental learning of applied technologies.

The equipment and components are mounted in a structure which can be closed to protect the inner circuits. These trainers can be easily stored in a laboratory cabinet.

HI-FI AUDIO AMPLIFIER TRAINER

Mod. M800/EV

INTRODUCTION

The trainer mod. M800/EV is a modern audio stereo amplifier complete with ancillary circuits and suitably modified to maximise the learning experience of its operation, configuration and fault finding.

The equipment is installed in a robust structure constituting a compact and fully functional system containing: the electronic circuits of an audio stereo amplifier; a detailed mimic diagram with functional blocks; 20 test points directly connected to the amplifier circuits; 2 loudspeakers; 2 resistive loads; the 16-fault simulator.



TRAINING PROGRAM

- Description and characteristics of the input circuits: sound (magnetic head), tape, tuner, auxiliary microphone
- Description and characteristics of the audio pre-amplifier
- Bass, loudness, sound power, volume, balancing, muting controls
- Description and characteristics of the stereo amplifier
- Monitoring of the audio levels via VU-meter
- Description and characteristics of the electrical power supply
- Measurement of the following parameters: input impedance to the different inputs, frequency response of the preamplifier and the amplifier, frequency response of the bass, treble and loudness, power gain, output power, distortion, output impedance
- Trouble-shooting

TECHNICAL SPECIFICATION

- Five inputs: phone (magnetic head), tape, tuner, auxiliary, microphone
- Controls: bass, treble, loudness, volume, balancing, muting
- Outputs: loudspeakers and earpieces
- Output power: 2x20 W (8 Ohm)
- Frequency response: 20 Hz-20 kHz
- VU-meter: LED bar indication
- Fault simulator: 16 faults insertable via switches, protected with cover with key-lock
- Test points: 20 test points mounted on panel and connected directly to the circuits of the equipment
- Loudspeakers: 2x30 W - 8 Ohm
- Resistive loads: 2x30 W - 8 Ohm

Power supply: 230 Vac 50 Hz single-phase - 100 VA
(Other voltage and frequency under request)

Dimensions: 415 x 400 x 130 mm

Weight: 10 kg

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION, FAULT INSERTION
TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR



STEREO AM/FM RECEIVER TRAINER

Mod. M510/EV

INTRODUCTION

The trainer mod. M510/EV is based on a modern HI-FI AM/FM stereo radio receiver suitably modified to maximise the learning experience of its operation, configuration and fault finding. The equipment is installed in a robust structure constituting a compact and fully functional system containing: a modern AM/FM stereo radio receiver, modified for easy access to the electronic boards and components; a 2x10W stereo amplifier; 2 loudspeakers; a detailed mimic diagram; 30 easily accessible test points on the mimic diagram and 4 test points directly on the printed circuit board; the 16-fault simulator.



TRAINING PROGRAM

- Advanced technology used in a modern radio receiver: integrated circuits for RF, IF and radio applications
- PLL synthesizers, digital tuning, digital display, system control with microprocessor, automatic search and memorization of the stations
- AM receiver: operation of the superheterodyne radio receiver, synthesized PLL local oscillator, RF converter, Varicap diode tuning, intermediate frequency amplifier, AM detector and Automatic Gain Control (AGC)
- Stereo FM receiver with RDS: RF preamplifier and mixer, PLL local oscillator, intermediate frequency amplifier, Automatic Frequency Control (AFC), FM detector, stereophonic decoder, de-emphasis circuits and RDS section (Radio Data System)
- Microprocessor controls: digital search, tuning and display, controls and memory
- Audio stereo amplifier: volume control, balancing, treble and bass
- Regulation and typical measurements in the different stages of the receiver and the audio amplifier: RF and IF alignment, regulation of the AM and FM detectors, sensibility, stereo separation, output gain and power, input output impedance and band width
- Troubleshooting

TECHNICAL SPECIFICATION

- General: 2-band receiver: AM-FM stereo, PLL synthesizer and microprocessor control (with digital display, automatic search and tuning, 50-station memorization)
- AM section: superheterodyne, 528-1605-kHz band, intermediate frequency 455 kHz
- FM stereo section: provided with RDS, superheterodyne, 87.5-108 MHz band, intermediate frequency 10.7 MHz
- Audio Stereo amplifier: frequency response: 10 Hz-15 kHz, power 2x10W, volume controls, balancing, treble and bass, loudspeakers: 2x10W
- Structure: compact container with liftable cover, containing all the electronic parts of the Radio Receiver and the Audio Amplifier, as well as the test points and the fault simulator; the cover includes the block diagram of the circuit
- Fault simulator: 16 faults insertable by means of switches, protected with key-locked cover
- Test points: 30 test points mounted on the panel and connected directly to the equipment circuits

Power supply: 230 Vac 50 Hz single-phase - 130 VA
(Other voltage and frequency under request)

Dimensions: 580 x 160 x 300 mm (main unit - closed)

Total weight: 18 kg

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION, FAULT INSERTION

TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR



COMPACT MULTISTANDARD LCD TV TRAINER

Mod. M26-E/EV

INTRODUCTION

The trainer mod. M26-E/EV is based on a modern multistandard colour television (DVB-T, PAL, SECAM, NTSC) suitably modified to maximise the learning experience of its operation, configuration and fault finding.

The didactic section is implemented in a separate structure which is connected to the TV monitor by means of a multi-core cable and that contains the test points which are accessible directly on a clear mimic diagram representing the electronic circuits of the component parts of the television.



TRAINING PROGRAM

- Introduction to colour television
- Characteristics of the DVB-T, PAL, SECAM and NTSC standards
- Composite video signal
- Block diagram and circuit analysis of the TV set
- Measurement and trouble-shooting on the different stages of the TV set:
 - Tuner
 - System controller
 - Audio/Video processor
 - Audio/Video interfaces
 - LCD panel controller
 - Sound amplifier
 - Power supply

TECHNICAL SPECIFICATION

- TV receiver with 19" LCD colour monitor
- Display mode:
 - Resolution: from 640x480 to 1360x768 pixels
 - Horizontal frequency: 60 kHz max
 - Vertical frequency: 75 Hz max
 - Clock pixel frequency: 85 MHz max
- Standard: PAL/SECAM/NTSC (analogue), DVB-T (digital)
- Coding: MPEG-2
- Connectors: Audio-Video EuroSCART, HDMI and USB
- Block diagram composed of:
 - Power supply
 - Tuner and Audio/Video processor
 - Microcontroller(Sysco)
 - LCD panel driver and power supply
- Included documentation:
 - Internal mimic diagram
- Antenna impedance: 75 Ohm
- Channels: VHF e UHF
- Sound system: stereo with internal speakers
- On-screen display (OSD) of the television functions
- Infrared remote control
- 24 Test points mounted on the synoptic panel and connected directly to the circuits of the equipment circuits
- Fault simulator: 8 faults

Power supply: 230 Vac 50 Hz single-phase - 50 VA
(Other voltage and frequency under request)

Dimensions: 470 x 450 x 490 mm (closed)

Weight: 10 kg

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION, FAULT INSERTION
TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR



DVD & HOME THEATRE TRAINER

Mod. M520/EV

INTRODUCTION

The trainer mod. M520/EV is based on a modern Home Theatre system player suitably modified to maximise the learning experience of its operation, configuration and troubleshooting. The equipment is installed in a metallic box constituting a compact and fully functional system containing: a FM stereo radio receiver; a DVD / CD player; a 5.1 channel stereo amplifier; a detailed mimic diagram; a panel with 30 test points; the 16-fault simulator. The trainer is supplied with 5 loudspeakers and 1 subwoofer.



TRAINING PROGRAM

- Advanced technology used in Home Theatre systems: integrated circuits for Servo, Power-Amp, RF, IF and radio applications
- Characteristics of the DVD digital signal
- Block diagram and analysis of the circuits of the DVD disk reader
- Servomechanisms and control circuits
- PLL synthesizer, digital tuning
- FM Stereo receiver
- Audio and video circuits
- Multi-channel amplifier
- Display circuit, keyboard and remote control
- Power supply
- Trouble-shooting

TECHNICAL SPECIFICATION

- Receiver: FM stereo
- CD/VCD/SVCD-compatible DVD reader and MP3
- Audio Stereo 5.1 channel amplifier
- Loudspeakers: stereo front and centre, rear stereo and subwoofer
- Total acoustic power over 300 W
- Structure: compact container with cover that can be raised, containing all electronic parts of the HomeTheatre system, as well as the test points and the fault simulator; the cover contains the block diagram of the circuit
- Fault simulator: 16 faults insertable by means of switches, protected with key-locked cover
- Test-points: 30 test-points mounted on the panel and connected directly to the circuit of the equipment

Power supply: 230 Vac 50 Hz single-phase - 80 VA
(Other voltage and frequency under request)

Dimensions: 510 x 150 x 290 mm (main unit - closed)

Total weight: 15 kg

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION, FAULT INSERTION
TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR





TECHNOLOGIES AND SYSTEMS OF RF/MW/FO COMMUNICATION

| | | |
|--|-----------------|-------|
| TV/SAT ANTENNA LABORATORY: | | |
| TERRESTRIAL ANTENNA TRAINER | MOD. TS3-T/EV | ST 23 |
| SATELLITE ANTENNA TRAINER | MOD. TS3-S/EV | ST 24 |
| FIELD METER | MOD. TS3-M/EV | ST 25 |
| VIDEO GENERATOR | MOD. VG1/EV | ST 25 |
| SAT LEVEL METER | MOD. TS3-L/EV | ST 25 |
| TV/SAT ANTENNA EXPERIMENTAL PANEL | MOD. TSTN/EV | ST 26 |
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| CELLULAR TELEPHONE TRAINER | MOD. CTS2/EV | ST 47 |
| EDUCATIONAL PANEL ON OPTIC FIBERS AND OPTICAL INSTRUMENTS | MOD. EFO41/EV | ST 49 |
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| CONNECTIVITY KIT | MOD. EFO43-C/EV | ST 51 |
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| OTDR KIT | MOD. EFO43-O/EV | ST 52 |

TV/SAT ANTENNA LABORATORY

INTRODUCTION

With the TV/SAT ANTENNA LABORATORY, learners can examine the typical aspects of the design and realization of an antenna reception system, with an in-depth analysis of signal amplification and distribution.

It is composed of two trainers mounted on a handy and modular vertical structure. The equipment is very user friendly during experiments, thanks to the functional diagram silkscreen printed on the structure.

Each trainer includes professional devices, which enable to realize:

- **MATV** (Master Antenna Television), centralized systems for terrestrial signals;
- **SMATV** (Satellite Master Antenna Television), centralized systems for satellite signals.



Mod. TS3-T/EV



Mod. TS3-S/EV

The lab is composed of the following two trainers, which can be used both individually and together to realize a complete system:

- **Terrestrial Antenna Trainer mod. TS3-T/EV:** enables to study a complete MATV system. Reception, amplification and distribution of VHF/UHF terrestrial TV signal for a two-floor building with 8 user plugs.
- **Satellite Antenna Trainer mod. TS3-S/EV:** enables to study a complete SMATV system. Reception, amplification and distribution of satellite TV signal provided by two dish antennas for a two-floor building with 16 user plugs.

The combinations of trainers **TS3-T/EV** and **TS3-S/EV** will enable to study a complete reception, amplification and distribution system of both types of signals, for a two-floor building with 16 user plugs.

The following optional accessory is available:

- **Field meter with noise generator mod. TS3-M/EV**

It can be used with both trainers to:

- Satellite Dish Pointing Calculator
- Correct pointing of TV antennas and satellite dishes
- Measure signal level and attenuation with accurate results
- Visualize the spectrum of the received signal
- Visualize the received terrestrial or satellite TV program
- Analysis of TV / IF SAT / CATV amplifiers and distribution networks
- Band and channel filters calibration
- Attenuation of cables and passive components measurements

TERRESTRIAL ANTENNA TRAINER mod. TS3-T/EV

TRAINING PROGRAM

- Design of a complete MATV system, composed of:
 - 2 VHF/UHF antennas
 - 2 floors
 - 8 user plugs
 - passive and active components to amplify and distribute the signal
- Characteristics and operation of the featured components, such as: mixers, wide band multi-input and channel amplifiers, filters, converters, power supplies, cables, plugs, switches, dividers and TV antennas (VHF/UHF)
- Cable attenuation measurement (**mod. TS3-M/EV option**)
- Distribution network: cascade on 1 column and nodes
- System including multi-band amplifier and TV signal distribution
- Use of channel filters and of a channel converter
- Use of an included RF generator to test signal attenuation and frequency conversion
- Use of antennas
- Connection of the terrestrial and satellite antenna systems (**mod. TS3-S/EV option**) to realize a complete reception, amplification and distribution system, compatible with all TV/SAT signals.

TECHNICAL SPECIFICATION

- Aluminum vertical frame
- 1 multi-band amplifier:
 - 4 RF inputs for antennas in III/IV/V/UHF bands
 - 1 RF output combining all the input signals
 - Gain: > 30dB, adjustable to 20dB for each input
 - Output level: > 100dBμ (90 dBμ band III)
 - A.B.L.A. technology (Automatic Building Level Adjustment) to keep output levels constant at varying input levels
 - power supply: 230 Vac (110 Vac upon request)–50/60Hz
- 1 FM notch filter (88-108MHz)
- 1 LTE notch filter (790-862MHz)
- 1 Channel converter:
 - 1 RF Input for the main antenna
 - 1 RF Input for the secondary antenna
 - Converted channel level control: 20dB
 - 1 RF output combining all the input signals
 - In/Out channels: selectable via Dip-Switch
- 1 RF Generator:
 - Audio/Video inputs
 - Output level: 90dBμ, adjustable
 - Output channel: selectable via Dip-Switch
- 1 two-way divider
- 5 two-way switches
- 8 simple user plugs (terminals), IEC connector
- 2 Antennas for VHF and UHF bands
- RF connectors: IEC type
- Accessories:
 - 1 RF cable coil, 100m
 - 5 cables, 1.5m
 - 1 pole to fix antennas
 - 8 terminations, 75 Ohm
 - 10 F Type Female Screw-on connectors
 - 1 tripod

Power supply: 230/110Vca 50/60Hz – 10W

Dimensions: 660 x 360 x 810 mm

Weight: 16 kg

SATELLITE ANTENNA TRAINER mod. TS3-S/EV

TRAINING PROGRAM

- Design of a complete SMATV system composed of:
 - 2 SAT antennas
 - 2 floors
 - 16 user plugs
 - passive and active components for signal amplification and distribution
- Characteristics and operation of the featured components, such as: passive and active multi-switches, switches, and SAT antennas.
- Cable attenuation measurement (**mod. TS3-M/EV option**)
- Distribution network: cascade on 1 column
- Multi-switch cascade system for IF SAT and TV signal distribution
- How to install and point a satellite dish
- Connection of the satellite and terrestrial antenna systems (**mod. TS3-T/EV option**) to realize a complete reception, amplification and distribution system, compatible with all TV/SAT signals.

TECHNICAL SPECIFICATION

- Aluminum vertical frame
- 2 Multi-switches:
 - installation: through and endline
 - 8 IF-SAT inputs
 - Compatibility: V/H polarization, Low/High band, signals provided by two LNBs (SAT1/SAT2)
 - 1 terrestrial TV input
 - 8 derived TV/SAT outputs
 - 8 IF-SAT outputs (only for "through" configuration)
 - 1 terrestrial TV output (only for "through" configuration)
 - power supply: 230 Vac (110 Vac upon request)–50/60Hz
- Satellite commutation control:
 - 14/18 V
 - 0/22 kHz
 - DISEqC
- 16 de-mixed user plugs (terminal):
 - 1 IF-SAT+TV cable input
 - 1 TV plug with IEC connector
 - 1 SAT plug with F connector
- 2 Antennas for Ku bands:
 - Parabolic reflector: 1m diameter, offset type
 - LNB: 4 IF outputs (V/H, Low-High)
- IF/RF connectors: F/IEC type
- Accessories:
 - 1 RF cable coil, 100m
 - 5 cables, 1.5m
 - 1 pole to fix antennas
 - 20 F Type Female Screw-on connectors
 - 1 tripod

Power supply: 230/110Vca 50/60Hz – 10W

Dimensions: 660 x 360 x 810 mm

Weight: 16 kg

SUPPLIED WITH

THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION



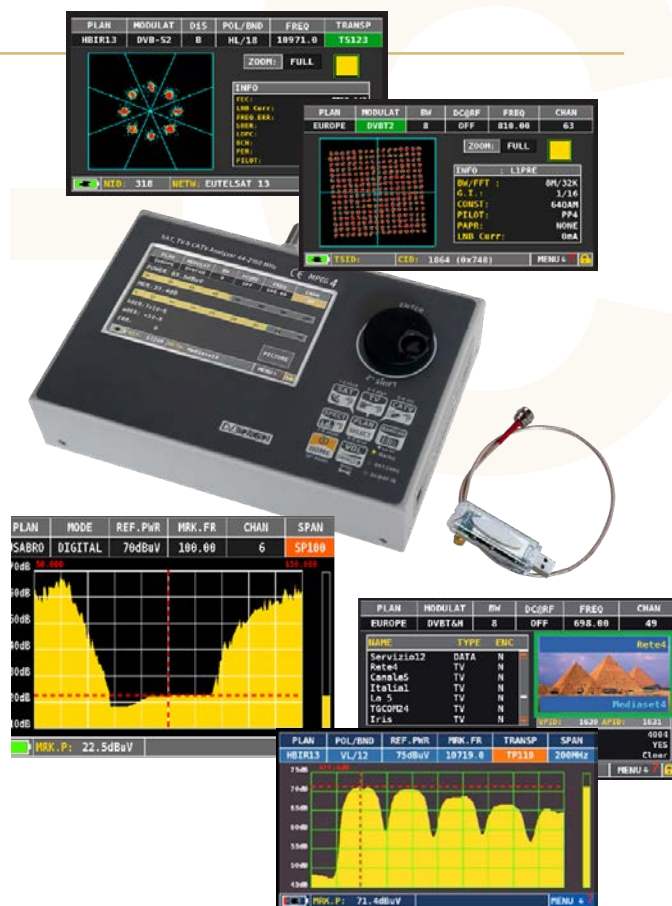
Optional: FIELD METER WITH NOISE GENERATOR - Mod. TS3-M/EV

FIELD METER

- Accurate and easy to use
- DVB-S/S2, DVB-T/T2, DVB-C
- All digital measurements
- DISEqC & SCR dCSS
- SD and full HD MPEG 2 - 4 images
- Analog TV and Video Input
- Automemory and Autoquality
- Spectrum with memory peak
- Features:
 - Measures level / spectrum / parameters of CATV (Cable TV) / RF (VHF/UHF) and SAT (IF) signal
 - Satellite Dish Pointing Calculator
 - Correct pointing of TV antennas and satellite dishes
 - Measure signal level and attenuation with accurate results
 - Visualize the spectrum of the received signal
 - Visualize the received terrestrial or satellite TV program
 - Analysis of TV / IF SAT / CATV amplifiers and distribution networks
 - Band and channel filters calibration
 - Attenuation of cables and passive components measurements
- Received signal spectrum visualization:
 - 44-860 and 950-2150 MHz
 - Min. span 2 MHz
- Analog, HD DVB-T and DVB-S TV demodulator with TV program visualization
- Measurements:
 - POWER
 - BER (bBER / aBER) and MER
- QPSK/8PSK/64QPSK/256QPSK constellation visualization
- 1 Display for measurement/program settings/visualization: 4,3" color LCD touch screen, 16/9
- Mechanical keypad for instrument settings
- Wall power supply and rechargeable battery
- PC interface software
- Supplied with shoulder bag
- Dimensions: 120 x 180 x 45 mm
- Weight: 1 Kg

NOISE GENERATOR

- Frequency range: 4 – 2.500 MHz
- Noise type: White Gaussian
- Output power: – 56 dBm
- Flatness: 1,5 dB typ.
- Impedance: 75 Ω
- Power supply: via USB, 5 Vdc, 80 mA
- Dimensions: USB key



TV/SAT ANTENNA EXPERIMENTAL PANEL

Mod. TSTN/EV

INTRODUCTION

The TV and SAT antenna trainer, using the latest technology and up-to-date components, enables to study, design and develop modern antenna reception systems, comparing different features and kinds of digital and satellite signal distribution systems. The compact tabletop trainer shows a silk-screen-printed block diagram for an easier use during lessons and exercises.

