

## ANALOG COMMUNICATION TRAINING SYSTEM



**We** introduce a new "TLA-00" series, Advanced Analog Communication Training System, complete range of Analog Communication modules in a modular fashion.

These modules have been designed to explain the basic concepts of Amplitude, Frequency and Phase Modulation / Demodulation.

Attempt has been made on these modules demonstrate every stage and phase archived in the process of modulation demodulation.

One of the most salient features of the modules being the capability to observ & analyse DSB-USB-LSB and FM signal spectrum on a common CR oscilloscope.

One look at the list experiment at the end of this section is sufficient to understand the depth at these modules will take the students to understand the principles of Analog Communication and its operating characteristics.

The modules now available are the following:

- **TLA-01: SIGNAL GENERATOR AND FREQUENCY MODULATION**
- **TLA-02: AMPLITUDE MODULATION**
- **TLA-03: AMPLITUDE DEMODULATION**
- **TLA-04: FREQUENCY DEMODULATION / PHASE MODULATION**
- **TLA-05: NOISE-AUDIO AMPLIFIER**

On the next pages the detailed features of each module.

## TLA-01: SIGNAL GENERATOR AND FREQUENCY MODULATION

This module forms the heart of the system, generating all the necessary signals for performing various experiment in Analog Communication, which includes all modulating and carrier signals.

It allows the student to examine the generator of various carrier signals and understand the functions of Function Generator & Sweep Generator. Detailed instruction manual is provided which explains the above functions at the circuit level.



### Features :

- On-board Function Generator
- VCO Signals
- Audio Preamplifier
- Sweep Generator
- Spectrum detector (RF detector)

### Technical Specifications :

- Onboard Sampling frequencies : Sine, Triangular, Square
- Amplitude : 0 to 2 V<sub>p-p</sub>
- Frequency Range : 100 Hz to 9 KHZ
- Synchronous Square wave : Frequency x 4 and ÷4 of the signal adjustable amplitude

#### a) Voltage Control Oscillator

- Frequency Range : 1) 385 KHz to 1535 KHz  
2) 385 KHz to 525 KHz
- Amplitude : Variable 0 to 1.5 V<sub>p-p</sub>
- Output Impedance : 50 Ohm
- Inputs to VCO1 : Modulating signal; Marker; AFC (Automatic Frequency Control)

#### b) VCO 2 carrier frequency generator

- Frequency Range : 385 KHz to 1535 KHz
- Amplitude : Variable 0 to 1.5 V<sub>p-p</sub>
- Output Impedance : 50 Ohm
- Inputs to VCO1 : Modulating signal

### Audio Preamplifier

- Audio Inputs : Microphone
- Input impedance : 600 ohm
- Voltage Gain : 1 to 100
- RC filter : 3.4 KHz cutoff
- Max.Output for Oscilloscope : 5V

### Sweep Generator

- Sweep Frequency : 10 Hz
- Sweep Depth : Adjustable
- Output for Oscilloscope : X axis

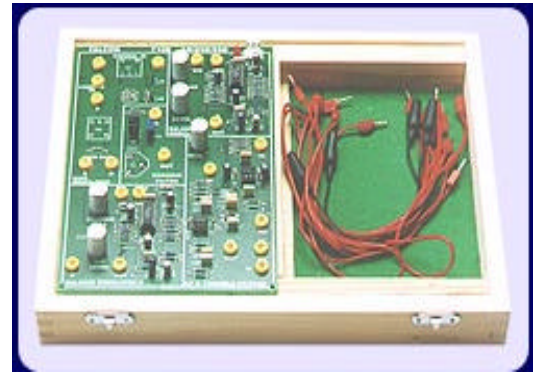
### Spectrum Detector

- Minimum Input : 100mV<sub>p-p</sub>
- Input Level : Adjustable
- Interconnection : 2mm standard banana socket
- Power Supply : ±12V

## TLA-02: AMPLITUDE MODULATION

This module allows the student to understand the functioning and operation of Balanced Modulator, Amplitude modulation with DSB/SSb, Ring modulator, Ceramic filter, Tunable filter & Low pas filter technique.

The detailed instruction manual explain the complete working of each of the individual section at the circuit level.



