# Telephony Trainers

**Four training systems are available covering introductory telephony principles through to complex Digital Trunk network systems.**
**58-001 is an introductory, stand-alone system covering Telephone & Interface and TDM/PCM Principles.**
**58-002 introduces Digital Switching techniques.**
**58-003 covers Digital Trunk Switching and message handling.**
**58-004 is a full Digital Trunk Networks trainer covering transit switching and signalling.**
**Customers purchasing 58-002 can subsequently expand their systems to cover the curriculum in 58-003 and 58-004 by the addition of more boards.**
**All use the unique *Discovery* software to provide computer based training systems and are complete with interfaces, cables and manuals, only requiring a PC.**

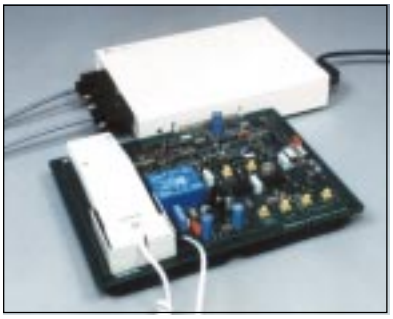
## Telephony Training System 58-001

**The introductory system comprises:**

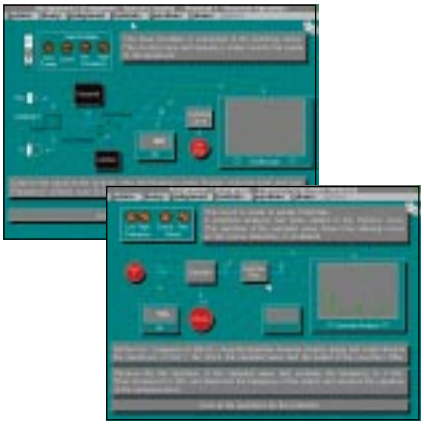
● **Rapid Access Terminal (RAT)** ● **Telephone & Interface Board** ● **TDM/PCM Board**

### Telephone & Interface

Examines the signalling and speech circuits and the immediate interface at the switching centre. The use of a high quality, commercial telephone hybrid circuit in the subscriber's line interface (SLIC) enables useful measurements to be made.



*Telephone & Interface connected to RAT*



**Curriculum Coverage**

**Telephone Signalling**
- Switch Hook
- Keypad
- Ringing (Alerting)

**Telephone Speech**
- Receiver
- Transmitter (Microphone)
- Telephone hybrid circuit

**Subscriber's Line Interface Circuit (SLIC)**
- Battery Feed
- Overvoltage protection
- Ringing (Alerting)
- Signalling

**Dual Tone Multi Frequency (DTMF) signalling**
- Keypad Codes
- Tone Duration
- Speech Immunity

**SLIC Hybrid**
- Forward loss
- Return balance loss

**Testing**
- Test-Out
- Test-In

### TDM/PCM Principles

Allows the study of the principles TDM/PCM. It is based on the use of standard telephony devices but also uses special circuits to demonstrate the effects of variable sampling rate, bit rate and filtering. PAM is used to demonstrate the concept of taking short samples to represent a continuous waveform. TDM is demonstrated by multi-channel PAM.

**Curriculum Coverage**

**Sampling**
- Basic Sampling
- Aliassing error ● Interference
- Spectrum Analysis

**Multiplexing (TDM)**
- Multiplexing Introduction
- Time slots and Frames

**Pulse Code Modulation (PCM)**
- Quantisation ● Quantisation noise
- Interference

**Companding**
- Linear Conversion
- Companding characteristic
- Companded conversion
- Speech

**Filtering**
- Aliassing error ● Filtered conversion

**Multichannel PCM**
- 24 and 30 Channel Systems
- Frame Synchronisation
- Control

# Telecommunications

## Digital Switching System 58-002

System comprises:

- **Controller**
- **Digital Switching Centre board**
- **Four telephone handset kit**

Covers Digital Switching techniques and applications, including time and space switching and the control of a digital switch by connection memory. Introduces Call State Transistion Diagrams conforming to ITU-T SDL format for call progress. Concepts of call state and state transition and the three stages of call handling. Supplied with a vertical mounting frame for ease-of-use and future upgrades.