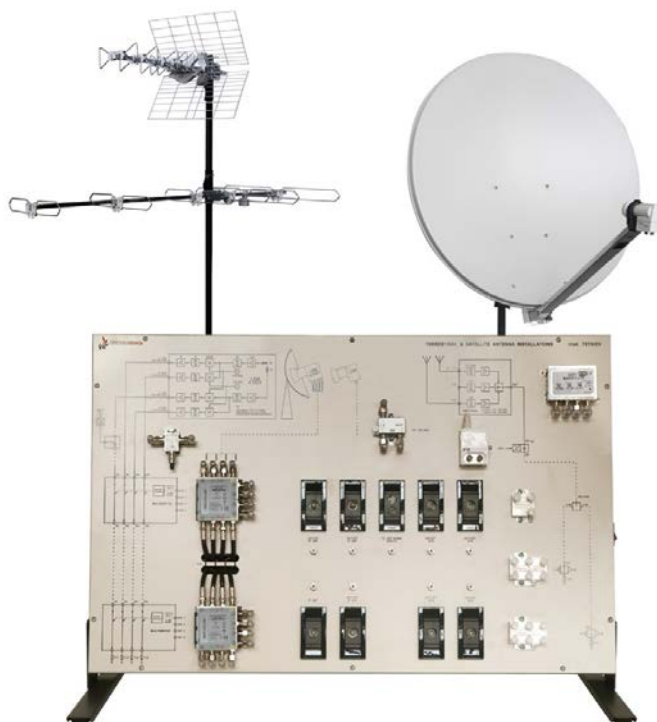
The trainer, using professional components and devices and a supplied experimental manual, enables the realization of single or centralized TV antenna circuits on MATV (Master Antenna Television) and SMATV (Satellite Master Antenna Television), in a very flexible modality.

Electronic circuits and specific features of the overall system are carefully studied.

By the use of specific instrumentation (quoted separately), distribution signals amplifications and attenuations can be measured.

TRAINING PROGRAM

- TV antenna components operation and characteristics: Antennas, multiple-input amplifiers, power supplies, splitters, taps, sockets, cables
- Study and realization of MATV reception systems, amplification and VHF/UHF terrestrial TV distribution for single-family home with single and multiple TV outlet type (up to 4 outlet) circuits
- Study and realization of MATV reception systems, amplification and VHF/UHF terrestrial TV distribution for apartment buildings (up to 4 users on different floors)
- SAT satellite antenna components operation and characteristics: satellite dishes and universal LNB, 4 independent outputs (polarization and separate bands) LNB type, start and final multiswitch, outlets and cables
- Study and realization of SMATV satellite TV signal reception systems with universal LNB for single-family home with single SAT outlet type
- Study and realization of SMATV reception systems with 4 output LNB type, TV satellite signal distribution by start and final multiswitch for apartment buildings (up to 4 users on different floors)
- Study and realization of "mixed" MATV and SMATV single cable systems, with SAT and DTV "demix" outlets



Extended training program using the Field meter with noise generator mod. TS3-M/EV (not included):

- Correct pointing of TV antennas and satellite dishes
- Measure signal level and attenuation with accurate results
- Visualize the spectrum of the received signal
- Visualize the received terrestrial or satellite TV program
- Analysis of TV / IF SAT / CATV amplifiers and distribution networks
- Attenuation of cables and passive components measurements

TECHNICAL SPECIFICATIONS

- Table-top metallic framework with fore panel of insulating material; tilt adjustment for easy use sitting or standing
- No. 1 Antenna, band III - RF F-type connector
- No. 1 Antenna, band V - RF F-type connector
- No. 1 Floor stand with tripod base and pole for TV antenna indoor use
- No. 1 Lte free amplifier, 3 band inputs III/UHF/UHF - RF output combining all the input signals - Gain 24/30/30 dB - Adjustment 15dB for each input - Output level 115 dBμV - RF input / output F-type connectors
- No. 1 power supply unit 230 V~ / 12 Vcc - 200 mA with F-type connector for RF input / output
- No. 1 two-way divider for distribution from 5 to 2400 MHz - Insertion loss 4-6 dB - Output separation 22-23 dB - DC switching between outputs and input - F-type connectors
- No. 2 four-way switches for distribution from 5 to 2400 MHz - Insertion loss 3,5-5,4 dB - Derivation loss 11,5-15,5 dB - Output separation 35-28 dB - Post DC switching - F-type connectors.
- No. 4 simple user plugs (terminals), IEC male connector Ø 9,5 mm - Class A
- No. 1 Steel parabolic antenna, 1 m diameter, offset type
- No. 1 LNB single universal Lte (1 independent output with F-type connector)
- No. 1 universal LNB four Lte (outputs with separate polarity H/V with 4 F-type connectors)
- No. 1 Floor stand with tripod base and pole for parabolic antenna indoor use
- No. 1 Starting multiswitch 4 SAT input (separate polarities H/V) - 4 Derivative output with gain -8 dB for typical pass-through installation - Switching type 14/18 V, 0/22 kHz - F-type connectors
- No. 1 Final multiswitch 4 SAT input (separate polarities H/V) - 4 Derivative output with gain 0 dB for typical terminal installation - Switching type 14/18 V, 0/22 kHz - F-type connectors
- No. 4 SAT simple user plugs (terminals), F-type connector - Class A
- No. 1 TV SAT mixer - insertion loss 0,5 dB - F-type connectors
- No. 1 user plug demixed with SAT+TV cable input, a TV plug IEC male connector 9,5 mm a SAT plug F-type connector - Class A

Power supply: 230 Vac 50/60Hz - 10 VA

Dimensions: 810 x 400 x 600 mm

Weight: 12 kg

SUPPLIED ACCESSORIES

- n. 60 RF F-type screw-on connectors
- No. 10 RF connectors F-type female to female coupler
- n. 25 right angle male to female coupler
- n. 5 IEC TV plugs, Ø 9,5 mm, female
- n. 5 terminating resistances, 75 Ohm, isolated
- n. 5 loads, 75 Ohm
- Cable for TV antennas, 100 m

Note: the items described above are supplied to develop different types of antenna installations and may not be used directly in the panel assembly.

OPTIONALS

FIELD METER WITH NOISE GENERATOR Mod. TS3-M/EV

To carry out an extended training program



32" FULL HD LED TV WITH BUILT-IN DIGITAL TERRESTRIAL AND SAT RECEIVER

With HDMI port for use as a PC monitor for classroom activity on antenna installation

SUPPLIED WITH

STUDENT MANUAL

PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION



TRANSMISSION LINES AND ANTENNAS

Mod. LA/EV

INTRODUCTION

The equipment mod. LA/EV is designed to examine the typical characteristics and practical aspects of transmission lines and antennas:

- Impedance matching
- signal propagation along the transmission lines
- radiation
- electromagnetic propagation
- other subjects exhaustively explained with simple experimental exercises.

Besides several kinds of antennas can be built up to obtain different systems and some radiant elements include a lamp system that points out the current distribution among the elements.

TECHNICAL SPECIFICATION

- RF transmitter:
 - UHF programmable Frequencies
 - Power: 1.5 W maximum, Adjustable with automatic level control (ALC)
 - Output impedance: 75 Ω
 - Modulation: amplitude of 1000 Hz
 - Wobulation; ± 15 MHz
 - 2 battery chargers for field strength meters
- Reflectometer bridge:
 - Operating frequency: 1-860 MHz
 - Impedance: 75 Ω
- Variable-gain selection amplifier
- Field strength meter:
 - Led bar indicator
 - Powered by rechargeable batteries
- Voltage and current detectors:
 - Led bar indicator
 - Powered by rechargeable batteries
- VSWR meter made with the reflectometric bridge
- Slotted line:
 - Impedance: 75 Ω
 - Length: 44 cm
 - including: 2 sensors for voltage measurement and 2 sensors for current measurements
- Balanced lines, 300 and 75 Ω
- Coaxial lines:
 - Coaxial cables of different length at 75 and 50 Ω , at $\frac{1}{4}$ and $\frac{1}{2}$ lambda
- Antenna stand system with graduated base for radiation diagram measurements
- Dipole with lamps for displaying the current distribution in the dipole
- Thin dipole - Thick dipole
- Balanced/unbalanced transformer 4:1 (300/75 Ω)
- Balanced/unbalanced transformer 1:1
- Passive elements of different length for realizing reflectors and directors in YAGI antenna
- GROUND-PLANE antenna with radial elements of variable inclination
- Slotted antenna (SLOT)
- Spiral antenna with circular polarization
- Broadband BATWING antenna
- Storage tray for the components

Power supply: 230 Vac 50 Hz single-phase - 50 VA
(Other voltage and frequency under request)

Dimensions: 605 x 255 x 470 mm (tray)

Total weight: 26 kg

SUPPLIED WITH

THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND PARAMETERS VARIATION



TRAINING PROGRAM

- Transmission lines:
 - Characteristic impedance
 - Different types of lines
 - Impedance matching
 - Impedance mismatching
 - Mismatching effects: standing waves
 - Impedance matching with lambda/4 transformer
 - Propagation speed
 - Speed factor of a line
 - Measurement of the losses on a line
- Basic antennas:
 - Radiation of a balanced line
 - Impedance matching between generator and antenna
 - Radiation of an open balanced line: dipole
 - Voltage and current distribution in a dipole
 - Conditions for the radiation: resonance frequency
 - Band-pass of thin and thick dipole
 - Radiation diagram: horizontal polarization and vertical polarization
 - Folded dipole
 - Slot antenna
 - Ground plane antennas
- Composite antennas:
 - Passive elements: YAGI antennas with reflector and directors
 - Radiation diagrams of YAGI antennas
 - Bandwidth of YAGI antennas
 - Circular polarization: spiral antennas
 - Broadband antennas: Batwing antennas

KIT FOR RF MEASUREMENT

Mod. ME-1/EV

INTRODUCTION

The KIT FOR RF MEASUREMENT mod. ME-1/EV is an option to be used together with TRANSMISSION LINES AND ANTENNAS Trainer mod. LA/EV.

This kit includes a set of professional components to allow precise measurements on the components of Trainer mod. LA/EV.



TECHNICAL SPECIFICATION

- 1 Spectrum Analyzer:
 - Measuring Range: > 10 dBm
 - Resolution: selectable
 - 4.5" CRT display, high resolution for both spectrum and level
 - LCD display for frequency indication
 - Max. attenuation: > 40 dB
 - Rechargeable batteries
- 1 calibrated attenuator:
 - Programmable via switch
 - Max. attenuation: 42 dB
 - Programming steps: 1, 2, 3, 6, 10 and 20 dB
- 1 Detector:
 - Max. input power: +22.5 dBm
 - Measuring Range: -40 to +15 dBm
- Measurement Frequency: 1000 MHz
- Connectors: BNC
- Impedance: 75 Ω

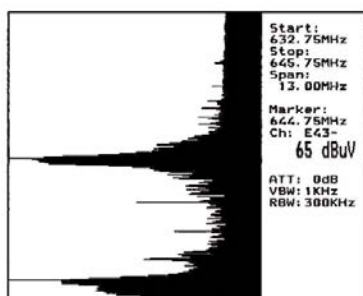
Power supply: 230 Vac 50 Hz single-phase - 30 VA
(Other voltage and frequency under request)

Dimensions: 330 x 280 x 150 mm (package)

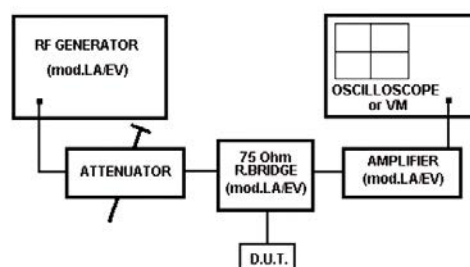
Total weight: 4 kg

TRAINING PROGRAM

- Measurements of:
 - Power (dBm and W)
 - Voltages (dB μ V)
 - Attenuation due to signal losses
 - Return Loss
 - VSWR (Voltage Standing Wave Ratio)
 - Reflection Coefficient
- Analysis of signal spectrum/level



Example of spectrum display



SUPPLIED WITH

THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION



ANTENNA MEASURING SYSTEM

Mod. ANT-M/EV

INTRODUCTION

With the ANTENNA MEASURING SYSTEM, learners can analyze and characterize single antennas and arrays, starting from the UHF band up until microwaves, through simple yet effective experiments:

- Impedance matching: RL and SWR
- Radiation: antenna gain, 2D/3D radiation diagrams and planes of polarization
- Antenna Arrays



The **ANTENNA MEASURING SYSTEM mod. ANT-M/EV** is a complete system composed of:

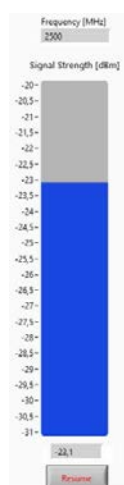
- 1 Transmitter, including:
 - PLL dual-band synthesized RF generator (1GHz and 10GHz)
 - Support for reference antenna
- 1 Receiver, including:
 - Synthesized PLL RF reception system
 - Motorized rotating support for D.U.T (Device Under Test)
 - Data acquisition system, that both acquires the RF signal and controls the motorized system
 - USB port to connect the system to a supervising PC
- Several types of antenna for 1 GHz and 10 GHz bands
- 1 Directional coupler to measure the Return Loss
- 1 supervision and control software, to configure and control the system. It enables to analyze the received data and represent them graphically on a PC screen

The following optional accessories are available:

- **Phase Shifter 1 mod. ANT-S1/EV:** this module inserts a phase shift at the input of one of two equal antennas composing an array. It also enables to continuously regulate the phase, and to analyze the changes in the array polar diagram. For example, learners can observe how a phase variation in only one of the two antennas composing an array converts a Broadside Array into an Endfire Array.
- **Phase Shifter 2 mod. ANT-S2/EV:** this module has the same features of mod. ANT-S1/EV, except it is controlled by a microprocessor and its phase is calibrated.
- **Directional Coupler 1 mod. ANT-C1/EV:** this module measures the Return Loss in the 2200-2600 MHz band.
- **Directional Coupler 2 mod. ANT-C2/EV:** this module measures the Return Loss in the 10-11 GHz band.

