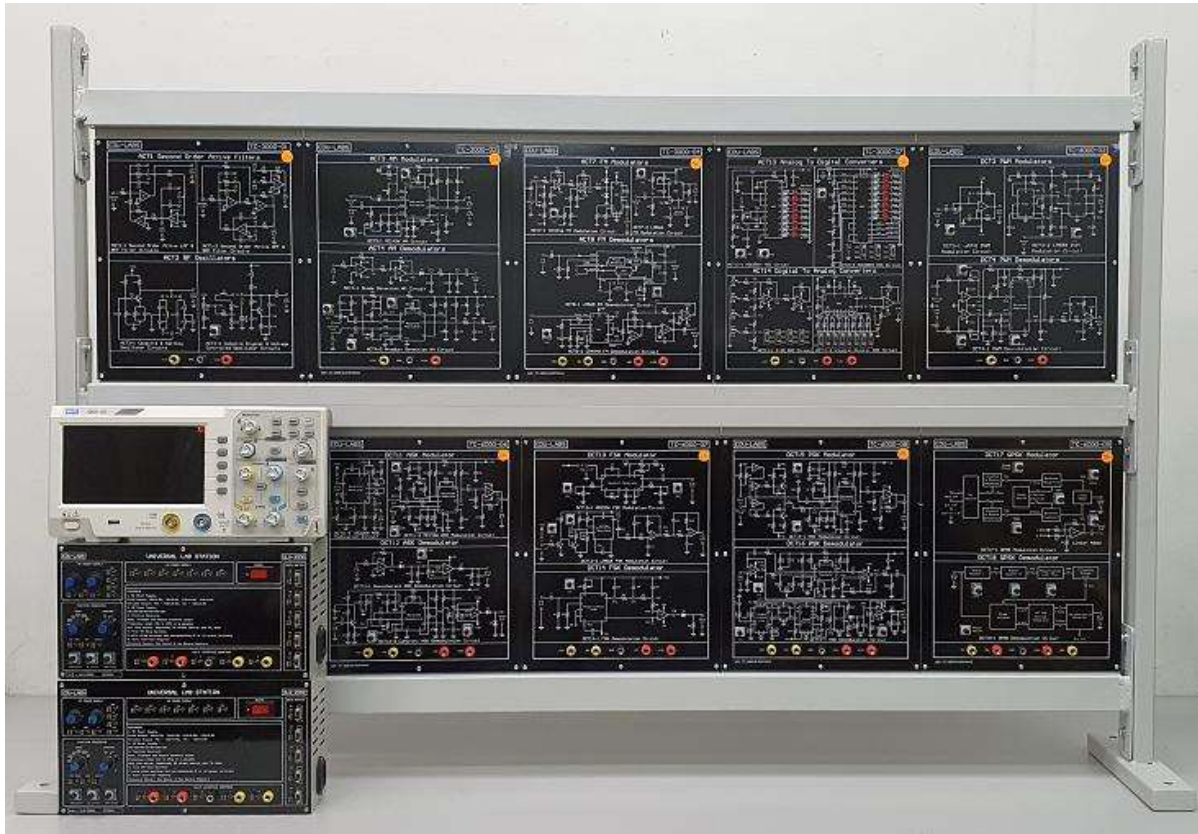


# Analog Communication Trainers

## TC-3000



The TC-3000 trainer includes the basic & advanced modules to experiment on fundamental & higher level of analog & digital topics of a telecommunication course. The purpose of the modules is to enable the student to acquire a clear experimental view of the basic & advanced concepts and familiarization with the operative aspects of the work in the telecommunication laboratory. This trainer combined the modules with experimental circuits. It can offer the beginner complete courses of basic & advanced communication in 10 Analog Experiments Modules with the optional power supply and signal unit, oscilloscope or Spectrum Analyzer, then they can complete various experiments independently.

### **ANALOG COMMUNICATION MODULES**

#### **LIST OF EXPERIMENTS**

- a. RF Oscillator Experiment
- b. Second Order LPF & HPF Experiment
- c. AM Modulator Experiment
- d. AM Demodulator Experiment
- e. DSB-SC and SSB Modulator Experiment
- f. DSB-SC and SSB Demodulator Experiment
- g. FM Modulator Experiment
- h. FM Demodulator Experiment
- i. TDM Multiplexer Experiment
- j. TDM Demultiplexer Experiment
- k. FDM Multiplexer Experiment

- l. FDM Demultiplexer Experiment
- m. Analog to Digital Converter Experiment
- n. Digital to Analog Converter Experiment
- o. Frequency Converter
- p. Signal Recovery