### Features :

- Balanced Modulator
- Ring Modulator
- Ceramic Filter
- Tunable Filter
- Low Pass Filter

### Technical Specifications :

- 2 nos. balance modulator for DSB/SSb amplitude modulation
- Carrier input : 1KHz - 900 KHz
- Modulating Input : 0.1KHz - 100KHz
- Carrier Null : Adjustable
- Output Amplitude : Adjustable

### Ring Modulator

- Diode balance modulator with AM DSB carrier (USB & LSB)
- Carrier input : 4KHz - 20Khz
- Modulating Input : 0.1KHz - 100KHz

### Ceramic Filter

- Central Frequency : 455KHz
- Banwidth :  $3 \pm 1$  KHz (Adjustable)

### Tunable Filter

- Central Frequency : Adjustable from 2 to 8KHz
- Detector Type : Diode envelope

### Low Pass Active Filter

- Cutting Frequency : 3.4KHz
- Interconnection : 2mm banana socket
- Power Supply : X axis

### Spectrum Detector

- Minimum Input : 100mVp-p
- Input Level : Adjustable
- Interconnection : 2mm standard banana socket
- Power Supply :  $\pm 12$ V

### TLA-03: AMPLITUDE DEMODULATION

This module allows the student to understand the functioning and operation of Amplitude Demodulation using two stage Intermediate Frequency Amplifier and Diode Envelop Detector. This module also includes the study of AGC, Mixer with dual tuned LC.

The detailed instruction manual explains the complete working of each of the individual sections at the circuit level.



#### Features :

- Frequency Converter
- 2 stage selective amplifier
- AM-Diode Detector
- Automatic Gain Control

#### Technical Specifications :

##### Frequency Converter (Mixer)

- Dual-Gate MOSFET used to mix up RF & Lo frequency. Inputs : Local Oscillator and Signal
- Output Intermediate Frequency : 455 KHz Adjustable
- FI Filter : Dual Tuned LC

##### 1st & 2nd stage IF Amplifier

- Central Frequency : 455 KHz Adjustable
- Load Impedance : Variable R-L-C
- Gain : 34 db
- Impedance Matching with Transformer & Autotransformer

##### Diode envelop detector

- Detecting of the positive or negative envelop with variable R-C Filter

##### Automatic Gain Control

- Output can be controlled in case of maximum input signal

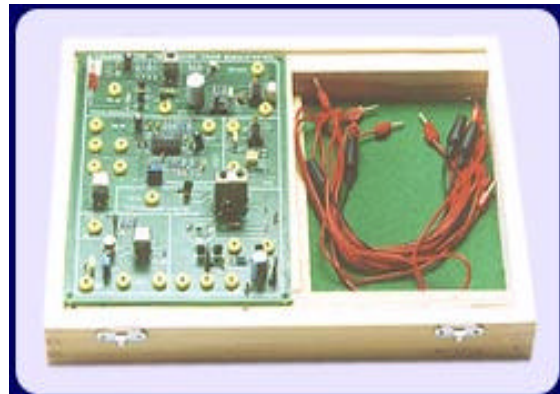
**Interconnection :** 2mm banana

**Power Supply :**  $\pm 12V$

## TLA-04: FREQUENCY MODULATION AND PHASE MODULATION

This module allows the student to understand the functioning and operation of Frequency Demodulation concept. This module also explain the working of Phase Modulation and Demodulation concepts.

The Detailed manual explains these concepts using the circuit diagram, to enable students of understand these concepts in details.



### Features :

- Phase Modulator
- Limiter
- Automatic Frequency Control
- Foster Seely & Ratio Detector Product Detector/Quadrature detector

### Technical Specifications :

#### Phase Modulator

- Modulation Technique : FET amplifier with resonate load
- Operating Frequency : 400KHz to 500 KHz
- Indirect Frequency Modulation

#### Limiter

- Operating Frequency : 455 KHz
- Input Amplitude : From 0.5 to 5 Vp-p
- Output Limited Amplitude : 1.5 Vp-p

#### Automatic Frequency control

- Frequency of Fm Modulator can be controlled with interrative effect

#### Foster-Seely Demodulator

- Operating Frequency : 400KHz to 500 KHz
- Input Amplitude : 1 Vp-p

#### Ratio Discriminator

- Operating Frequency : 400KHz to 500 KHz
- Input Amplitude : 1 Vp-p
- Phase Detector and FM Quadrature Deteror
- Phase Shiffer, Product detector and RC filter
- Operating Frequency : 400KHz to 500 KHz
- Input Amplitude : 1 Vp-p

**Interconnection** : 2mm banana Socket

**Power Supply** :  $\pm 12V$

**TLA-05: NOISE-AUDIO AMPLIFIER**

This module allows the student to understand the noise effect in audio circuits and in communication system.

**Technical Specifications :****Noise Generator**

- Output Amplitude : Adjustment from 0 to 3 V<sub>p</sub>-

**Signal Attention Network**

- Output Signal Amplitude : Adjustable from 0 to the maximum of Input Value
- Signal + Noise Adder Stage

**Audio Amplifier with Lounspea**

- Output Power : 0.5 W
- Speaker : 8 Ohms, 0.3 W

**Interconnection :** 2mm standard banana Socket

**Power Supply :**  $\pm 12V$