TRAINING PROGRAM

- Analysis and operation of antennas
- Characteristics of antennas:
 - Antenna gain
 - Directivity and beamwidth
 - Polar radiation diagram
 - EM wave polarization: Linear (H/V) and Circular (RHCP, LHCP)
 - Impedance matching
 - Antenna arrays: use of combiners
- Units of measurement:
 - dB, dBm, RL, VSWR
- Measurements in 1 GHz and 10 GHz band:
 - Received Signal Strength Indicator (RSSI)
 - Noise Floor analysis
 - Received signal level vs Frequency
 - Antenna gain vs Frequency
 - Antenna gain vs Angle
 - 2D and 3D polar diagram
- Assembly and mechanical installation of single antennas and arrays



RSSI bargraph

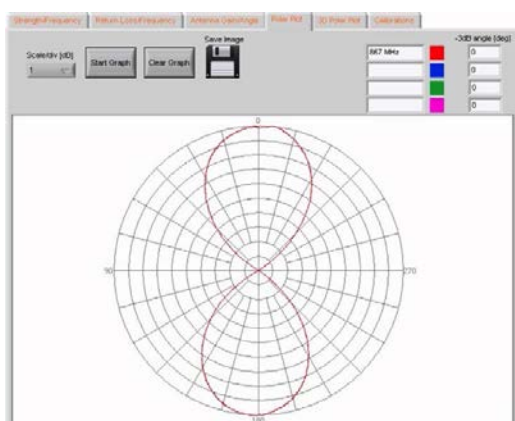
- Alignment of transmitting and receiving antennas
- Measurement of the antenna gain by comparison, using path attenuation
- Software setup:
 - Transmitter and Receiver calibration with distance setting
 - Reference antennas calibration
 - Directional coupler calibration
- Antennas:
 - Single antennas: directional and omnidirectional
 - Linear arrays using omnidirectional antennas: Broadside and Endfire Array
 - Planar array using directional antennas: Array composed of 4 antennas
- Antenna arrays:
 - Effect of a phase shift inserted in the feed of one antenna in the array (Phased Array)
 - Effect of the distance between antennas in the array



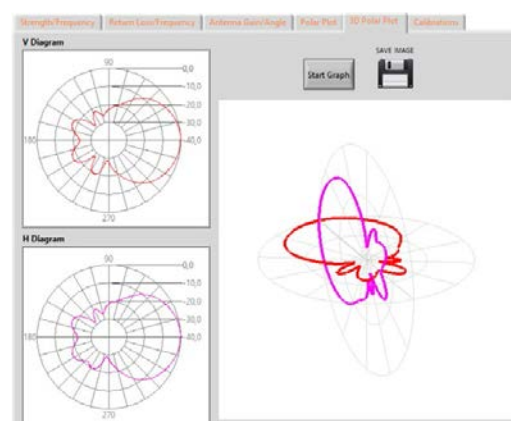
Gain vs Angle - cartesian graph



Gain vs Frequency - cartesian graph



Gain vs Angle - polar graph



Vertical & Horizontal plane

3D pattern

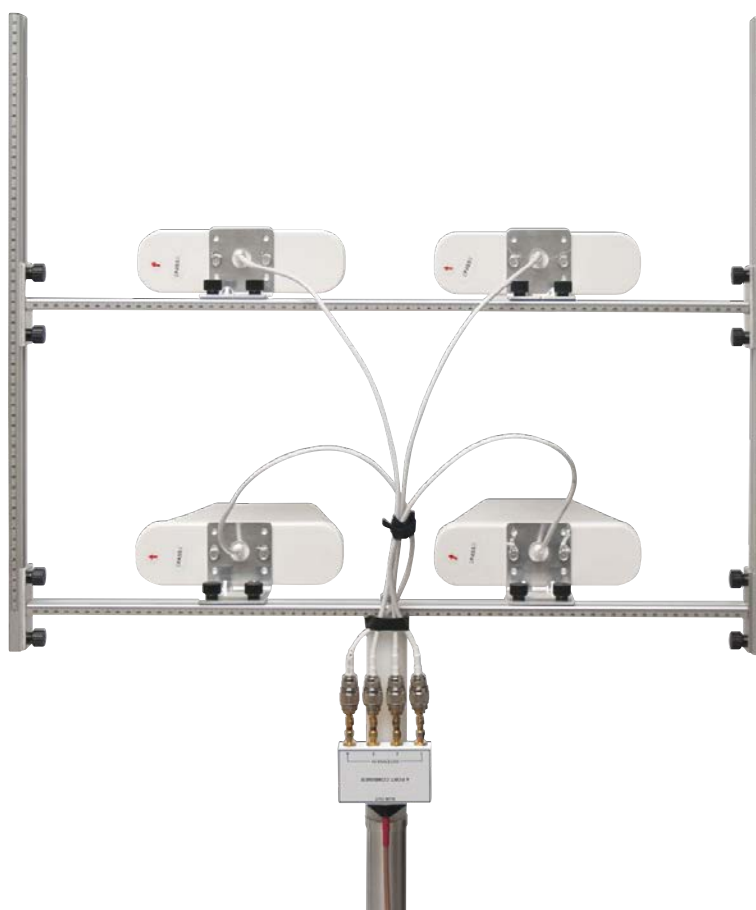
TECHNICAL SPECIFICATIONS:

- Transmitter:
 - Low Band RF Generator: +7dBm RF level, 850-2700 MHz band, 1MHz step
 - High Band RF Generator: 0dBm RF level, 10-11 GHz band, 1MHz step
 - Synthesized Reference oscillator with PLL control and thermo-stabilized frequency reference
 - Vertical support for reference antenna: non-rotating, adjustable height from 1.08 to 1.55m
 - Proprietary port to connect the receiver
 - Proprietary port to connect the directional coupler
 - Safety feature: the RF generator is only active during the necessary time required to perform measurements. A LED lights up to alert the user.
 - Dimensions: 310x310x1100 mm
- Receiver:
 - Low Band and High Band RF receiver, 1MHz step, 300kHz BW, 65dB range
 - Synthesized tuner with PLL control, frequency conversion and high-selectivity IF S.A.W. filters
 - Data acquisition system resolution: 10bit
 - USB port for PC
 - Support for reference antenna or D.U.T.: 360° rotation with motorized control, 0.2° resolution, 1.1m height
 - Proprietary port to connect the transmitter: provides electrical power and control of the system
 - Acoustic protection: intermittent sound signalling the ongoing rotation of the support
 - Mechanic protection: every antenna or array is fixed at a minimum height of 1.1m from the table where they are placed
 - Electrical plug to connect the system to the mains
 - Dimensions: 310x310x1100 mm
- Directional coupler 1GHz/2GHz:
 - measures the reflected component of the signal, caused by the D.U.T. mismatch to the standard 50 Ohm impedance
 - Active RF Detector
 - Bands: 850-1000 MHz and 1700-2200 MHz
 - Directivity: >17dB
 - RF output to connect the D.U.T.
 - RF input to connect the coupler to the RF generator output
 - Cable to connect the transmitter, in order to send data and provide power to the module
- Directional antennas:
 - 2 Yagi, 8 elements
 - 1 Patch Panel
 - 4 Log Periodic
 - 2 Horn 10dB
 - 1 Horn 15dB
 - 2 Helical (RHCP)
 - 1 Helical (LHCP)
- Omnidirectional antennas:
 - 2 Monopole $\frac{1}{4} \lambda$ (1 helical)
 - 2 Ground Plane
- Parabolic reflector:
 - Diameter: 360mm
 - f/D: 5
- 2 Waveguide-to-coax adaptors:
 - Waveguide: WR75
 - Flange: UBR120
 - Coaxial connector: SMA
- Shield for monopole antennas:
 - 300x300mm
- Combiners:
 - 2 input ports and 1 output port
 - 4 input ports and 1 output port
- Phase Shifter:
 - 5 SMA-SMA elements
- Characteristic impedance of all the components (generators, receivers, directional coupler, antennas and combiners): 50 Ohm
- Available measurements:
 - Received signal total strength
 - D.U.T. Return Loss
 - Cartesian graph: received signal strength trend depending on frequency
 - Cartesian graph: antenna gain trend depending on frequency
 - Polar diagram/graph: response of the antenna depending on the angle, with a preset frequency
 - Polar 3D diagram/graph: response of the antenna depending on the planes of polarization H/V, with a preset frequency
- Distance between transmitter and receiver:
 - 2 - 5m
- Assembly of complex antennas:
 - Directional Broadside Array using omnidirectional antennas
 - Directional Endfire Array using omnidirectional antennas
 - Linear Array using two directional antennas
 - Planar Array using four directional antennas
 - Antenna for microwaves composed of a feeder and a parabolic reflector
- Examples of possible experiments:
 - Analysis of the characteristics of an antenna in both planes of polarization H/V
 - Noise floor measurement with source localization and frequency measurement
 - Influence on measurements and analysis of interferences caused by other electric appliances located near the system (cellphones, GSM base stations, Wi-Fi networks or television transmitters)
 - Measurement errors caused by the presence of an operator near the system: importance of the absence of obstacles near the receiver and of the lab layout
 - Effect of the presence/absence of a ground floor with a monopole antenna
 - Influence of the distance between feeder and parabolic reflector on the gain of a microwave antenna
 - Variations in the radiation diagram of an array inserting a phase shift in one antenna at a time, and modifying the distance between them
 - Effects on the received signal amplitude using transmitting and receiving antennas with same/different linear/circular polarizations
 - It is also possible to use the system to analyze antennas realized or purchased separately by the customer

- Supervision and Control software, to be installed in **one PC (not included)**:
 - Measurement angle: 360° (0.2° resolution)
 - Frequency range and measurement gain: adjustable by the user
 - The user can set the software to calibrate the system according to the types of antenna and directional coupler being used
 - Up to 4 diagrams for each graph (linear or polar)
 - Possibility to save measurement images in jpg format
 - Possibility to save configuration and calibration data in txt format
- Units of measurement:
 - dB: relative and selectable among 1, 2, 3, 5, 6 or 10dB
 - dBm: absolute, with selectable range to adapt the measurement to the graph
 - VSWR: relative, with selectable range for values >0 to adapt the measurement to the graph
- Supplied accessories:
 - USB cable (5m) to connect the receiver to a PC
 - Multipolar cable (5m) to connect the transmitter to the receiver
 - Coaxial cables
 - Coaxial adaptors: BNC, SMA, N
 - Supports for antennas: fixed and adjustable, with possibility to modify the plane of polarization
 - Every necessary component for the operation of the system is included

Power supply: 100/240 Vac 50/60 Hz single-phase - 30 VA
(Other voltage and frequency under request)

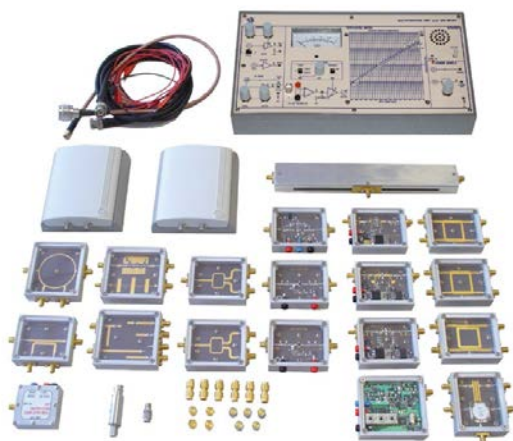
Weight: 30 kg



4 antenna array - Rear view

MICROSTRIP LABORATORY

Mod. MW-A1/EV Mod. MW-A2/EV



Microstrip Trainer mod. MW-A1/EV

This laboratory consists of two separate systems and of an optional accessory:

- **Microstrip Trainer mod. MW-A1/EV**, realized with microstrip components (19 units: 8 active and 11 passive circuits, 2 antennas), which performs more complete microstrip experiments. This is the Microstrip basic configuration
- **Calibration and Measuring Kit mod. MW-A2/EV**, including:
 - a Scalar Network Analyzer, which enables measurements of S-parameters (S21 and S11), frequency, gain, power and return loss, by using a powerful software application (**PC required – not included**);
 - an adjustable Selective Filter, used to adjust and calibrate resonant cells with the Scalar Network Analyzer, so that the required specifications (gain flatness, frequency range, return loss) can be obtained.

Note: the Scalar Network Analyzer can be used for measurements with all components included in Microstrip Trainer mod. MW-A1/EV
- **Digital Controlled Attenuator mod. MW-A3/EV** is an optional unit. It is a 1dB-step high-precision attenuator which can control the attenuation between its in and out ports digitally by means of pushbuttons. Moreover a digital display shows the selected attenuation. It is used during the measurements whenever the exact attenuation must be detected: insertion loss, antenna gain, Radio-Link path loss...

INTRODUCTION

This MICROSTRIP TECHNOLOGY TRAINER is designed to study and test the electronic components used in the field of microwaves. In fact this technology is applied in modern satellite receivers and cellular telephones, in "consumer" field, as well as in telephone and TV radio links, in instruments, in Up-converters transmitting to satellites and in modern radars, as regards the "professional" field.

This laboratory consists of a set of components and devices enabling to carry out a sequence of modular exercises for understanding the technology and operation of the single module as well as of the whole system.

In detail, it is possible to analyze and test the following main aspects of microstrips and their applications in communication systems:

- Microstrip components: active and passive
- Antennas for microwaves
- Microwave measurements

MICROSTRIP TRAINER mod.MW-A1/EV

TRAINING PROGRAM

- Introduction to microstrip:
 - Constructional structure
 - Signal propagation
 - Characteristics and performance
- Microstrip technology components:
 - Active components: PIN diode modulator, voltage controlled oscillators, MMIC amplifiers
 - Passive components: filters, resonator, directional and hybrid couplers, power divider, circulator, selective and wideband matched loads, impedances, bias networks, patch antenna, detector
- Microwave measurements:
 - Attenuation and Gain
 - Insertion loss
 - Impedance matching
 - SWR
 - Power
- Experiments:
 - power division
 - balanced amplifier
 - pulsed modulation
 - Amplitude/band measured by XY-mode

Oscilloscope and spectrum analyzer (**not included**)

TECHNICAL SPECIFICATION

- Active and passive components:
 - Mounted into metal units
 - Teflon substrate with gold-plated stripline (VCO unit excluded)
- Multifunction unit including:
 - VSWR/Level Meter
 - Sine, Square and X-axis Wave Generators
 - Loudspeaker with AF amplifier
 - Main Power supply with fixed and adjustable outputs
- 1 LOG Detector diode
- 1 LOG Detection unit:
 - Calibration sheet
 - 70dB dynamic range
- 1 VCO (voltage controlled oscillator) unit:
 - ISM band
 - Frequency controlled by external Voltage or internal PLL circuit
- 1 four-port Directional coupler unit
- 1 Filter unit: LPF and HPF
- 1 Circulator and BPF Filter unit
- 2 Power divider units: 2-port Wilkinsons
- 1 Rat Race Hybrid coupler unit
- 1 Ring resonator unit: Notch and Band-Pass Filters
- 2 Branch Line Coupler units: quadrature hybrid coupler
- 1 PIN diode modulator unit
- 1 Load unit:
 - 3-Matched loads: selective and wideband
 - 3 load impedances
- 2 MMIC Monolithic integrated amplifier unit
- 1 adjustable Stripline module for VSWR measurement

- 3 GaAsFET Amplifier unit with different Bias network:
 - Butterfly, Direct and PAD
- Adjustable VSWR measure stripline unit
- 2 Patch microstrip antennas:
 - 2 SMA IN connector
 - Dual Polarization
 - 8.5 dB Gain
- 5 Matched termination
- 2 Short-circuit termination
- 2 Open-circuit termination
- 1 20dB coax attenuator
- 10 SMA-SMA plug adapter
- 1 BNC-BNC coax cable
- 1 SMA-N coax cable
- 2 SMA-SMA coax cable
- Frequency range: 2.3 - 2.7 GHz
- IN/OUT: 50 Ohm impedance, SMA female
- Handy aluminum suitcase

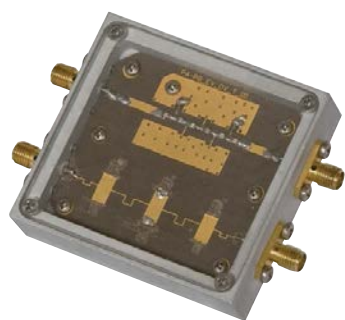
Power supply: 230 Vac 50 Hz single-phase - 25 VA
(Other voltage and frequency under request)

Dimensions: 580 x 210 x 460 mm (tray)

Weight: 14 kg

SUPPLIED WITH

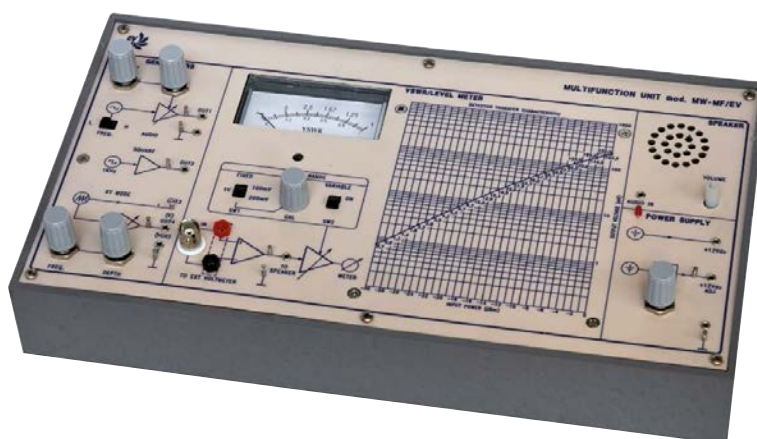
THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND PARAMETERS VARIATION



Filter module

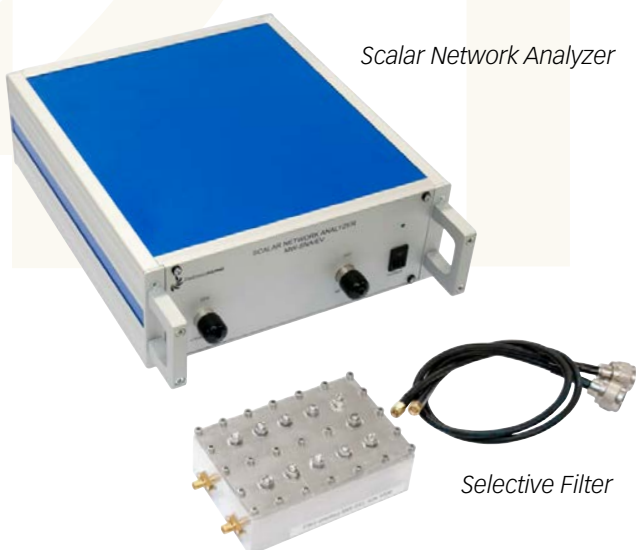


VCO module



Multifunction unit

CALIBRATION AND MEASURING KIT mod. MW-A2/EV



Scalar Network Analyzer

Selective Filter

Calibration and Measuring Kit mod. MW-A2/EV, including:

- a Scalar Network Analyzer, which enables measurements of S-parameters (S21 and S11), frequency, gain, power and return loss, by using a powerful software application (**PC required – not included**);
- an adjustable Selective Filter, used to adjust and calibrate resonant cells with the Scalar Network Analyzer, so that the required specifications (gain flatness, frequency range, return loss) can be obtained.

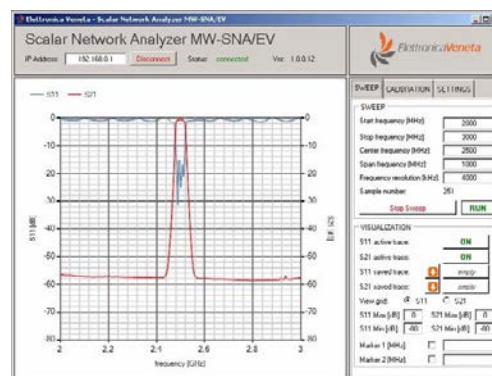
Note: the Scalar Network Analyzer can be used for measurements with all components included in Microstrip Trainer mod. MW-A1/EV.

