PCM SWITCHING AND TRANSMISSION SYSTEM

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.

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

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.

- 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 interfaceabile 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 Users1, 2, 3 and 4
  - Switch Hook detection: for Users 1, 2, 3 and 4
  - DTMF binary code and Line signalling: for User1
- 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
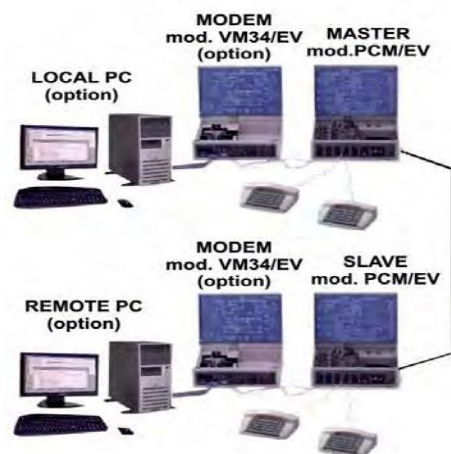
Power supply:	230 Vac 50 Hz single-phase - 35 VA (Other voltage and frequency under request)
Dimensions:	445 x 335 x 135 mm (closed)
Weight:	13 kg
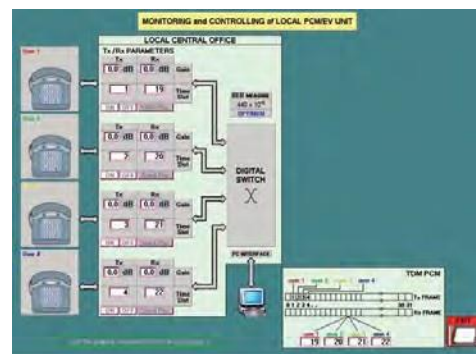
Supervision Software

Link - Master Slave