### Analog Communication Experiments Modules

<b>TC-3000-01</b>	<b>Second Order Active Filters &amp; RF Oscillators Experiments Module</b>
<b>Lab 1</b>	<b>Second Order Active Filters</b>
Experiment 1	Second Order Active Low-pass Filter (Low-pass -3dB Frequency: 1 kHz ~ 3 kHz)
Experiment 2	Second Order Active High-pass Filter (High-pass -3 dB Frequency: 5 kHz ~ 10 kHz)
Experiment 3	Second Order Active Band-pass Filter (Center Frequency: 10 kHz ~ 100 kHz, Bandwidth: (6 kHz ~ 60 kHz)
Experiment 4	Second Order Active Band-stop Filter (Cutoff Frequency: 10 kHz ~ 100 kHz, Bandwidth: 6 kHz ~ 60 kHz)
<b>Lab 2</b>	<b>RF Oscillators</b>
Experiment 1	Colpitts Oscillator (Oscillation Frequency: 1 MHz ~ 9 MHz)
Experiment 2	Hartley Oscillator (Oscillation Frequency: 500 kHz ~ 1.8 MHz)
Experiment 3	Crystal Oscillator (Oscillation Frequency: 500 kHz ~ 1.8 MHz)
Experiment 4	Voltage Controlled Oscillator (Oscillation Frequency: 3.5 MHz ~ 4 MHz)

<b>TC-3000-02</b>	<b>AM Modulator &amp; Demodulator Experiments Module</b>
<b>Lab 3</b>	<b>AM Modulator</b>
Experiment 1	Transistor AM Modulator (Carrier Signal: 1.5 kHz ~ 2 kHz, Audio Signal: 500 Hz ~ 1 kHz)
Experiment 2	MC1496 AM Modulator (Carrier Signal: 500 kHz ~ 1 MHz, Audio Signal: 500 Hz ~ 1 kHz)
<b>Lab 4</b>	<b>AM Demodulator</b>
Experiment 1	AM Diode Detector (Carrier Signal: 300 kHz, Audio Signal: 500 Hz ~ 2 kHz)
Experiment 2	AM Product Detector (Carrier Signal: 500 kHz ~ 1 MHz, Audio Signal: 500 Hz ~ 1 kHz)

<b>TC-3000-03</b>	<b>DSB-SC and SSB Modulator &amp; Demodulator Experiments Module</b>
<b>Lab 5</b>	<b>DSB-SC and SSB Modulator</b>
Experiment 1	DSB-SC Modulator (Carrier Signal: 100 kHz ~ 500 kHz, Audio Signal: 500 Hz ~ 1 kHz)
Experiment 2	SSB Modulator (Carrier Signal: 200 kHz, Audio Signal: 500 Hz ~ 1 kHz)
<b>Lab 6</b>	<b>DSB-SC and SSB Demodulator</b>
Experiment 1	DSB-SC Product Detector (Carrier Signal: 100 kHz ~ 500 kHz, Audio Signal: 500 Hz ~ 1 kHz)
Experiment 2	SSB Product Detector (Carrier Signal: 200 kHz, Audio Signal: 500 Hz ~ 1 kHz)

<b>TC-3000-04</b>	<b>FM Modulator &amp; Demodulator Experiments Module</b>
<b>Lab 7</b>	<b>FM Modulator</b>
Experiment 1	MC4046 FM Modulator (Carrier Signal: 20 kHz, Audio Signal: 1 kHz)
Experiment 2	LM566 FM Modulator (Carrier Signal: 20 kHz, Audio Signal: 500 Hz ~ 700 Hz)
<b>Lab 8</b>	<b>FM Demodulator</b>
Experiment 1	MC4046 FM Demodulator (Carrier Signal: 20 kHz, Audio Signal: 1 kHz)
Experiment 2	LM565 FM Demodulator (Carrier Signal: 20 kHz, Audio Signal: 500 Hz ~ 700 Hz)

<b>TC-3000-05</b>	<b>TDM Multiplexer &amp; Demultiplexer Experiments Module</b>
<b>Lab 9</b>	<b>TDM Multiplexer</b>
Experiment 1	Waveform Generator (Sine Wave Signal Generator: 13 kHz, Triangle Wave Signal Generator: 2.3 kHz, Square Wave Signal Generator: 2.3 kHz)
Experiment 2	TDM Multiplexer (Transmission Channels: 3 Channels, Switching Time:500 ms ~ 50 ms)
<b>Lab 10</b>	<b>TDM Demultiplexer</b>
Experiment 1	TDM Demultiplexer (Transmission Channels: 3 Channels, Switching Time:500 ms ~ 50 ms)