TRAINING PROGRAM

- Scalar Network Analyzer:
 - Dedicated Instrument complete of Application software
 - RF instrument configuration and operation
 - S-parameter measures: S21 and S11
- Selective Filter:
 - Professional Band Pass Filter unit
 - Regulation and calibration
 - Measures of Gain flatness, frequency range and RL

TECHNICAL SPECIFICATION

- Scalar Network Analyzer:
 - Measurement Frequency range: 2200 - 2900 MHz
 - Output Power: -2 dBm
 - ± 0.5 dB (2400 - 2900 MHz)
 - ± 1 dB (2200 - 2900 MHz)
 - Frequency resolution: 1kHz (min)
 - Frequency step: 100kHz (min)
 - S11 resolution step: 0.01 dB/Div (min)
 - S21 resolution step: 0.1 dB/Div (min)
 - Sweep generator
 - Detector
 - 3 ports directional coupler
 - Internal frequency reference: TCXO
 - Output power level: 4096 steps
 - All generator functions are PC remote controlled by means of a Ethernet RJ45 interface
 - IN/OUT: 50 Ohm impedance, N female
- PC Application software for configuration and use of the instrument: requested 1 PC (not included); selectable languages: English, Spanish, French
- 2 SMA-N coax cable
- 1 SMA-SMA adapter
- Selective Filter
 - 5 sections: cavity resonator
 - 5 tuning and 4 coupling controls externally adjustable
 - IN/OUT: 50 Ohm impedance, SMA female
- Components set holder in aluminium



Application Software

DIGITAL CONTROLLED ATTENUATOR (OPTIONAL) mod. MW-A3/EV

TECHNICAL SPECIFICATION

- Attenuation range: 6 to 66 dB
- Resolution step: 1dB
- Energy saving and store functions
- 2-digit display
- Power supply: 12 Vdc (from Multifunction unit)
- Maximum Input power: +27 dBm
- IN/OUT: 50- Ω impedance, SMA female



Digital controlled attenuator (mod. MW-A3/EV)

MICROWAVE LABORATORY

Mod. MW-B-C/EV

INTRODUCTION

The MICROWAVE LABORATORY is designed to study and test waveguide electronics and components used in the field of microwaves.

In detail, it is possible to analyse and carry out experiments in the principal aspects of microwaves and their application to communication systems:

- Active and passive components
- Waveguides and antennas for microwaves
- Audio/Video/Data communication systems and Measurements on microwaves



The laboratory consists of a main system and an optional accessory:

- **Waveguides, Antennas and Microwave Audio/Video communication System Mod. MW-B-C/EV** enables to study and test lines, antennas and transmissions used in the field of microwaves and to carry out a complete microwave radio link for the transmission and reception of an Audio/Video signal.
- **Gunn Kit mod. MW-G/EV** is an optional system that uses a Gunn diode mounted on a cavity as RF source in microwaves.

In detail, it is possible to analyze and to experiment the following main aspects of microwaves and their applications in communication systems:

- Microwave generation
- Waveguide components
- Antennas for microwaves
- Microwave propagation
- Measurements on microwave systems

Besides its primary function, it also has high potentialities. In fact, if used with other equipment manufactured by Elettronica Veneta, it enables to carry out modular systems of high performance and complexity, such as:

- a directional (one way) transmission channel for PCM-TDM Audio/Data/PC signals, realized with 1 mod. MW-B-C/EV and 1 MCM32/EV: it simulates a PCM telephone microwave link;
- a directional (one way) transmission channel for PCM-TDM Audio/Data/PC signals, realized with 1 mod. MW-B-C/EV and 2 mod. MCM32/EV: it simulates the operation of transmitting and receiving stations (physically separated) and the use of a microwave link between two PCM Central units;
- a bidirectional (two-way) transmission for PCM-TDM Audio/Data/PC signals, realized with 2 mod. MW-B-C/EV and 2 mod. MCM32/EV: it simulates the operation of transmitting and receiving stations (physically separated) and the use of a bidirectional microwave link between two PCM Central units.

MICROWAVE WAVEGUIDES, ANTENNAS AND AUDIO/VIDEO COMMUNICATION SYSTEM - mod. MW-B-C/EV

TRAINING PROGRAM

- General microwave theory
- Overview of electronic devices and passive components of the laboratory
- Characteristics of:
 - microwave components
 - waveguide and flange
 - Horn antennas and parabolic reflector
 - reflection and polarization system
- Oscillator
- Frequency measurements
- Wavelength measurements in waveguide and free space
- Direct and reflected power measurements
- Power splitting and impedance mismatch measurement
- SWR and impedance measurement
- Impedance calculation with Smith's chart
- Impedance matching
- Directional and T-hybrid couplers
- Gain and radiation diagram of microwave antennas
- Antenna Gain measurement:
 - comparison method
 - method of the two antennas
- Link attenuation
- Passive repeaters (mirrors)
- Modulation and transmission of microwave signals
- Reception and demodulation of microwave signals
- Frequency conversion with local oscillator and mixer
- Audio/Video point-to-point communication system
- Audio/Video Satellite communication system: Analog satellite receiver required (not supplied)
- Audio/Data communication system and communication between PCs (with 1 or 2 optional modules mod. MCM32/EV - not included)
- Doppler Radar: more antennas are used and the relationship between the object speed and the doppler signal is complied with.

TECHNICAL SPECIFICATION

- Operating frequency:
 - 10750, 10777, 10804, 10831 MHz
 - X and Ku band,
 - 4 channels with PLL frequency generation
- TX/RX link frequencies: 10750 or 10777 MHz
- Silver-plated internal waveguide
- 2 waveguides – coaxial adapter
- 3 straight-line waveguide (WG)
- 1 WG frequency-meter:
 - Range: about 10500 to 11000 MHz
 - Calibration report: 21 points inside the frequency range with 25 MHz steps and 4 points on the 4 output frequencies (10750, 10777, 10804, 10831 MHz)
- 1 WG slotted line
- 1 WG variable attenuator of 30 dB
- 2 WG fixed attenuators of 3 dB and 6 dB
- 1 coax fixed attenuator:
 - 50 Ω impedance
 - SMA/SMA connectors
 - Range: DC to 3000 MHz
 - 20dB Attenuation
- 3 WG Loading terminations:
 - 2 matched terminations of 1 W
 - 1 short-circuit termination
- 1 WG tuner/impedance matching unit E-H
- 1 Coax detector:
 - 50 Ω input
 - SMA/BNC connectors
 - Range: 10 to 12400 MHz
 - Max input level: +20 dBm
 - Negative polarity
- 1 WG 4 ports T-magic
- 1 WG directional coupler:
 - 3 ports
 - 20dB coupling
- 3 WG horn antennas:
 - 2 with 20 dB gain
 - 1 with 15 dB gain
- 1 parabolic antenna:
 - 0.36 m Diameter
 - f/D = 0.5
 - Gain: 29.5 dB (theoretical)
- 2 reflector planes:
 - 1 with 180 X 180 mm
 - 1 with 300 X 300 mm
- 1 Polarization plane:
 - with 180 X 180 mm
- 2 conversion units:
 - Up converter: LO 8350 MHz, +15 Vdc power supply
 - Down converter: LO 8296 MHz, +15 Vdc power supply
- 6 (high and low) supports and connection cables
- 1 Rotary table with bearing scale
- Microphone



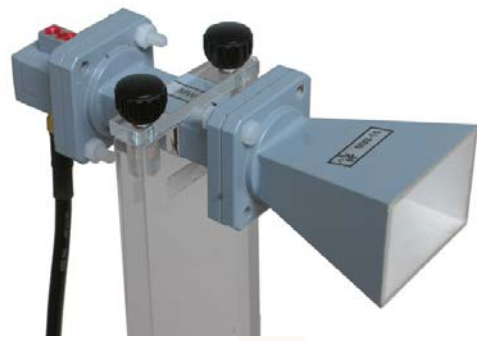
Wave guide components

- Transmitter unit including:
 - Regulated power supply protected from short-circuit
 - Audio generator
 - Video bar generator
 - Audio/video input
 - Audio modulator
 - Audio/video combiner
 - IF converter
- Receiver unit including:
 - Regulated power supply protected from short-circuit
 - IF demodulator
 - Audio demodulator
 - Audio/Video output
 - Loudspeaker with audio amplifier and volume control
 - LCD colour Video Monitor
- VSWR/LEVEL Measuring unit including:
 - Regulated power supply protected from short-circuit
 - Power and VSWR meter
 - Rechargeable battery with charge indicator
- 2 ALU tray for storing components

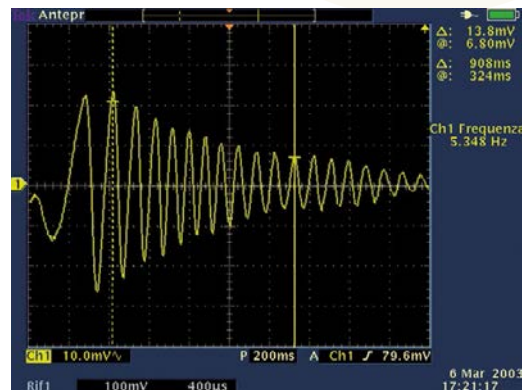
Power supply: 230 Vac 50 Hz single-phase - 90 VA
(Other voltage and frequency under request)

Dimensions: 620 x 460 x 230 mm (each tray)

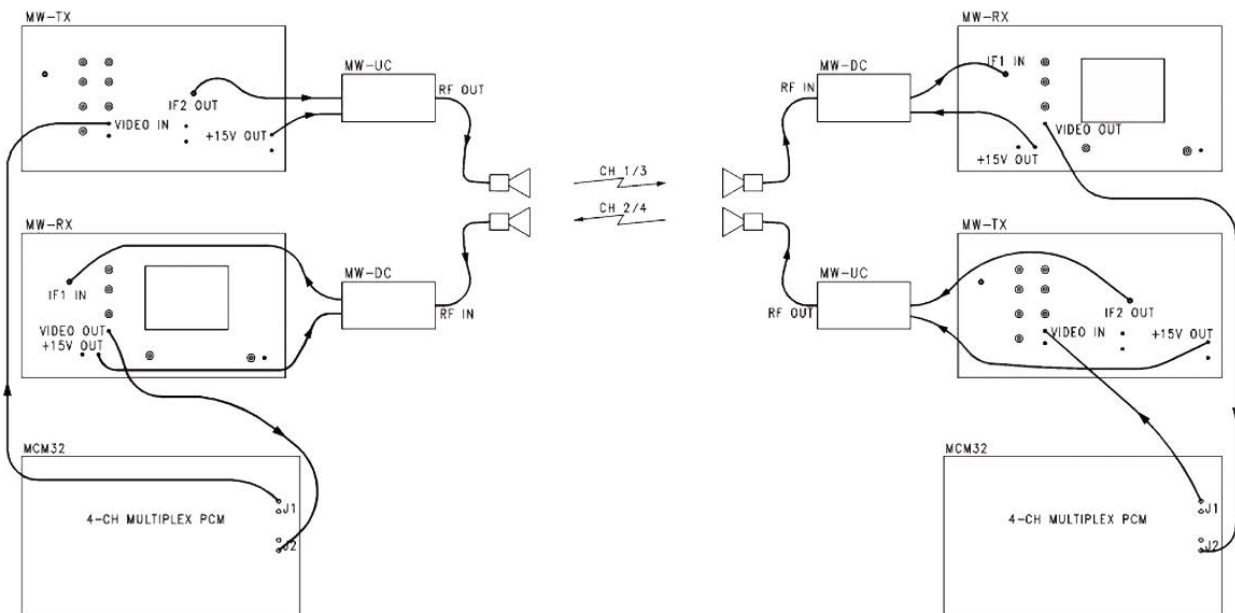
Total weight: 40 Kg



Matching unit + Antenna



Doppler signal



Example of bidirectional PCM - TDM Audio / Data / PC radio link

SUPPLIED WITH

THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION



GUNN KIT (optional) mod. MW-G/EV

TRAINING PROGRAM

- Gunn Diode Oscillator
- Gunn Transceiver: Gunn Oscillator and Schottky diode (mixer)
- Radar Experiment and frequency relation between the signal Doppler – object speed

TECHNICAL SPECIFICATION

- 1 WG horn Antenna suitable for Gunn Diode Oscillator:
 - Frequency: 10525 MHz
 - Gain: 12dB
 - Ray Amplitude: 70° (E plane) / 30° (H plane)
- Gunn diode oscillator frequency: 10525 MHz (X band)
- Gunn oscillator power output: +7 dBm



Gunn Transceiver

SATELLITE COMMUNICATION SYSTEM

Mod. MW-AS/EV

INTRODUCTION

The SATELLITE COMMUNICATION SYSTEM is designed to study and test lines, antennas and transmissions used in the field of microwaves.

In detail, it is possible to analyse and carry out experiments in the principal aspects of microwaves and their application to communication systems:

- Active and passive components
- Waveguides and antennas for microwaves
- Audio/Video/Data communication systems and Measurements on microwaves
- Satellite transponder simulation



TRAINING PROGRAM

- General microwave theory
- Overview of electronic devices and passive components of the laboratory
- Characteristics of:
 - microwave components
 - waveguide and flange
 - Horn antennas and parabolic reflector
 - reflection and polarization system
- Oscillator
- Gain and radiation diagram of microwave antennas
- Link attenuation
- Passive repeaters (mirrors)
- Overview of electronic devices and antennas making up a satellite transponder
- Frequency conversion: up converter and down converter
- Audio/Video Satellite communication system with Satellite Ku band repeater simulation
- Modulation and transmission of microwave signals
- Reception and demodulation of microwave signals
- Frequency conversion with local oscillator and mixer
- Audio/Video point-to-point communication system
- Audio/Video Satellite communication system

TECHNICAL SPECIFICATION

- Silver-plated internal waveguide
- 2 waveguides – coaxial adapter
- 4 coax fixed attenuators:
 - Impedance: 50 Ω
 - SMA/SMA connectors
 - Range: DC to 3000 MHz
 - Attenuation: 3, 6, 10, 20dB
- 1 coax detector:
 - Input impedance: 50 Ω
 - SMA/BNC connectors
 - Range: 10 to 12400 MHz
 - Max input level: +20 dBm
 - Negative polarity
- 2 reflector planes:
 - 1 with 180 X 180 mm
 - 1 with 300 X 300 mm
- 1 Polarization plane:
 - with 180 X 180 mm
- 4 supports and connection cables
- Microphone
- Transmitter unit including:
 - Regulated power supply protected from short-circuit
 - Audio generator
 - Colour Video bar generator

- Audio/video input
- Audio modulator
- Audio/video combiner
- IF converter
- Up-Link unit including:
 - IF Ku-band converter (14GHz) with output amplifier
 - WG horn antenna, 10 dB
- Satellite Transponder unit including:
 - receiver parabolic antenna with waveguide - coaxial adapter
 - Ku-band converter (14GHz-to-10,75GHz)
 - transmitter parabolic antenna with waveguide-coaxial adapter
- Down-Link unit including:
 - IF Ku-band converter (10.75GHz)
 - WG horn antenna, 10 dB
- Receiver unit including:
 - Regulated power supply protected from short-circuit
 - IF demodulator
 - Audio demodulator
 - Audio/Video output
 - Loudspeaker with audio amplifier and volume control
 - LCD colour Video Monitor

Power supply: 230 Vac 50 Hz single-phase - 90 VA
(Other voltage and frequency under request)

Total weight: 30 Kg

SUPPLIED WITH

**THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION**



MICROWAVE TRAINER

Mod. MW-E/EV

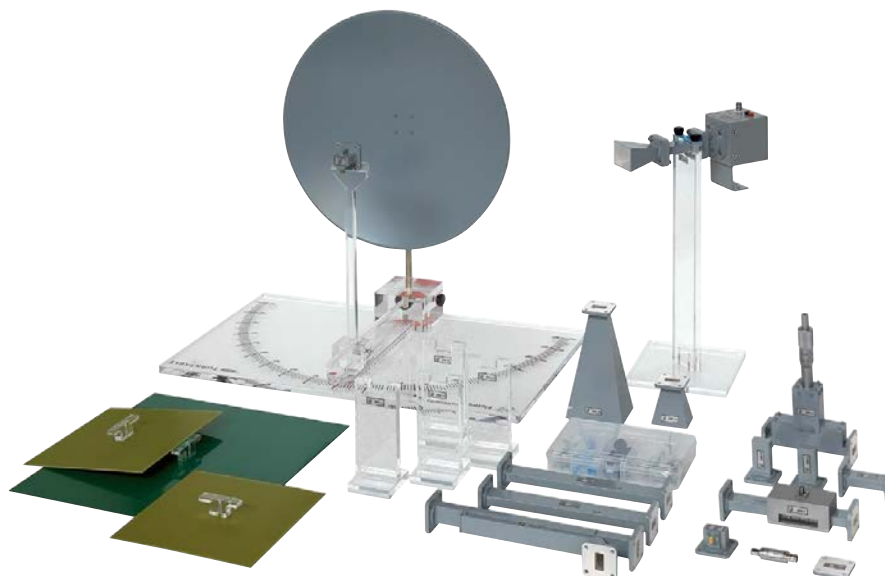
INTRODUCTION

This MICROWAVE TRAINER is designed to study and test lines and antennas used to broadcast information in microwave field.

In detail, it is possible to analyse and test the following major aspects related to microwaves and to their application in communication systems.

- Microwave generation with Gunn oscillator
- Waveguide Components and Antennas for microwaves
- Assembling and Measurements

This unit consists of a main Trainer and of a set of optional waveguide Components (WG).