### Curriculum Coverage

**Local signalling**
- Operation
- Tones and cadences

**Digital Switch Principles**
- Time switching
- Time and space switching

**Digital switch**
- Control of time switch
- Connection of tones

**Line scan**
- Switch hook
- DTMF receivers

**Call records**
- Call state
- Line identities
- Call time

**Line records**
- Directory numbers
- Call accounting

**Line maps**
- Location maps
- Condition maps

**State transitions**
- Inputs
- Outputs
- Tasks

**Call progress**
- Call set-up
- Call supervision
- Call release

**Manual control**
- Control

**Testing**
- Test out & loop back

**Traffic**
- System traffic

## Dual Switching System 58-003

System comprises:

- **Controller**
- **2 - Digital Switching Centre boards**
- **2 - Four telephone handset kits**

In addition to the curriculum covered by 58-002 extends the work to cover trunk switching and trunk traffic topics. Covers local & inter-switching centre numbers and their origin through trunk switching, highways and timeslots. CCITT (now ITU-T) codes and formats are used. Supplied with a vertical mounting frame for ease-of-use and future upgrades.

### Curriculum Coverage

**Trunk Configuration**
- Trunk paths
- Local & inter-switching centre numbering
- Tones and cadences

**Trunk Switching**
- Outward path
- Return path

**Signal Protocol Controller**
- Flags
- Frame check sequence
- Zero insertion (bit stuffing)

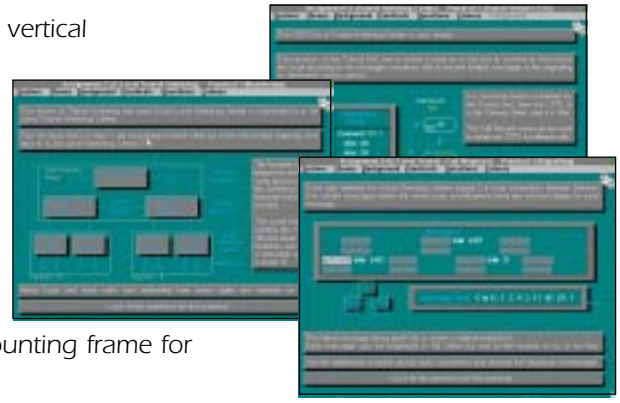
**Trunk Signal Units**
- Message signal units
- Fill-in signal units

**Signalling Information Field**
- Label
- Heading codes
- Address signals

**Error Control**
- Sequence numbers
- Buffers

**Trunk State Diagrams**
- Originating switch
- Dialling
- Destination switch

**Trunk Call Progress**
- Originating switch
- Dialling
- Destination switch



## Trunk Networks System 58-004

System comprises:

- **Controller**
- **2 - Digital Switching Centre boards**
- **2 - Four telephone handset kits**
- **Trunk Networks board**

In addition to the curriculum covered by 58-002 & 58-003 the trunks network board has three transit switches and extends the work to cover transit switching and signalling.
The system can be configured as four local switching centres, to cover simple transit switching, two level transit switching, non-associated signalling and the use of ITU-T type transaction capability messages to control system testing. Supplied with a vertical mounting frame for ease-of-use.

### Curriculum Coverage

**Transit Switching Centre**
- Numbering
- Transit Switch CSTD
- Transit Signalling

**Transit Switch Call Progress**
- Transit Switch Centre
- Originating Switch
- Destination Switch

**Two-Level Transit Switching**
- Numbering
- Dialling CSTD
- Routeing Tables

**Two-Level Transit Call Progress**
- Signalling
- 1st & 2nd Level Switches

**Non-Associated Signalling**
- Signalling
- Call Progress

**System Testing**
- TCAP Signalling
- Testing
- Manual Testing

**For further information on these and other equipment in the Feedback range please contact . . . . . .**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