<b>TC-3000-06</b>	<b>FDM Multiplexer &amp; Demultiplexer Experiments Module</b>
<b>Lab 11</b>	<b>FDM Multiplexer</b>
Experiment 1	FDM Signal Generator (Carrier Signal: 500 kHz ~ 1.5 MHz, Audio Signal: 500Hz~1.5 kHz)
Experiment 2	DSB-SC Modulated Signal Generator (Carrier Signal: 500 kHz ~ 1.5 MHz, Audio Signal: 500 Hz ~ 1.5 kHz)
Experiment 3	FDM Multiplexer (Modulation Type: DSB-SC Signal, Transmission Bandwidth: 2 MHz)
<b>Lab 12</b>	<b>FDM Demultiplexer</b>
Experiment 1	FDM Demultiplexer (Modulation Type: DSB-SC Signal, Demultiplexing Type: Product Demultiplexer)

<b>TC-3000-07</b>	<b>A/D &amp; D/A Converter Experiments Module</b>
<b>Lab 13</b>	<b>Analog-to-Digital Converter</b>
Experiment 1	ADC0804 Analog-to-digital Converter (Resolution: 8 bits, Analog Input Voltage: 0 V ~ 5 V)
Experiment 2	ADC0809 Analog-to-digital Converter (Resolution: 8 bits, Analog Input Voltage: 0 V ~ 5 V)
<b>Lab 14</b>	<b>Digital-to-Analog Converter</b>
Experiment 1	R-2R Digital-to-analog Converter (Digital Input: 4 bits, Analog Output: 0 V ~ 5 V)

<b>TC-3000-08</b>	<b>Frequency Converter &amp; Signal Recovery Experiments Module</b>
<b>Lab 15</b>	<b>Frequency Converter</b>
Experiment 1	Frequency Multiplier (Carrier Signal: 10 kHz)
Experiment 2	Up/Down Frequency Converter (Carrier Signal @ LO port: 100 kHz; Carrier Signal @ RF port: 120 kHz)
<b>Lab 16</b>	<b>Signal Recovery</b>
Experiment 1	Carrier Signal Recovery Circuit (Carrier Signal: 10 kHz)
Experiment 2	Clock Recovery Circuit (Clock Signal: TTL, Encoded Signal: Manchester, Clock Frequency: 5 kHz ~ 10 kHz)

### Accessory Sets

<b>TC-3000-TS2</b>	<b>2mm Stackable Test Lead Set (350mm Length)</b>
	Assorting in 5 different colors 30 units : Red x 6, Yellow x 6, Blue x 6, Black x 6, Green x 6
<b>TC-3000-TS4</b>	<b>4mm Stackable Test Lead Set (350mm Length)</b>
	Assorting in 5 different colors 10 units : Red x 2, Yellow x 2, Blue x 2, Black x 2, Green x 2

<b>TC-3000-EF</b>	<b>Experiments Frame (1450mm Length)</b>
	a. Epoxy Coated Steel Bended T Slot Frame b. Din Standard A4 With Two Shelves c. Side Frame: T Shape d. Dimension: <ul style="list-style-type: none"> <li>• Length : 1450mm</li> <li>• Width : 20mm</li> <li>• Height : 300mm</li> </ul>

**Universal Lab Station ULS-2000**

<b>DC Power Supply</b>	
Fixed Output:	+5V/0.5A, -5V/0.5A, +12V/0.5A, -12V/0.5A
Variable Output:	+0V ~ +23V/1A, -0V ~ -23V/1A
<b>AC Power Supply</b>	
Fixed Output:	19V-15V-9V-0V-9V-15V-19V
<b>Function Generator</b>	
Sine, Triangle and Square waveform output	
Frequency range: 1Hz to 1MHz in 6 decades	
With fine adjust, Amplitude and DC offset control	
TTL Mode Output Range: 1Hz to 1MHz in 6 decades	
Six frequency ranges:	1Hz to 10Hz
	10Hz to 100Hz
	100Hz to 1KHz
	1KHz to 10KHz
	10KHz to 100KHz
	100KHz to 1MHz
Sine wave output: 0 to 12V peak to peak variable	
Triangle wave output: 0 to 8V peak to peak variable	
Square wave output: 0 to 16V peak to peak variable	
<b>Five (5) Data Switches Module</b>	
5 units slide switches and corresponding output terminals. When switch is set at "down" position, the output is LO level; contrarily, it is to be HI level when setting at "up" position.	
<b>Multi Interface Adaptor Module</b>	
Miniature Socket, 2mm Socket & 4mm Banana Adaptors	

**Optional Equipment Need To Complete The Experiments Testing**

<b>1.0</b>	<b>3 ½ Digits Digital Multimeter</b>
<b>2.0</b>	<b>60MHz Digital Storage Oscilloscope</b>

**Note: Specification, Layout, Design etc. May Change Without Prior Notice For Products Continuous Development Process.**