TRAINING PROGRAM

- General microwave theory
- Characteristics of:
 - Microwave components
 - Waveguide and flange
 - Horn antennas and parabolic reflector
 - Reflection and polarization system
- Gunn Diode oscillator
- Gunn transceiver: Gunn oscillator and Schottky diode
- Measurement of direct frequency (**with opt. Mod. MW-E1/EV**)
- Wavelength measurement: in free space and WG
- Measurement of direct and reflected power
- Attenuation measurement
- Power division and impedance mismatching measurement (**with opt. Mod MW-E2/EV**) SWR and impedance matching measurement.
- Use of Smith's chart for impedance calculation
- Impedance matching (**with opt. Mod MW-E3/EV**)
- Signals separation in a transceiver system and transmitter protection (**with opt. Mod MW-E4/EV**)
- Directional couplers and T-hybrid
- Microwave antennas: gain and irradiation diagram
- Measurement of antenna gain:
 - comparison method
 - method of the two antennas
- Link attenuation
- Passive repeaters (mirrors)
- Doppler Radar with different antennas: it is possible to observe the relationship between the object speed and the received doppler signal

TECHNICAL SPECIFICATION

- Gunn oscillator Frequency: 10525 MHz (X band)
- Gunn oscillator output power: +7 dB
- Waveguide internal sheath: silver-coated
- 2 waveguides – coaxial adapter
- 3 straight waveguides (WG)
- 1 WG slotted line
- 1 WG variable attenuator of 30 dB
- 2 WG fixed attenuators of 3 dB and 6 dB
- 3 WG loading terminations:
 - 2 matched 1W and
 - 1 short-circuit
- 1 coaxial Detector:
 - Input: +20 dBm (max), 50 Ω , SMA, 10 – 12400 MHz
 - Output: BNC, negative polarity
- 1 WG directional coupler:
 - 3 ports, coupling 20 dB
- 3 WG horn antennas:
 - Gain of 10 dB (n.2) and of 15 dB (n.1)
- 1 parabolic antenna:
 - 0.36 m (diam.), 0.5 (f/D) and 29.5 dB (theoretical gain)
- 2 reflection planes:
 - dimensions: 180x180 mm and 300x300 mm
- 1 polarization plane:
 - dimensions. 180x180 mm
- 6 (high and low) supports and connection cables
- Rotary table with slider and graduated scale.

Power supply: 230 Vac 50 Hz single-phase - 20 VA
(Other voltage and frequency under request)

Dimensions: 620 x 460 x 230 mm

Total weight: 25 Kg



FREQUENCYMETER (optional) mod. MW-E1/EV

It is an optional waveguide (WG) component used for direct frequency measurements with the power absorption method.

- Calibration Report: 21-point Range.



T-MAGIC (optional) mod. MW-E2/EV

It is an optional waveguide (WG) component that can be used in six different situations.

- Four I/O ports.



TUNER / E-H IMPEDANCE MATCHING DEVICE (optional) mod. MW-E3/EV

This optional waveguide (WG) component can be used to improve the impedance matching of a transmission line or of a load not perfectly matched.

- Matching through 2 short-circuit stubs on E – H planes.



CIRCULATOR (optional) mod. MW-E4/EV

This optional waveguide (WG) component can be used to separate the signals in a Receiver-transmitter system or to protect the transmitter output.

- 3 ports: input, output and input/output.

SUPPLIED WITH

**THEORETICAL-EXPERIMENTAL MANUAL
PRACTICAL EXERCISES: MEASUREMENT AND
PARAMETERS VARIATION**



TV TRANSMISSION SIMULATOR

Mod. STT/EV

INTRODUCTION

TV TRANSMISSION SIMULATOR mod. STT/EV is designed to study the system for TV transmission (Broadcasting), including all the technological phases of this process, from the program producer to the final user. It consists of:

- Demonstration panel including a mimic diagram with luminous indicator and various controls
- Assistance Software for explanation and control having to be installed on a **PC (not included)**: a USB port of the PC is used and no hardware installations nor configurations are necessary in the demonstration Panel



The aims achieved by this simulator with a simplified and intuitive approach are:

- TV signal processing principles
- exhaustive supervision of the technological processes and of the various relevant sub-processes including the information less diffused on structure and technological processes actually existing
- knowledge of apparatus and systems of the various technologies used
- learning of measurements on radio signals

TRAINING PROGRAM

- The software supplies a lot of data concerning the devices used in actual applications. It includes images, video and animations which simplify the comprehension of subjects and enrich the contents.
- Video / Monitor TV source
- Transmission / reception systems:
 - Analog / Digital
 - Terrestrial
 - Satellite
 - Fixed / mobile radio link
 - Central TV reception equipment
- Operation environment:
 - Program provider
 - Broadcasting provider
 - Telecom Satellite provider
 - Users

- Video sources: Video pattern and colour camera
- TV signal display with colour LCD TV Monitor
- Selection and control of operating conditions by potentiometers, switches and pushbuttons for:
 - Video sources
 - TV signal
 - Analog / Digital transmission
 - Level of transmitted power I
 - Antenna positioner
 - Atmospheric noises
- Display with single and bar LEDs, digit displays of:
 - Transmission condition (on air)
 - Reception condition
 - Received signal intensity
 - Source/antenna/channel selection
- Atmospheric phenomenon simulator
- Monitoring and control of signals and parameters using the computer monitor that becomes a powerful real-time measuring instrument for complex TV signals
- PC connection (USB) with cable set

Power supply: 230 Vac 50 Hz single-phase - 50 VA
(Other voltage and frequency under request)

Dimensions: 930 x 460 x 730 mm

Weight: 29 kg

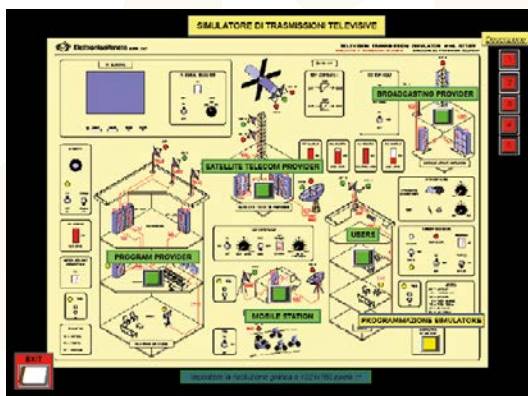
Software:

- Control and monitoring of parameters in the panel
- Real-time virtual tools of signals in the panel
- Hypertext with images and video

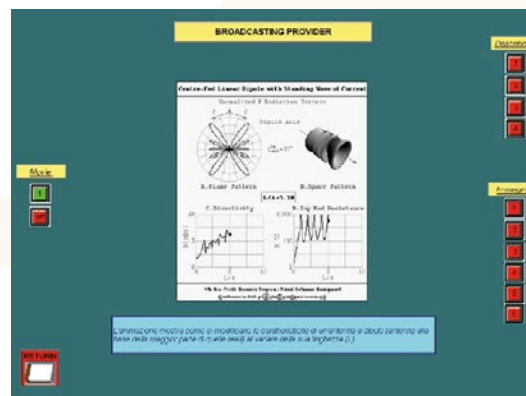
TECHNICAL SPECIFICATION

Synoptic Panel:

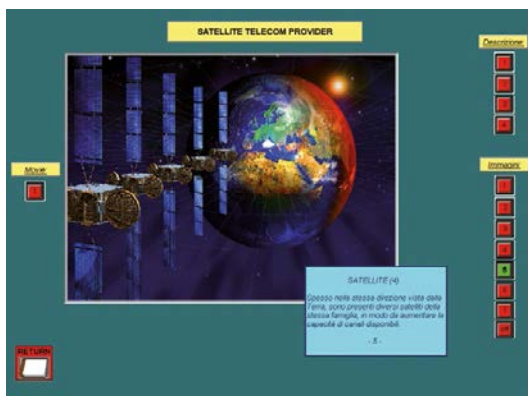
- Colour silk-screen printed panel
- Ø 2mm Test points



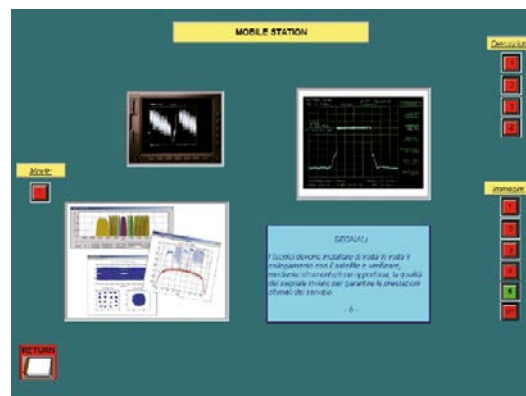
Introducing the Software



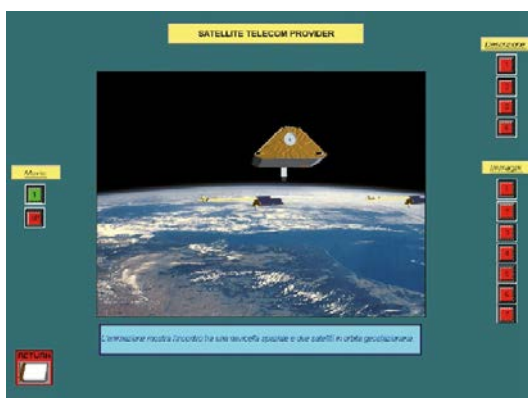
Animation of an antenna design



Representation of a satellite



Some typical signals



Animation of a satellite in motion

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION



CELLULAR TELEPHONE TRAINER

Mod. CTS2/EV

INTRODUCTION

The unit mod. CTS2/EV is a Trainer of the Mobile Telephony series, which enables the development of a theoretical-experimental course on the study of issues concerning cellular telephony, with a particular reference to the network, the characteristics of mobile telephones and the measurement techniques.

Trainer mod. CTS2/EV applies a modern electronic technology properly changed to improve the learning experience on the operation, measuring and troubleshooting.

The Theoretical-experimental manual supplied with the equipment will explain:

- the theoretical topics
- the international standards and
- the experiments with a guide for carrying out measurements, troubleshooting and setting the Trainer



TRAINING PROGRAM

- GSM (Global System for Mobile Communication) standard
- GSM Cellular Network and Radio cell:
 - MS (Mobile Station)
 - BTS (Base Transceiver Station)
 - BSC (Base Station Controller)
 - MSC (Mobile Switching Center)
- Channel Coding
- Gaussian Low-Pass Filter
- GMSK (Gaussian-Filtered Minimum Shift Keying) modulation
- GSM bands
- TDMA (Time Division Multiple Access) technology
- Functional characteristics of cellular telephone
- Experiments:
 - Measurements on different circuits of Cellular Telephone Trainer
 - Wireless Communication
 - two bi-directional connections between 4 Users
 - Troubleshooting
 - Use of spectrum analyzer **(not included)**

TECHNICAL SPECIFICATION

- 4 Phone Users
- Display: 16 character x 2 lines
- Keyboard: 4 lines x 4 columns
- DTMF (Dual Tone Multi Frequency):
 - Telephone tone generator
 - 2-Band filter decoder
- DSP IC:
 - it generates DTMF signal
 - it uses the keyboard for data input
 - it shows the number selected on the display
- PIC IC manages:
 - Display
 - Keyboard
 - Calls
- Built-in loudspeaker with adjustable power amplifier
- Selections:
 - Dialling
 - Incoming call answer
 - Radio channel
- Channel coding:
 - PCM (Pulse Code Modulation)
 - 8-bit word: 13-bit linear to pseudo-log 8-bits ADC (and DAC) by data companding
 - 8-kHz sampling frequency
 - baud rate of 64 kb/s

- TDMA Frame:
 - 4 User Time Slots
 - 1 Synchronism Time Slot
 - Time Slot display
- Smoothing Filter
- UHF Transmitter and Receiver:
 - 4 selectable channels by PLL circuit
 - RF channel frequency: 2400 to 2481 MHz
 - In/Out Impedance: 50 Ω
 - Transmitter Output RF Power: ≥ 10 dBm
- Channel Noise simulator
- Channel Attenuation simulator
- 2 Stylus Antennas
- Compact and strong metal box including:
 - Lifiable cover with block diagram
 - Electronic components and power supply
 - Schematic diagram including signalling LEDs, selection switches and 42 Measuring test points
 - Fault simulator: protected with key-locked cover and including 12 faults insertable by means of switches
- Cables as necessary
- Microphone

Power supply: 230 Vac 50 Hz single-phase - 30 VA
(Other voltage and frequency under request)

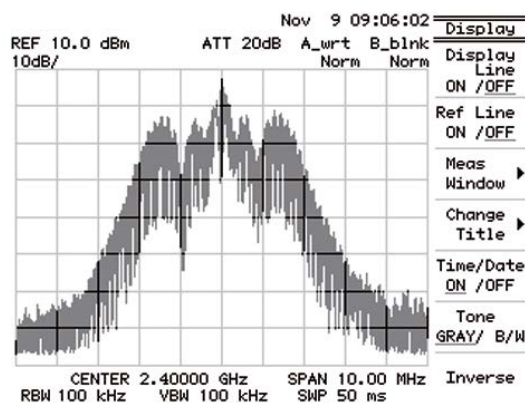
Dimensions: 445 x 335 x 135 mm (closed)

Weight: 13 kg

GMSK modulation diagram



Spectrum analyzer waveform sample

**SUPPLIED WITH**

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION, FAULT INSERTION

TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR



EDUCATIONAL PANEL ON OPTICAL FIBERS AND OPTICAL INSTRUMENTS

Mod. EFO41/EV

INTRODUCTION

Using the panel mod. EFO41/EV and the theoretical-experimental handbooks of its equipment will enable to carry out a modular theoretical-experimental course on optical fibers and on the electronic circuits and transmission systems using them. It consists of a panel mounted on the vertical support and includes optical instruments and different accessories.

In detail, the panel is provided with a silk-screen printed diagram showing the functional blocks, the test and signaling points, all connectors and the necessary sockets for the different circuit topologies and for an easy and immediate understanding of the operation of all its components.

Moreover professional optical instruments are used and also troubleshooting operations can be carried out.



- Bidirectional transmission system with one fiber
- Bidirectional transmission system with two fibers
- Synchronous data transmission
- Asynchronous data transmission
- Used components
 - digital transmitter
 - analog transmitter
 - digital receiver
 - analog receiver
 - FM modulator
 - FM demodulator
 - audio modulator and Audio+Video combiner
 - Video/Audio separator and Audio demodulator
 - data multiplexer
 - data demultiplexer
 - WDM (Wavelength Division Multiplexer)
 - data coding / decoding: NRZ, Manchester, bi-phase Mark / Space
 - V24/RS232C interface
- Characteristics of components:
 - Digital and linear driving
 - characteristic curves of the optical source
 - bias current
 - emitted power adjustment
 - "Optical power/current" curve of the source
 - operating point of the LED
 - characteristics and driving of Laser diode
 - automatic control of the power emitted by Laser diode
 - waveform of the transmitted signal
 - detector responsivity
 - characteristics and biasing of avalanche photodiode
 - receiver saturation
 - modal dispersion
 - linearity of the connection
 - frequency response of the connection
 - dimensioning of the connection
 - power margin

TRAINING PROGRAM

Introduction to optical fiber systems:

- Optical fibers
 - Constructional structure
 - Light propagation in optical fibers
 - Modal dispersion
 - Chromatic dispersion
 - Attenuation
 - Bandwidth
- Sources and detectors
 - Sources: Led and Laser
 - Optical detectors: PIN and avalanche photodiodes
- Connections and headings
 - Connections
 - Headings

Optical fiber communication systems:

- Digital transmission system
- Analog transmission system
- Video transmission system
- Transmission system between PCs
- Data Multiplexer transmission system

Measurements on optical fibers:

- Identification of components
- Structure of optical cables
- Numerical opening
- Attenuation
- Connectors

Troubleshooting

TECHNICAL SPECIFICATION

Silk-screen printed panel:

- Characteristics:
 - It contains the silk-screen printed panel
 - It contains the functional block diagrams
 - It contains the access and connection points, signalling and test points of system components
 - The rear side in transparent plastic enables to display all component parts
- Components included:
 - LCD colour Video Monitor
 - 2 amplified speakers with volume control
 - 300 meters of multimode connectorized graded-index 62.5/125 optical fiber
 - Pulse generator
 - Data generator (0, 1, 0/1, 4x0/4x1)
 - Sine generator
 - Input for external microphone
 - Video bar generator
 - FM modulator / FM demodulator
 - Audio modulator / Audio demodulator
 - Audio/Video combiner
 - Audio/Video separator
 - Audio amplifier with loudspeaker
 - Transmission interface / reception interface
 - LED optical source
 - LASER optical source and monitoring photodiode for automatic power control (APC)
 - Optical receiver with PIN photodiode
 - Optical receiver with avalanche photodiode
 - 8-channel data multiplexer
 - 8-channel data demultiplexer
 - Wavelength division multiplexer
 - Wavelength division demultiplexer
 - Data coders/ decoders: NRZ, Manchester, Biphase Mark Space
 - V24/RS232C/USB interfaces
- Audio/Video inputs
- Audio/Video outputs
- Test points, display, connection and regulation
- 10-fault simulator insertable by means on switches and protected with key-lock covering

Power supply: 230 Vac 50 Hz single-phase - 50 VA
(Other voltage and frequency under request)

Dimensions: 640 x 810 x 300 mm

Total weight: 25 kg

Kit for Numerical Opening evaluation:

- Characteristics:
 - Laser Source in visible
 - Support for connectorized fibers

Accessories:

- Cables as necessary
- Microphone

Optical cables:

- 4 3-m optical cables of graded-index connectorized fiber 62.5/125
- 1 3-m optical cable of step-index connectorized fiber 9/125
- 1 3-m optical cable of connectorized step-index fiber 200/230
- 1 5-m optical fiber with connectorized plastic fiber

Portable Optic Power Source:

- Characteristics:
 - Double light source: selectable in the first and second windows (850/1300 nm)
 - signalling LED
 - Adaptor for ST Connector included
 - ON/OFF control
 - solid external cover of soft plastic
 - suitable for portable use
 - perfectly combinable to be used with the portable optical power measuring unit
 - power supply from internal battery of 9 Vdc

Optical Power Source



Optical Power Measuring Unit

Portable Optical Power Measuring Unit:

- Characteristics:
 - triple light measure band: selectable in the 1st, 2nd and 3rd windows (850/1300/1500 nm)
 - it enables to identify and measure the optical power of an optical fiber and to carry out tests on cables and devices
 - LCD Control and level measure Display
 - Absolute and relative measurement: dBm and dB
 - Adaptor for ST connector included
 - ON/OFF control
 - solid external cover of soft plastic
 - suitable for portable use
 - perfectly combinable to be used with the portable optical power source
 - power supply from internal battery of 9 Vdc

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION, FAULT INSERTION
TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR



OPTIONAL

OTDR KIT Mod. EFO43-O/EV
- NOT INCLUDED -



LABORATORY FOR OPTICAL FIBER TECHNOLOGY

INTRODUCTION

The OPTICAL FIBER TECHNOLOGY LABORATORY has been designed to perform practical experiments with professional equipment and tools in the field of optical fibers.

