DIGITAL COMMUNICATIONS TRAINING SYSTEM

EC-796

The **EC-796** is an ideal equipment for teaching digital transmission systems.

It allows to cover the theory and practice of the different stages of a transmission system with ease: sampling, quantification, modulation, simulation of channel and reception; essential to lay the foundations for the modern telecommunication digital network.

The **Emitter** and **Receiver** modules have a test points prepared for the monitoring of the signals.

The **EC-796** allows the development of experiments at five levels:
- Analysis of the sampling and quantification of analogical signals, with acoustic and visual experimentation of the effect of the sampling frequency (aliasing) and of the number of bits used in the generation of the PCM signal.
- Study of digital modulations on continuous wave in amplitude, frequency and phase.
- Experimentation of the characteristics of circuit alternatives in the emission and reception modules.
- Analysis of the effect of disturbance in the channel (interference, noise, bandwidth and attenuation) on the different modulations.
- Experimentation on different means of transmission: coaxial cable, two-wire, infrared, radio and optical fibre.

The **EC-796** is presented in stackable desks, very easy to set up, designed both for graphic demonstrations of the theory explained in class, and for the student to carry out very attractive practices with basic instrumentation.

The instruments recommended for operation are a function generator and an oscilloscope.

Signal inlets and outlets
-Inlets for Function Generator, TTL signals and microphone.
-Outlet for headphone and connectors for oscilloscope.

PCM signal, base band
Sampling and quantification:
-Clock: 1.333 MHz
-T bit: 12 μs
-11 bits frame: 1 start, 8 data, 1 stop and 1 parity.
-Antialiasing filter BW $_{3dB}$: 280-3400 Hz
-Compander and expander for microphone.

Modulators

ASK (OOK)
-Bandwidth modulator: DC - 60 kHz.

FSK
- Bandwidth modulator:
  DC - 60 kHz (DFD reception)
  DC - 100 kHz (FSK reception)

BPSK and DBPSK
- Bandwidth modulator: DC - 45 kHz

QAM,QPSK and DQPSK
- Bandwidth modulator: DC - 45 kHz
- Levels: 8

Demodulators

ASK (OOK)
Type: Band pass filter, detector of envelope and comparator.

FSK
Types: - Dual band pass filters
- PLL direct detector

BPSK and DBPSK
Pass band:
- Referring to the microphone and signal input: all the antialiasing filter.
- Referring to the TTL input: DC - 45 kHz

QPSK, DQPSK and QAM (AFK)
Pass band:
- Referring to the microphone and signal Input: all the antialiasing filter.
- Referring to the TTL input: DC - 45 kHz

EMITTER CHARACTERISTICS

Twin Cable Emitter:
Output level (measured at connector):
- receiver not connected: 0 at ±4 V (according to modulation)
- receiver connected: 0 at ±3 V (according to modulation)

Connector: banana female adapter

Coaxial Cable Emitter:
Output level (measured at connector):
- receiver not connected: 0 at ±4 V (according to modulation)
- receiver connected: 0 at ±3 V (according to modulation)

Connector: BNC female adapter.

Fibre Optic Emitter:
Emission by LED
Emission wave-length: 850 nm (red)

Infrared Emitter:
Emission by LED
Emission wave-length: 950 nm

27 MHz Emitter:
Output level on 50 Ω: 10 dBm
Antenna: Monopole. 5 mm cable and 150 cm length
Connector: BNC female
Carrier frequency: 27 MHz (crystal)
Modulation on AM: Modulation index of 10 to 40%, according to selected modulator signal

RECEIVER CHARACTERISTICS

Twin-Line Cable Receiver:
Type: Direct
Connector: Banana adapter

Coaxial Cable Receiver:
Type: Direct
Connector: BNC adapter

Fibre Optic Receiver:
Type: Photo-diode (PIN).
Reception band: 400 - 1.100 nm (for 90% efficiency)
FSMA connector

Infrared Receiver:
Type: Photo-diode (PIN).
Reception band: 800 - 1.000 nm (for 50% efficiency)

27 MHz Receiver:
Type: Envelope detector
Reception band: 27 MHz
Antenna: Monopole. 5 mm cable, 150 cm length
Connector: BNC female adapter

Accessories and documentation included
-Antenna connection cables
-Optical fibre PMMA with FSMA connectors
-Headphone and dynamic microphone
-User's Manual
-Theory Manual
-Training Manual
-Electric diagrams and Technical Documentation