In detail, it is possible to perform the following experiments:

- Connectorization of optical fibers
- Mechanical and fusion splice of optical fibers
- Measuring optical fiber attenuation and troubleshooting

This laboratory consists of three kits:

- **Connectivity Kit mod. EFO43-C/EV** is a set of tools for the connectorization of optical fibers. In detail, it is possible to carry out operations on fibers, such as termination of connectors.
- **Splicing Kit mod. EFO43-S/EV** is a set of tools for the tooling of optical fibers. In detail, it is possible to carry

out operations on fibers, such as fiber splice by fusion or mechanical welding.

- **OTDR Kit mod. EFO43-O/EV** is a set of tools enabling to perform measurements of attenuation and to display them on a LCD screen via a PC connection.

| EXPERIMENTS AND COMPATIBILITY | Connectivity Kit EFO43-C/EV | Splicing Kit EFO43-S/EV | OTDR Kit EFO43-O/EV | O.F. Panel and optical instruments - EFO41/EV |
|---|--------------------------------|----------------------------|------------------------|--|
| Fiber termination and splicing Measurements using OTDR | ✓ | ✓ | ✓ | ✓ |
| Termination of connectors | ✓ | - | ✓ | ✓ |
| Fiber splice (fusion or welding) | - | ✓ | ✓ | ✓ |
| Fiber measurements and troubleshooting using OTDR | ✓ | ✓ | ✓ | - |
| Fiber measurements using Optical instruments | ✓ | ✓ | - | ✓ |

✓ Indispensable ✓ Optional

CONNECTIVITY KIT - mod. EFO43-C/EV

TRAINING PROGRAM

- Operations on optical fibers
- Mounting of connectors
- Cable preparation
- Fiber preparation
- Fiber cutting
- Measurement of attenuation on terminated fiber (with the optional accessories included in the **Educational panel on optical fibers and optical instruments - mod. EFO41/EV** or in the **OTDR KIT - mod. EFO43-O/EV**)

TECHNICAL CHARACTERISTICS:

- Case with a set of tools for fiber termination, including:
 - Precision fiber cutter: suitable for single-mode and multi-mode fibers
 - Universal fixing support of connectors ensuring a very low insertion loss
 - Kit of fast-acting glue with set of syringes
 - Fiber stripper
 - Scissors

- Pack of paper napkins
- Isopropyl alcohol
- Connector cleaning accessory
- Fault localizing system with laser light source 650 mm
- 5 optical patchcords, single-mode and multi-mode type, length 1m, ST/SC/LC connectors
- 40 ST pre-polished connectors
- 2 ST bare fiber adapters
- 100 meters of optical cable 62.5 / 125



SPLICING KIT - mod. EFO43-S/EV

TRAINING PROGRAM

- Operations on optical fibers
- Cable preparation
- Fiber preparation
- Fiber cutting
- Mechanical splice
- Fusion splice
- Measurement of attenuation on spliced fiber (with the optional accessories included in the **Educational panel on optical fibers and optical instruments - mod. EFO41/EV** or in the **OTDR KIT - mod. EFO43-O/EV**)

TECHNICAL CHARACTERISTICS:

- Case with a set of tools for fiber splicing, including:
 - Precision fiber cutter: suitable for single-mode and multi-mode fibers
 - Fiber stripper
 - Scissors
 - 2 ST bare fiber adapters
 - 5 mechanical splices
 - 10 splice protection covers
- 1 Microfusion splicer with the following characteristics:
 - Suitable for multi-mode and single-mode fibers
 - Semi-automatic with alignment on two axes
 - Automatic alignment on core



- Control of cutting angle of optical fibers
- Automatic evaluation of joint loss
- Typical attenuation: 0,01/0,02 dB (multi-mode/single-mode)
- Mechanical tensile test on splice: 2N
- 3.5" TFT color display
- Controlled by microprocessor
- Programmable by user
- USB port
- Including multi-language software program
- Display for showing and guiding the preparation phases, step by step, assisted by software program
- Internal rechargeable batteries
- Power supply and battery charger
- 2 spare electrodes
- 100 meters of optical cable 62.5 / 125

OTDR KIT - mod. EFO43-O/EV

OTDR Kit mod. EFO43-O/EV is a professional measurement system based on an Optical Time Domain Reflectometer enabling to perform measurements of attenuation and to display them on LCD screen.

This kit can be connected to a PC via its own USB port and the software of the equipment, to display the acquired data and charts and to fill in test reports on the measurements previously performed.

It is possible to perform measurements on the optical cables just assembled with the **Connectivity Kit EFO43-C/EV**, on pre-existing cables or on those used in the **Educational panel on Optical Fibers and Optical Instruments mod. EFO41/EV**.

TRAINING PROGRAM

- Features: OTDR, Power Source, Power Meter and damaged Fiber search
- Methods of loss measurement:
 - 2 points: absolute, dB/km
 - Splice loss
 - Least Squares Approximation (LSA)
- Launch box operation
- Set up and operation of the measuring instrument
- Connection to a **PC (not included)**

TECHNICAL CHARACTERISTICS:

- Compatibility with multi-mode optical fibers
- Optical source 850/1300 nm
- Visible light source: laser, 650 nm, 1mW (max), CW/modulated
- 4" TFT color display
- Internal storage: 1000 traces (max)
- Dynamic range: 27/26 dB
- Distance: from 1 to 64 Km
- Dead zone: 2 m
- Resolution: from 0.25 to 64 m



- Real-time Refresh Rate: 4s (typ.)
- Speaker
- USB port
- Functions of Auto Test and Visual Fault Locator
- Software for analysis of traces
- ST, SC and FC adapter kit
- Unit in a plastic box containing 100 meters of optical cable 62.5/125 with ST/SC connectors
- Sample roll: optical cable 62.5/125 with ST connectors, length 300 meters
- Shock-proof rubber boot
- Rechargeable battery
- Power supply unit with battery charger

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: OPERATION AND MEASUREMENT





RADAR LABORATORY

TELECOMMUNICATIONS AND TELEMATICS

www.elettronicaveneta.com

21C-E-ST

RADAR TECHNOLOGY LABORATORY

| | | |
|-------------------------|-----------------|-------|
| INTRODUCTION | | TS 54 |
| RADAR TRAINER | MOD. M702/EV | TS 55 |
| μ P FAULT SIMULATOR | MOD. M702-F/EV | TS 56 |
| INTERACTIVE SOFTWARE | MOD. SW-M702/EV | TS 57 |
| ELECTRONIC COMPASS | MOD. M702-C/EV | TS 57 |
| RADAR IMAGE SIMULATOR | MOD. M702-T/EV | TS 57 |
| GPS RECEIVER | MOD. M702-G/EV | TS 58 |

RADAR TRAINER

| | | |
|--------------------|-----------------|-------|
| INTRODUCTION | | TS 59 |
| RADAR TRAINER | MOD. M702-E/EV | TS 60 |
| SCANNER UNIT | MOD. M702-SU/EV | TS 61 |
| ELECTRONIC COMPASS | MOD. M702-C/EV | TS 62 |
| GPS RECEIVER | MOD. M702-G/EV | TS 62 |

RADAR TECHNOLOGY LABORATORY

Mod. M702/EV

INTRODUCTION

This RADAR LABORATORY is designed to study radar technologies and systems used in maritime navigation. All devices are of professional type.



It consists of a main Trainer unit and of various accessory units:

- **Radar Trainer mod. M702/EV** based on a modern and complete digital radar system, modified for the teaching of operation and installation of a radar system. Troubleshooting and servicing are also included. This is the basic configuration of the program.

This Trainer consists of a large silk-screen printed panel, including:

- Block diagrams, wiring diagram and test points
- Components and circuits completely visible on the fore panel
- Fault simulator
- Radar indicator Unit

It is also provided with an outdoor unit, complete with support, that includes:

- Slot Antenna and dummy load
- Transmission and receiving circuits

- **µP Fault Simulator mod. M702-F/EV** for microprocessor-controlled fault control, via a keyboard and with a digital display
- **Interactive Software mod. SW-M702/EV** for carrying out Lessons, Exercises and Troubleshooting with a PC

- **Electronic Compass mod. M702-C/EV** that supplies information on navigation direction and North
- **GPS Receiver mod. M702-G/EV** that applies information on geographic position
- **Radar Image Simulator mod. M702-T/EV** that replaces the outdoor unit and supplies actual stored informations

| | Radar Lab - Available versions | | | |
|--|--------------------------------|----------------|---------------|------|
| | Basic | With µP Faults | with Software | Full |
| Radar Trainer mod. M702/EV | ✓ | ✓ | ✓ | ✓ |
| µP Fault Simulator mod. M702-F/EV | | ✓ | ✓ | ✓ |
| Interactive SW mod. SW-M702/EV | | | ✓ | ✓ |
| Electronic Compass mod. M702-C/EV | ✓ | ✓ | ✓ | ✓ |
| Radar Image Simul. mod. M702-T/EV | ✓ | ✓ | ✓ | ✓ |
| GPS Receiver mod. M702-G/EV | ✓ | ✓ | ✓ | ✓ |

✓ Indispensable | ✓ Optional unit

RADAR TRAINER mod. M702/EV

TRAINING PROGRAM

- Introduction to radar techniques
 - Incident and reflected wave
 - Echo effect: it generates an echo that can move radially and angularly on the screen
 - Pulse duration/repetition frequency ratio
 - Power/range ratio
 - Continuous-wave (CW) radar
 - Radar equation
- Proper interpretation of radar diagram with reference to physical phenomena and to technological limits
- Block description and circuit analysis of radar
- PRF (Pulse Repetition Frequency) generator and transmitter trigger
- Gate signal generator
- Solid state modulator
- Magnetron transmitter
- Control of antenna rotation
- Circulator and limiter for input protection
- Solid-state preamplifier and mixer
- Logarithmic receiver
- Echo signal processing
- Echo signal acquisition
- Interference rejection
- Correlation and first integration
- Video circuits:
 - Horizontal and vertical deflection
 - Video signal and memory
 - On-screen display (OSD) for navigation and for setting data
- Radar image generator
- "Switch mode" power supply
- Instructions of use
- Measurements on radar different parts
- Troubleshooting

TECHNICAL SPECIFICATION

Silk-screen printed panel:

- Compact panel
- 28 test points at the most significant points of the circuits
- Cards mounted near the related electric diagram
- Dimensions: 650x800 mm

Indicator:

- Type: 15" of diagonal, high resolution, RGB color LCD TFT
- Pull-Down and Pull-Up menus



Example of display
on the indicator

Active elements:

- Rings
- Target
- Mini-Arpa
- Cursor
- Bar graphs...

- Mini Arpa functions:
 - with automatic tracking up to 12 targets with manual initialization
 - inquire object for target data acquisition
- Representation: PPI raster scanning with image shown continuously and updated
- Video:
 - resolution of 1024x768 pixels
 - Dot pitch 0.297
 - 16-level quantization
 - backlight: CCFL twin lamps, 50000 P.O.H. replaceable
- Image stop: it "freezes" the image to study it
- Echo stretch: it points out the slightly perceptible echoes
- Computing speed:
 - speed calculation (kT)
 - course calculation (°)
- Guard zones:
 - Sectorial GZ: 3 maximum available selectable guard zones
 - Polygonal GZ: 6 maximum available guard zones selectable by maximum 6 points
 - When an echo appears within the area limits, a visual and acoustic alarm is enabled
- Plot:
 - it leaves the tracks of all echoes, for the representation of the last positions
 - selectable: 15s, 30s, 1m, 3m, 6m
- Off-center representation: 55% of the ray in all directions and ranges
- Ranges:
 - 1/16, 1/8, 1/4, 1/2, 3/4, 3/2, 3, 6, 12, 24, 48 N.M.
 - 96, 48, 24, 12, 6, 3, 1.5, 1, 0.5, 0.25 km
- Fixed markers:
 - 6: 3/4 to 48 N.M. range
 - 2: 1/16 to 1/2 N.M. range
- Distance between fixed markers: 1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4, 8 N.M.
- Mobile markers: 2 with value display
- Electronic cursors: 2 with value display
- Electronic pointer: 1 with value display
- Reference line: 1
- Controls:
 - GAIN
 - FTC (Fast Time Constant)
 - STC (Sensitivity Time Control)
 - Electronic tuning of Local Oscillator: manual or automatic
 - Pulse duration: short or long
 - Interference Rejection
 - Echo Stretch
 - Navigation modes: Head-UP, North-UP or Course-UP
 - EBL (Electronic Bearing Line)
 - VRM (Variable Range Marker)
 - HL (Head Line)
- Indication of ship data:
 - Latitude
 - Longitude
 - Speed
 - Actual course
- Illumination of two-color background:
 - Blue for the day (2 settings)
 - Black for the night (2 settings)
 - Object color for any display object

- Joystick for EBL and VRM positioning, changing of menu functions, cursor positioning, off-centering, etc...
- NMEA-0183 interface for electronic compass
- NMEA-0183 interface for SATNAV/GPS/Loran C

Fault simulator:

- Included in the silk-screen printed panel
- Key-locked compartment
- 15 pre-set faults
- Possibility of inserting 15 faults simultaneously

Outdoor unit:

- Stand for antenna inserted in the Trainer unit
- Slot antenna (for outdoor use):
 - Type: slotted waveguide 4 ft with radome
 - Biasing: horizontal
 - Radiation amplitude (-3 dB): horizontal 1.8°, vertical 25°
 - Speed of rotation: 22 r.p.m. \pm 2 r.p.m.
 - Gain: 27 dB
- Transmitter-Receiver:
 - Peak power: 4 kW
 - Frequency: 9410 MHz \pm 30 MHz
 - Modulator: solid state
 - Receiver: logarithmic
 - Pulse amplitude: 0.08 μ s (1/16-1/8-1/4-1/2-3/4-3/2 nautical miles), 0.3 μ s (3/4-3/2-3-6-12 nautical miles), 0.6 μ s (3-6-12 nautical miles), 1.2 μ s (12-24-48 nautical miles)
- Dummy load (for indoor use)
- 15 m multicore cable for connecting the antenna with the main unit
- 25mm diam. mast (**not included**) for outdoor use

Power supply: 230 Vac 50 Hz single-phase - 140 VA
(Other voltage and frequency under request)

Dimensions: 760 x 910 x 410 mm (without outdoor unit)

Total weight: 70 kg

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION

TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR



μ P FAULT SIMULATOR (optional) mod. M702-F/EV

This external and optional unit replaces the original Fault Simulator available in Radar Trainer mod. M702/EV.

It supplies a microprocessor-controlled fault control in Radar Trainer mod. M702/EV via a keyboard.

This accessory must be supplied together with Radar Trainer mod. M702/EV and it cannot be sold separately.



*μ P Fault simulator
mod. M702-F/EV*

TECHNICAL SPECIFICATION

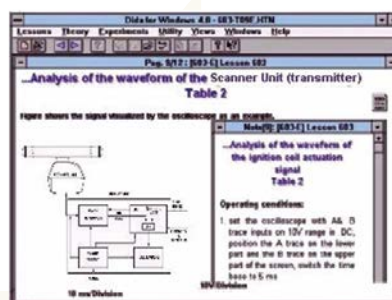
- 4-key keypad
- Digital Display of 16x2 characters
- Simultaneous insertion of several faults
- Signalling of unsuccessful troubleshooting attempts
- Storage of:
 - Attempts carried out by students during troubleshooting
 - Time spent by students for troubleshooting
- USB port available on Radar Trainer mod. M702/EV for controlling the fault simulator unit via PC with the optional software mod. SW-M702/EV

INTERACTIVE SOFTWARE (optional) mod. SW-M702/EV

This software must be installed in a PC for Students' use.

TECHNICAL SPECIFICATION

- It is used to carry out Lessons, Exercises, Troubleshooting with a PC connected with Radar Trainer mod. M702/EV via a USB port
- It manages the μP Fault Simulator mod. M702-F/EV unit directly during Troubleshooting
- **The software can only be used in conjunction with the microprocessor-controlled fault simulator mod. M702-F/EV.**



Interactive software - mod. SW-M702/EV

ELECTRONIC COMPASS (optional) mod. M702-C/EV

This modern compass based on Solid-State sensor (remote unit) supplies information about the boat's course even in difficult sea conditions continuously.

TECHNICAL SPECIFICATION

- Measures:
 - Prow: 0° to 359°
 - Accuracy: 1° (static), 2° (dynamic)
 - Display resolution: 0.1°
- Display: 4", colour
- Data interface: RS422 compatibility
- Cables included: power supply and data
- Interface: NMEA0183
- Power supply: from Radar Trainer
- Sensors:
 - 3-axis magnetic compass
 - 3-axis accelerometer
 - 3-axis rate gyro
- Fixture system: tripod



Remote unit
mod. M702-C/EV



Display unit
mod. M702-C/EV

RADAR IMAGE SIMULATOR (optional) mod. M702-T/EV

This modern and compact unit is connected with Radar Trainer Display Unit mod. M702/EV instead of the Scanner unit (outdoor unit) which includes the slot antenna, the transmitter and the receiver, to provide a radar actual image, stored and continuously repeated.

TECHNICAL SPECIFICATION

- Compact unit
- Output radar image with:
 - 4 moving targets
 - coastal line
 - weather disturbance
 - other radar disturbance
- Continuous repetition of the image
- Cable included: for the interconnection with Trainer Radar mod. M702/EV
- Power supply: from Trainer Radar mod. M702/EV



Radar image simulator - mod. M702-T/EV

GPS RECEIVER (optional) mod. M702-G/EV

This modern system for professional use can receive and process GPS (Global Position System) data and supply them to Radar Trainer M702/EV. It consists of an indoor unit that can be perfectly and easily assembled to Radar Trainer mod. M702/EV, and of an outdoor antenna provided with tripod.

The wide and high-resolution, Touch-Screen LCD display included in the indoor unit, allows the planning of the system and the display of the received information. It can display the data of 12 satellites simultaneously.

Functions of track planning, distance, speed and alarm are available.

TECHNICAL SPECIFICATION

General characteristics:

- Accuracy:
 - position: 25m CEP (Circular Error Probability)
 - speed: 0.1 m/s
 - time: $\pm 1 \mu s$
- Maximum speed: 515 m/s (about 1000 kn)
- Data interface compatibility: RS232 e RS422
- Cables included: power supply, antenna (10m) and data

Indoor unit:

- LCD display: backlit, STN type, dimensions 120x90 mm
- Channels: 12
- Refresh speed: 0.1 s
- Power supply: from Radar Trainer mod. M702/EV

Outdoor Unit:

- Polarization: circular clock-wise
- Frequency: 1575.42 MHz
- Antenna Gain: 3.5 dBi
- Power supply Gain Low Noise: 30 dB
- Impedance: 50 Ω
- Azimuth coverage: omnidirectional



Outdoor unit - mod. M702-G/EV



Internal unit - mod. M702-G/EV

RADAR TRAINER

Mod. M702-E/EV



INTRODUCTION

This Radar trainer is designed to study radar technologies and systems used in maritime navigation.

All devices are of professional type.

The **Radar Trainer mod. M702-E/EV** features an up-to-date real marine digital radar, properly modified to teach the operation, installation and maintenance of a radar system.

The trainer consists of a main unit, including:

- a **Mimic panel** with the functional diagram of the radar and the test point on the most significant signals
- the **Display unit** contains radar control and management; components and circuits are completely visible
- a **Screen** displays the information received and processed by the radar system
- the **Radar Image Simulator** generates a radar image with moving targets, thus accurately reproducing the operation of an outdoor scanner unit;
- a **Fault simulator**

The training program can be expanded using the following **additional optional devices (not included)**:

- **Scanner Unit mod. M702-SU/EV**: it is a real radar outdoor unit including transmission and receiving circuits and slot antenna (for outdoor use) or dummy load (for indoor use)
- **Electronic Compass mod. M702-C/EV** that supplies information on navigation direction and North
- **GPS Receiver mod. M702-G/EV** that supplies information on geographic position

RADAR TRAINER mod. M702-E/EV

TRAINING PROGRAM:

- Introduction to radar techniques
 - Incident and reflected wave
 - Pulse duration/repetition frequency ratio
 - Power/range ratio
 - Continuous-wave (CW) radar
 - Radar equation
- Proper interpretation of radar diagram with reference to physical phenomena and to technological limits
- Block description and circuit analysis of radar
- PRF (Pulse Repetition Frequency) generator and transmitter trigger
- Gate signal generator
- Solid state modulator
- Magnetron transmitter
- Control of antenna rotation
- Circulator and limiter for input protection
- Solid-state preamplifier and mixer
- Logarithmic receiver
- Echo signal processing and acquisition
- Interference rejection
- Correlation and integration
- Mini ARPA (Automatic Radar Plotting Aids) anti-collision system and guard zones
- Video circuits:
 - Horizontal and vertical deflection
 - Video signal and memory
 - On-screen display (OSD) for navigation and data setting
- Radar image generator
- "Switch mode" power supply
- Instructions of use
- Measurements on radar different parts
- Troubleshooting

TECHNICAL SPECIFICATION:

Silk-screen printed panel:

- Compact panel
- 28 test points at the most significant points of the circuits
- Cards mounted near the related electric diagram
- Dimensions: 650 x 800 mm



Example of display on the indicator

Active elements:

- Rings
- Target
- Mini-Arpa
- Cursor
- Bar graphs...

Indicator:

- Screen: 15", high resolution, RGB color TFT LCD
- Pull-Down and Pull-Up menus
- Mini ARPA functions:
 - with automatic tracking up to 12 targets with manual initialization
 - inquire object for target data acquisition
- Representation: PPI raster scanning with image shown continuously and updated
- Freeze frame: it "freezes" the image to study it
- Echo stretch: it points out the slightly perceptible echoes
- Computing speed:
 - speed calculation (KT)
 - course calculation (°)
- Guard Zones (GZ):
 - Sectorial GZ: 3 maximum available selectable guard zones
 - Polygonal GZ: 6 maximum available guard zones selectable by maximum 6 points
 - When an echo appears within the area limits, a visual and acoustic alarm is enabled
- Plot:
 - it leaves the tracks of all echoes, for the representation of the last positions
 - selectable: 15s, 30s, 1m, 3m, 6m
- Off-center representation: 55% of the ray in all directions and ranges
- Ranges:
 - 1/16, 1/8, 1/4, 1/2, 3/4, 3/2, 3, 6, 12, 24, 48 Nautical Miles (N.M.)
 - 0.25, 0.5, 1, 1.5, 3, 6, 12, 24, 48, 96 km
- Fixed markers:
 - 6: 3/4 to 48 N.M. range
 - 2: 1/16 to 1/2 N.M. range
- Distance between fixed markers: 1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4, 8 N.M.
- Mobile markers: 2 with value display
- Electronic cursors: 2 with value display
- Electronic pointer: 1 with value display
- Reference line: 1
- Controls:
 - GAIN
 - FTC (Fast Time Constant)
 - STC (Sensitivity Time Control)
 - Electronic tuning of Local Oscillator: manual or automatic
 - Pulse duration: short or long
 - Interference Rejection
 - Echo Stretch
 - Navigation modes: Head-UP, North-UP or Course-UP
 - EBL (Electronic Bearing Line)
 - VRM (Variable Range Marker)
 - HL (Head Line)
- Indication of ship data:
 - Latitude
 - Longitude
 - Speed
 - Actual course

- Illumination of two-color background:
 - Blue for the day (2 settings)
 - Black for the night (2 settings)
 - Object color
- Joystick for EBL and VRM positioning, changing of menu functions, cursor positioning, off-centering, etc...
- NMEA-0183 interface for electronic compass
- NMEA-0183 interface for SATNAV/GPS/Loran C

Radar Image Simulator:

- The simulator accurately reproducing the operation of an outdoor scanner unit
- Output radar image with:
 - 4 moving targets
 - coastline
 - noise caused by the weather
 - noise caused by other radars
- Continuous repetition of the image

Fault simulator:

- Positioned on the side of the main unit; locked with key
- 15 faults, insertable also simultaneously

Power supply: 230 Vac 50 Hz single-phase - 140 VA
(Other voltage and frequency under request)

Dimensions: 760 x 910 x 410 mm (without Scanner unit)

Total weight: 70 kg

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION

TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR



SCANNER UNIT (optional) mod. M702-SU/EV

The Scanner unit is a real radar outdoor unit including transmission and receiving circuits and slot antenna (for outdoor use) or dummy load (for indoor use)

TECHNICAL SPECIFICATION:

- Stand for antenna inserted in the Trainer unit
- Slot antenna (for outdoor use):
 - Type: slotted waveguide 4 ft with radome
 - Biasing: horizontal
 - Radiation amplitude (-3 dB): horizontal 1.8°, vertical 25°
 - Speed of rotation: 22 r.p.m. \pm 2 r.p.m.
 - Gain: 27 dB
- Transmitter-Receiver:
 - Peak power: 4 kW
 - Frequency: 9410 MHz \pm 30 MHz
 - Modulator: solid state
 - Receiver: logarithmic
 - Pulse amplitude: 0.08 μ s (1/16, 1/8, 1/4, 1/2, 3/4, 3/2 N.M.),



Scanner Unit
mod. M702-SU/EV

- 0.3 μ s (3/4, 3/2, 3, 6, 12 N.M.), 0.6 μ s (3, 6, 12 N.M.), 1.2 μ s (12, 24, 48 N.M.)
- 15 m multicore cable for connecting the antenna with the main unit
- 25mm diam. mast (**not included**) for outdoor use
- Dummy load (optional - for indoor use): mod. M702-DL/EV

ELECTRONIC COMPASS (optional) mod. M702-C/EV

This modern compass based on Solid-State sensor (remote unit) supplies information about the boat's course even in difficult sea conditions continuously.

TECHNICAL SPECIFICATION:

- Measures:
 - Prow: 0° to 359°
 - Accuracy: 1° (static), 2° (dynamic)
 - Display resolution: 0.1°
- Data interface: RS422 compatibility
- Cables included: power supply and data
- Interface: NMEA0183
- Power supply: from Radar Trainer
- Sensors:
 - 3-axis magnetic compass
 - 3-axis accelerometer
 - 3-axis rate gyro
- Fixture system: tripod (included)



Remote unit
mod. M702-C/EV



Display unit
mod. M702-C/EV

GPS RECEIVER (optional) mod. M702-G/EV

This modern system for professional use can receive and process GPS (Global Position System) data and supply them to the Radar Trainer. It consists of an indoor unit that can be perfectly and easily assembled to the trainer and of an outdoor antenna provided with tripod.

The wide and high-resolution, Touch-Screen LCD display included in the indoor unit, allows the planning of the system and the display of the received information.

It can display the data of 12 satellites simultaneously. Functions of track planning, distance, speed and alarm are available.

TECHNICAL SPECIFICATION:

General characteristics:

- Accuracy:
 - position: 25m CEP (Circular Error Probability)
 - speed: 0.1 m/s
 - time: $\pm 1 \mu s$
- Maximum speed: 515 m/s (about 1000 kn)
- Data interface compatibility: RS232 e RS422
- Cables included: power supply, antenna (10m) and data

Indoor unit:

- LCD display: backlit, STN type, dimensions 120x90 mm
- Channels: 12
- Refresh speed: 0.1 s
- Power supply: from Radar Trainer mod. M702-E/EV

Outdoor Unit:

- Polarization: circular clock-wise
- Frequency: 1575.42 MHz
- Antenna Gain: 3.5 dBi
- Power supply Gain Low Noise: 30 dB
- Impedance: 50 Ω
- Azimuth coverage: omnidirectional



Outdoor unit - mod. M702-G/EV



Internal unit - mod. M702-G/EV



ST



TELECOMMUNICATIONS AND TELEMATICS

PSTN NETWORK AND TRANSMISSION SYSTEMS

**PCM SWITCHING AND
TRANSMISSION SYSTEM**

MOD. PCM/EV

ST 64

TELEFAX TRAINER

MOD. TFX/EV

ST 66

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21C-E-ST

PCM SWITCHING AND TRANSMISSION SYSTEM

Mod. PCM/EV

INTRODUCTION

Trainer mod. PCM/EV has been designed to examine all the main issues concerning coding, switching and digital transmission of signals. The system carries out all the functions of a branch exchange used for communications in a switched PSTN (Public Switched Telephone Network) line.



This equipment mounted on a metallic structure is a compact and functional unit including electric circuits, silk-screen printed panel with block diagram, test points of easy access, signalling LEDs, auxiliary circuits (noise generator and Time Slot selector), simulator for 12 faults and theoretic-experimental handbooks.

Trainer mod. PCM/EV has 4 analog interfaces for connecting 4 users (telephones, modem...).

A PCM-TDM with 32 channels and 2048 kb/s (HDB3 coded) frame is generated to go out on the Trunking.

The Trainer can work as PBX or simulate a Trunking.

Two Trainers PCM/EV can be interconnected to simulate a Link between two Branch Exchanges and the connection of 4 Local users with other 4 remote Users.

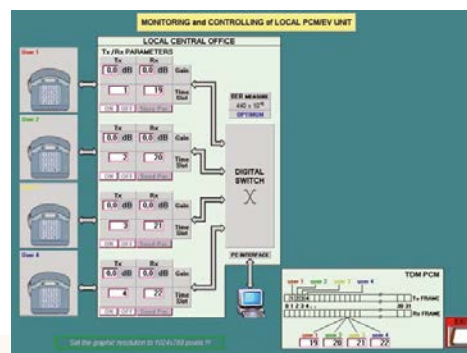
TRAINING PROGRAM

- Basics of telephony:
 - telephone terminal
 - transmission medium
 - switching devices
- Telephone:
 - acoustic/electrical transmission transducer
 - electrical/acoustic reception transducer
 - dial and electronic keyboard
 - communication signals with the branch exchange
 - TONE/PULSE calling tones
 - power supply
- User interface (SLIC):
 - B (Battery powered): telephone set powered by the branch exchange
 - O (Overvoltage protection): protection against overvoltages from the line
 - R (Ringing): control of ringing current
 - S (Supervision): detection of the hook switch pulses or multifrequency dialling tones
 - H (Hybrid): conversion from 2 to 4 wires and vice versa
 - T (Testing): signals level; characteristics on line
- CODEC:
 - channel filter 300-3400 Hz in transmission and reception
 - PCM coding and decoding at 64 kb/s with A-type or μ -type compression
 - Transmission and reception Time Slot assignment and frame insertion at 2048 kb/s
- Simultaneous communication of more users:
 - analog multiplex: FDM
 - digital multiplex: TDM-PCM
 - multiplex/demultiplex
 - signal regenerators
 - international standards
- Digital switched matrix:
 - connection memory and data memory
 - slot and frame switching
 - frame switching
 - display of frames and of input and output slots
- CEPT interface, artificial line and noise:
 - synchronism and signalling bit insertion
 - HDB3 coding of the signal to be transmitted
 - HDB3 decoding of received signal

- Line interface:
 - E1/T1 line standard
 - Line driver and impedance matching
 - Attenuation and distortion due to the line
 - Noise effects
 - Reception equalizer
 - Extraction of reception clock signal
 - PRBS generation and detection
 - Detecting transmission loss and received carrier
- Line signal conversion: unipolar-bipolar
- Artificial line simulator:
 - Attenuation and noise
- Timing and exchange tones:
 - bit, frame and time slot synchronism
 - tone generation
- Simulation and troubleshooting

TECHNICAL SPECIFICATION

- 4 telephone sets: PULSE/TONE dialling
- Operating modes:
 - Local: TDM E1-32 frame generation, PCM channels and digital exchange switching
 - Local line: TDM E1-32 frame generation, PCM channels, on line 4 transmission with HDB3 coding, Loop with Line Simulator and digital exchange switching
 - Testing line: like Local line with assessment of service quality
 - Remote Loop: like Local line with external Loop
 - Remote Master/Slave: a bidirectional link can be established to connect 2 Trainers mod. PCM/EV
- Loop modes:
 - Internal: with Line Simulator
 - External: with output and input on coaxial line
- 4 User interfaces (SLIC) for the connection of 4 Users for
- POTS or PSTN networks:
 - Compatibility: telephone, modem, fax
 - Dialling: pulses, multifrequency tones (DTMF)
- 4 CODECs with functions of:
 - Filter
 - Signal conversion: analog/digital PCM
 - Time-Slot assignment: transmission and reception
 - Serial frame generation: 32 channels (2048 kb/s)
- 1 Digital Switch that "routes" the PCM signals for the required links
- 1 CEPT Interface with functions of:
 - HDB3 coder-transmitter
 - HDB3 receiver-decoder
- 1 Line Interface with functions of:
 - Line equalizer
 - Reception clock regenerator
- 1 Simulator of artificial line:
 - Controls of Attenuation and Noise generator
- 1 Control microprocessor interfaceable with a PC
- 1 Synchronization system for displaying
- Time Slots on oscilloscope
- State indication LED:
 - Signalling: Clock Loss, BER, Frame Sync, Multi-Frame Sync
 - Incoming calls: for Users 1, 2, 3 and 4
 - Switch Hook detection: for Users 1, 2, 3 and 4
 - DTMF binary code and Line signalling: for User 1



Supervision Software

- Fault simulator: 12 faults can be inserted via switches; this unit is protected by key-locked cover
- Test points: 46 test points connected directly with the circuits of the equipment
- 1 RS232/USB interface for connection with supervision PC
- 1 Supervision software for programming the operating parameters of branch exchange: it must be installed on **1 PC (not included)**
- Framework: compact box with liftable lid containing all electronic parts, signalling and test points and fault simulator. A block diagram of the circuit is available on the lid

Power supply: 230 Vac 50 Hz single-phase - 35 VA
(Other voltage and frequency under request)

Dimensions: 445 x 335 x 135 mm (closed)

Weight: 13 kg

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION, FAULT INSERTION

TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR



TELEFAX TRAINER

Mod. TFX/EV



TRAINING PROGRAM

- General concepts on fax service
- Document scanning
- Huffman digital coding
- Transmission via modem
- Reception and decoding
- Document printing
- Block diagram and circuit analysis of telefax equipment
- Use of telefax on switched telephone network
- Measurement and troubleshooting on the different parts of the equipment:
 - Keyboard
 - User interface
- Scanner
- CPU and data processor
- Modem and line interface
- Printing unit
- Power supply

INTRODUCTION

Trainer mod.TFX/EV is based on a modern standard telefax CCITT Group 3, properly modified to improve the learning experience on operation, set-up and troubleshooting.

The equipment is mounted on a framework for a compact and functional storage of the electronic circuits and mechanical components of the telefax, enabling an easy access to all its parts during the development of exercises; it also includes a detailed silk-screen printed panel with block diagrams, 30 test points mounted on an easily accessible panel, an 16-fault simulator with signalling LEDs on the block diagram identifying the points where the fault has been enabled (these LEDs can also be disabled for students' tests) and theoretical-experimental handbooks.

NB: it is recommended to use 2 telefax trainers and a telephone line simulator (see mod. PCM/EV)

TECHNICAL SPECIFICATION

- Transmission standards:
 - II-III CCITT Groups
 - baud rate: 28 seconds/page or better
 - gray tones: 16
 - document width: 210 mm
 - DTMF or pulse dialling
- Framework: compact box with liftable cover containing all the electronic and mechanical parts of telefax, test points and fault simulator; the cover also includes the block diagram of the circuit and the LEDs signalling the fault enabled
- Fault simulator: 16 faults can be inserted via switches; unit protected with key-locked cover. Each fault lights up a LED in the corresponding block in the diagram, if this function is enabled
- Test points: 30 test points mounted on panel and connected directly with the equipment circuits

Power supply: 230 Vac 50 Hz single-phase - 110 VA
(Other voltage and frequency under request)

Dimensions: 530 x 200 x 375 mm (closed)

Weight: 30 kg

SUPPLIED WITH

STUDENT HANDBOOK
THEORETICAL-EXPERIMENTAL MANUAL.
PRACTICAL EXERCISES: MEASUREMENT,
PARAMETERS VARIATION, FAULT INSERTION
TEACHER HANDBOOK
DESCRIPTION OF THE FAULT SIMULATOR







POWER SUPPLY AND SERVICE INSTRUMENTS

PS

www.elettronicaveneta.com

Aim:

- Supplying of power supply units and accessories of general use and competitive cost

Equipment:

- Power supply unit
- Module Box

| | | |
|------------------------------------|-----------------|------|
| UNIVERSAL POWER SUPPLY UNIT | MOD. PS1-PSU/EV | PS 3 |
| SLIM POWER SUPPLY UNIT | MOD. PSLC/EV | PS 4 |
| COMPACT POWER SUPPLY UNIT | MOD. PS3-C/EV | PS 5 |
| MODULE HOLDER-BOX | MOD. BOX/EV | PS 6 |
| VIDEO GENERATOR | MOD. VG1/EV | PS 7 |
| RF INSTRUMENTS TOWER | MOD. RF-IT/EV | PS 8 |

21C-E-PS

POWER SUPPLY UNIT

Mod. PS1-PSU/EV

INTRODUCTION

This power supply unit is available in a case that creates an ergonomic unit with the module box. The silk-screen printed fore plate houses the terminals and LEDs for drawing and displaying the output voltages. These voltages are available on DIN connectors available on the rear side of the unit.

This power supply unit is **universal**, that is it can power all types of modules produced by Elettronica Veneta S.p.a.



TECHNICAL SPECIFICATION

- The supplied voltages are:
 - **Output S1: +30 Vdc – 4A**
Rectified, filtered voltage protected with fuse.
Voltage indicator LED.
 - **Output S2: 24 Vac – 4A**
Protection with fuse.
Voltage indicator LED.
 - **Output S3: +5 Vdc – 2A**
 - **Output S4: +12 Vdc – 2A, -12 Vdc – 1A**
Regulated voltage, electronically protected from shortcircuits and overloads.
Voltage indicator LED.
 - **Output S5: 1.3 Vdc – 24 Vdc, 1A**
Regulated voltage, electronically protected from shortcircuits and overloads.
Voltage indicator LED.
 - **Output on DIN connector: 24 Vac – 0 – 24 Vac, 0.5A**
Voltage protected with fuse

(Outputs S1 and S2 supply 4 A separately and 2 A if used simultaneously)

Power supply: 230 Vac 50 Hz single-phase - 200 VA
(Other voltage and frequency under request)

Dimensions: 415 x 185 x 195 mm

Weight: 8 kg

SLIM POWER SUPPLY UNIT

Mod. PSLC/EV

INTRODUCTION

It supplies the necessary continuous voltages for powering the experimental modules.

The voltage and current values supplied are pinpointed on the fore panel. These outputs are available on one connector set on the right bottom side of the unit.

These voltages are supplied directly to the module via a cable.



TECHNICAL SPECIFICATION

- The supplied voltages are:
 - **OUTPUT 1: +1.3 Vdc ÷ +24 Vdc, 1A.**
Regulated voltage, electronically protected against short-circuits and overloads. Lateral knob for selecting the variable voltage.
 - **OUTPUT 2: 24 Vac – 0 – 24 Vac, 0.5A.**
Protected with fuse.
 - **OUTPUT 3: +5 Vdc – 2 A.**
 - **OUTPUT 4: +12 Vdc – 2 A.**
Regulated voltage, electronically protected against short-circuits and overloads.
 - **OUTPUT 5: -12 Vdc – 1A.**
Regulated voltage, electronically protected against short-circuits and overloads.

Power supply: 230 Vac 50 Hz single-phase - 130 VA
(Other voltage and frequency under request)

Dimensions: 385 x 105 x 130 mm

Weight: 5 kg

COMPACT POWER SUPPLY UNIT

Mod. PS3-C/EV

INTRODUCTION

It provides the necessary d.c. voltage for powering the experiment modules.

It consists of a case that creates an compact and ergonomic unit with the educational modules of IPES series.

It uses a standard cable for interconnection with the module of IPES series to avoid any wrong connection of the power supply.

This power supply unit fully complies with some of the experimental modules manufactured by Elettronica Veneta S.p.A. for Telecommunications.



TECHNICAL SPECIFICATION

- Protections against short-circuit, overload, overvoltage, overtemperature on all outputs
- Plastic Case
- Power On LED
- Supplied voltages:
 - **OUTPUT 1: +12 Vdc, 0.8 A**
Regulated voltage, electronically protected from short-circuits and overloads. Indicator LED of applied voltage
 - **OUTPUT 2: -12 Vdc, 0.3 A**
Regulated voltages, electronically protected from short-circuits and overloads. Indicator LEDs of applied voltage
 - **OUTPUT 3: +5 Vdc, 2.5 A**
- Standard output cable: 150 cm terminated with a DIN std output plug: fully compatible with modules of IPES series.
- Power cord for mains connection: included

Power supply: 90/264 Vac - 25 VA

Dimensions: 108 x 67 x 36 mm

MODULE BOX

Mod. BOX/EV

INTRODUCTION

Support for housing the experimental modules. These modules can be fixed to the frame by a "Plug-in" system.

The power supply unit is universal, because it can power all types of modules produced by Elettronica Veneta S.p.A.



TECHNICAL SPECIFICATION

Dimensions: 415 x 400 x 110 mm

Weight: 1Kg

VIDEO GENERATOR

Mod. VG1/EV

INTRODUCTION

Video Generator mod. VG1/EV is an instrument that can be used in laboratory when a signal in analog video standard must be sent to a device under test.

It is also provided with an input for PC keyboard enabling to write a text that is added to the output video signal.

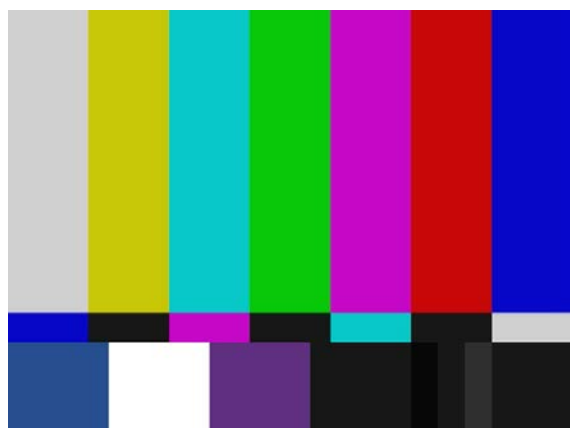
TECHNICAL SPECIFICATION:

- Generator of composite video signal:
 - SMPTE colour bar
 - PAL standard (NTSC selection via built-in switch)
 - Digital Signal Processing (DSP) technology with 8-bit D/A converter
 - Text overwriting
 - Impedance of 75 Ω
 - BNC/RCA output
- Text Generator:
 - programmable via PS/2 keyboard (included)
 - enabled by ON/OFF switch
 - it keeps the text stored even when not powered
- Text characteristics:
 - flash mode
 - colours of character: 8
 - background colours: 8 (besides transparent)

Power supply: 90/264 Vac - 10 VA

Dimensions: 135 x 129 x 47 mm

Weight: 1 kg



Colour bar - Text Off



Colour bar - Text On

RF INSTRUMENTS TOWER

Mod. RF-IT/EV

INTRODUCTION

The mod. RF-IT/EV is a bundle consisting of the most suitable instruments for measurements in the field of radio frequency. It allows quality and reliable measurements and provides a complete solution for every telecommunications lab.

It is recommended to analyze in detail the modulated RF signals and perform attenuation, gain and bandwidth measurements, with the telecommunications modules of Elettronica Veneta. It includes:

- a digital oscilloscope that allows the analysis of a signal in the time domain with 100 MHz band limit. The Virtual Screen function allows to scroll the display, improving the visualization of the signals. The XY direct function uses both the two channels for the display of Lissajous figures or, for example, constellation of digital signals
- a spectrum analyzer that allows the spectrum analysis of a signal in the frequency domain with 3GHz frequency limit. The integrated tracking generator allows the analysis of bandwidth and / or gain and / or attenuation of signal amplifiers and RF filters
- a counter, for frequency measures up to 1.6GHz of low or high impedance signals
- a function generator, which generates periodic signals of frequency up to 20MHz with amplitude up to 10Vpp upon 50 Ω

The USB port in the oscilloscope and in the Spectrum analyzer allows the simple and fast saving of data and screenshots shown during the measurement.

TECHNICAL SPECIFICATIONS

DIGITAL STORAGE OSCILLOSCOPE

- 100MHz 2 Channels
- Display: 8" TFT SVGA Display
- Virtual Screen: virtual Display
- Memory Zoom
- Visualization: Time domain, Frequency domain (FFT), voltage (XY)
- Input sensibility: 1mV/Div to 10V/Div
- Max input voltage: 300Vrms, CAT I
- Auxiliary input: external trigger
- BW limiter: 20MHz
- Triggering: Edge, Pulse Width, Video, Pulse Runt, Rise & Fall (Slope), Alternate, time out, Event Delay, Time Delay
- Sampling Rate: 2 x 1 GS/s, 1 x 2 GS/s
- Display Memory: 2 x 1 MPts, 1 x 2 MPts
- Frequency Counter: 6 Digit resolution
- Auto measurements: amplitude, frequency, period, pulse count, ... 36 automatic measurement sets
- Cursor measurements
- Interface: Output for ext monitor, 2xUSB/RS232 for Mass-Storage/Printer/Remote Control, Ethernet port



SPECTRUM ANALYZER WITH TRACKING GENERATOR

- Frequency Range: 9 kHz to 3 GHz
- Display: 8.4" TFT VGA Display
- Tracking Generator: up to 0dBm
- In/Out: N connectors, 50 Ohm
- Amplitude Measurement Range: +20dBm max
- Amplitude Range: log (0.5 to 10dB/Div) or linear
- Amplitude Unit: dBm, dBmV, dBuV, V, W
- Automatic or manually selectable: sweep time, RBW and VBW
- Sweep Time: 0.2ms to 1000s, single/continuous with int/ext trigger
- Frequency Counter resolution: 1Hz
- Resolution Bandwidth: 1 Hz to 1 MHz
- Spectral Purity: <-100dBc/Hz (@100kHz)
- Video Bandwidth: 1 Hz to 1 MHz
- Integrated AM and FM Demodulator with Phone and Speaker
- Detectors: Auto/Min/Max-Peak, Sample, RMS, Quasi-Peak
- Markers with Delta Marker, miscellaneous Peak Functions
- Limit lines: upper/lower limits with selectable beep/message
- Interface: DVI Output for ext monitor, USB/RS232 for Mass-Storage/Printer/Remote Control, Ethernet port

UNIVERSAL COUNTER / FREQUENCY METER:

- Frequency range: 0 Hz to 3 GHz
- 400 MHz time base
- 0.5 ppm stability with TCXO component
- Sensitivity:
 - up to 1 GHz: 30 mVrms (typ. 20 mVrms)
 - 1...3 GHz: 100 mVrms (typ. 80 mVrms)
- Time interval resolution: from 10ns to 0.1 ps

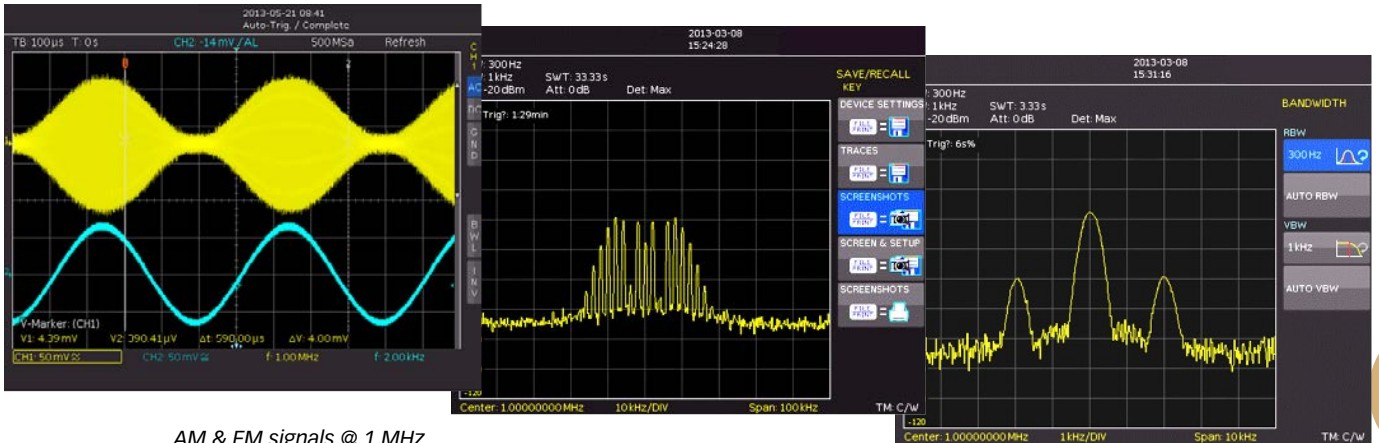
FUNCTION GENERATOR:

- Frequency range: 1 μ Hz to 20 MHz
- Output voltage: 10 Vpp max with 50 Ohm
- Waveforms: Sine, Square, Triangle, Ramp, Pulse, Noise, Harmonic, DC
- Surge&short circuit proof output

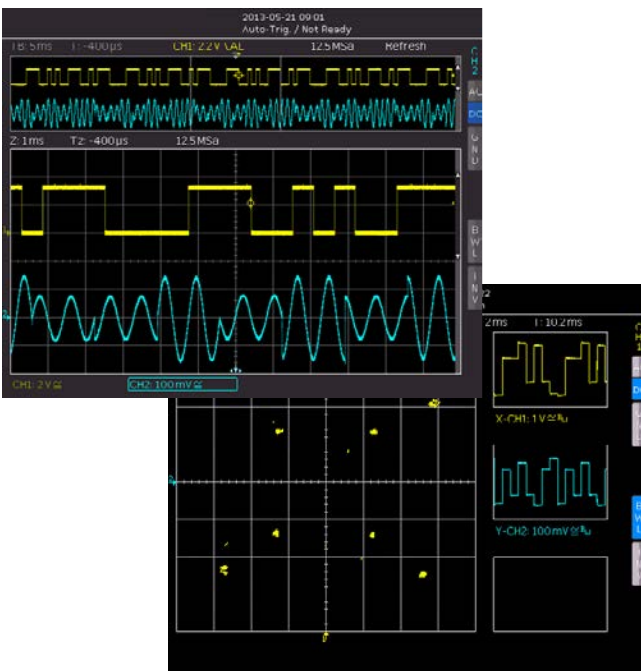
ACCESSORIES:

- 2x 100MHz Probe
- 2x N-to-BNC 50 Ohm adapter
- 1x telescopic antenna
- 2x 0.5m coax test cable
- 2x 1m coax test cable
- 1x BNC-to-4mm banana adapter

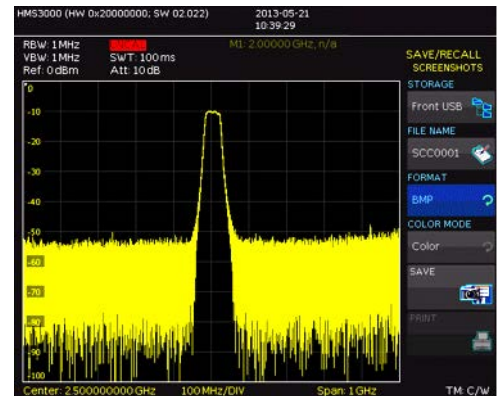
SAMPLE MEASUREMENTS CARRIED OUT ON OUR TELECOMMUNICATIONS BOARDS AND TRAINERS:



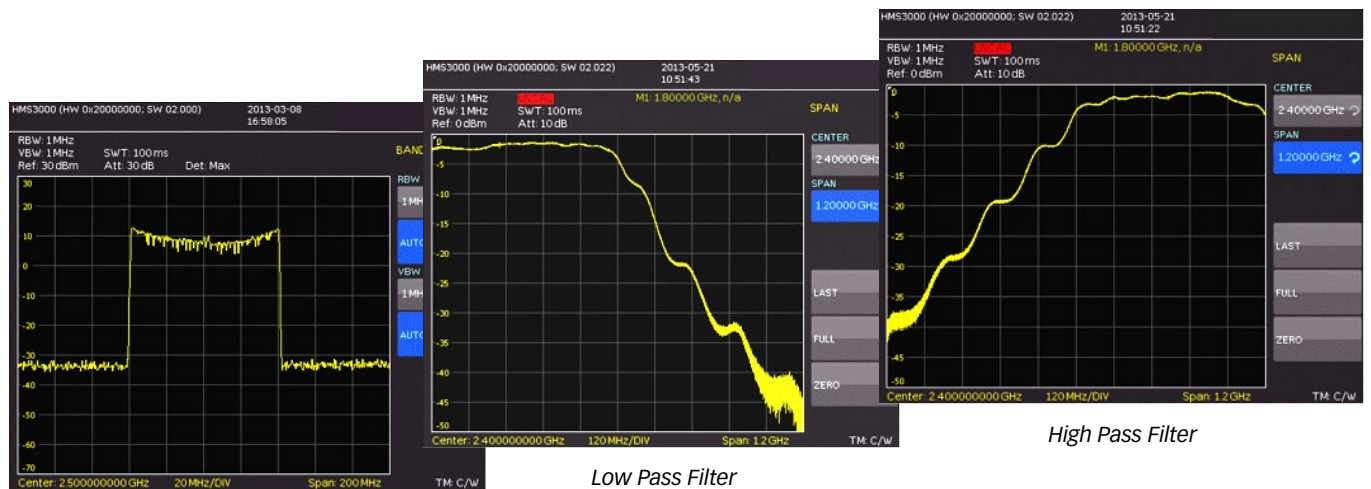
AM & FM signals @ 1 MHz
AM/FM/SSB Radio Transmitter mod. MCM24/EV



QPSK modulation
Digital Modulations mod. MCM31/EV



Band Pass Filter @ 2.5GHz
Calibration and Measuring Kit mod. MW-A2/EV



FM signal @ 2.5 GHz

Low Pass Filter

High Pass Filter

Microstrip Trainer mod. MW-A1/EV



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SORTED ALPHABETICALLY BY MODEL

TELECOMMUNICATIONS AND TELEMATICS

CATALOGUE No. 21-C

BT

BASIC TELECOMMUNICATIONS - I.P.E.S. SYSTEM

ST

TRAINERS AND HI END SYSTEMS - M.P.T. SYSTEM

PS

POWER SUPPLY AND SERVICE INSTRUMENTS

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