

**BASIC COMMUNICATION TRAINER/  
KL-900A**

KL-900A



This trainer includes the basic modules to experiment on ground-level topics of a Telecommunications course. The purpose of the modules is to enable the student to acquire a clear experimental view of the basic concepts and a familiarization with the operative aspects of the work in the Telecommunication Laboratory.

**The KL-900A BASIC COMMUNICATION TRAINER consists of 3 parts, 8 modules:**

**(A) Analog Communication Modules (KL-900A1)**

1. KL-93001 Oscillator/Second Order LPF & HPF
2. KL-93002 AM Modulator/Demodulator
3. KL-93003 DSB-SC & SSB Modulator/Demodulator
4. KL-93004 FM Modulator/Demodulator

**(B) Digital Communication Modules (KL-900A2)**

5. KL-94001 A/D, D/A Converter Applications
6. KL-94002 PWM Modulator/Demodulator
7. KL-94003 FSK Modulator/Demodulator

**(C) Power Supply & Audio Generator Modules (KL-92001)**

8. KL-92001



**KL-900A**

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**(1) Analog Communication Modules  
(KL-900A1)**



KL-93001



KL-93002



KL-93003



KL-93004

1. KL-93001  
A. RF Oscillator  
(1) Oscillator Frequency : (Calculated) 500KHz - 10MHz  
: (Measured) 450KHz - 7MHz  
(2) Power Supply : +12V

- B. Second Order LPF and HPF  
(1) Low Pass - 3 db Frequency : 1KHz - 10KHz  
(2) High Pass - 3 db Frequency: 800Hz - 8KHz  
(3) Power Supply : +12V, -12V

2. KL-93002

- A. AM Modulator  
(1) Carrier Signal : 500KHz-3MHz  
(2) Audio Signal : 1KHz-3KHz  
(3) Power Supply : +12V, -5V

- B. AM Demodulator  
(1) Carrier Signal : 300KHz-3MHz  
(2) Audio Signal : 1KHz-3KHz  
(3) Power Supply : +12V, -12V

3. KL-93003

- A. DSB-SC and SSB Modulator  
(a) DSB-SC Modulator  
(1) Carrier Signal : 500KHz-1MHz  
(2) Audio Signal : 1KHz-2KHz  
(3) Power Supply : +12V, -5V  
(b) SSB Modulator  
(1) Carrier Signal : 453KHz  
(2) Audio Signal : 1KHz-2KHz  
(3) Power Supply : +12V, -5V

B. DSB-SC and SSB Demodulator

- (a) DSB-SC Demodulator  
(1) Carrier Signal : 500KHz  
(2) Audio Signal : 1KHz-3KHz  
(3) Power Supply : +12V  
(b) SSB Demodulator  
(1) Carrier Signal : 453KHz  
(2) Audio Signal : 2KHz  
(3) Power Supply : +12V

4. KL-93004

- A. FM Modulator  
(a) MC 1648 Modulator  
(1) Carrier Signal : 2MHz-3MHz  
(2) Audio Signal : 3KHz-8KHz  
(3) Power Supply : +5V  
(b) LM 566 Modulator  
(1) Carrier Signal : 2KHz-20KHz  
(2) Audio Signal : 1KHz-5KHz  
(3) Power Supply : +5V, -5V

B. FM Demodulator

- (a) LM 565 Demodulator  
(1) Carrier Signal : 2KHz-20KHz  
(2) Audio Signal : 1KHz-5KHz  
(3) Power Supply : +5V, -5V  
(b) FM to AM Demodulator  
(1) Carrier Signal : 500KHz-2MHz  
(2) Audio Signal : 1KHz-5KHz  
(3) Power Supply : +5V, -5V

**(2) Digital Communication Modules  
(KL-900A2)**



KL-94001



KL-94002



KL-94003

5. KL-94001

- A. Analog to Digital Converter  
(1) Resolution : 8 bits, 256 steps  
(2) Clock Frequency : 100KHz-800KHz  
(3) Input Voltage Range : 0-5V  
(4) Power Supply : +5V  
B. Digital to Analog Converter  
(1) Digital Input : 8 bits, 256 steps  
(2) Output Voltage : Single or Bipolar  
(3) Power Supply : +12V, -12V





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**6. KL-94002**

**A. PWM Modulator**

(a) Use LM 741 PWM

- |                    |               |
|--------------------|---------------|
| (1) Carrier Signal | : 1.5KHz-2KHz |
| (2) Audio Signal   | : 500Hz       |
| (3) Power Supply   | : +12V, -12V  |

(b) Use 555 PWM

- |                    |              |
|--------------------|--------------|
| (1) Carrier Signal | : 5KHz-10KHz |
| (2) Audio Signal   | : 1KHz       |
| (3) Power Supply   | : +12V       |

**B. PWM Demodulator**

- |                         |               |
|-------------------------|---------------|
| (1) Modulation Signal   | : 5KHz-6KHz   |
| (2) Audio Signal        | : 500Hz-700Hz |
| (3) Demodulation Signal | : 500Hz-700Hz |
| (4) Power Supply        | : +12V        |

**7. KL-94003**

**A. FSK Modulator**

- |                    |              |
|--------------------|--------------|
| (1) Space Signal   | : 1270Hz     |
| (2) Mark Signal    | : 1070Hz     |
| (3) Output Voltage | : 0V-5V      |
| (4) Power Supply   | : +12V, -12V |

**B. FSK Demodulator**

- |                    |            |
|--------------------|------------|
| (1) Space Signal   | : 1270Hz   |
| (2) Mark Signal    | : 1070Hz   |
| (3) Output Voltage | : 0V-5V    |
| (4) Power Supply   | : +5V, -5V |

**(3) Power Supply and Audio Generator  
Modules (KL-92001)**



KL-92001

**8. KL-92001**

**A. Fixed DC Power Supply**

- |                             |   |
|-----------------------------|---|
| (1) Output Voltage          | : +5V, -5V, +12V, -12V                      |
| (2) Output Current          | : +5V/3A, -5V/0.3A,<br>+12V/0.3A, -12V/0.3A |
| (3) Output Connector        | : two 5PIN DIN Connector                    |
| (4) Output Overload protect |   |

**B. Variable DC Power Supply**

- |                             |          |
|-----------------------------|----------|
| (1) Output Voltage          | : 0V-15V |
| (2) Output Current          | : 0.5A   |
| (3) Output Overload protect |          |

**C. Generator**

(a) Audio Generator (1)

- |                        |                          |
|------------------------|--------------------------|
| (1) Frequency          | : 10Hz-100KHz            |
| (2) Output Waveforms   | : Sine, Triangle, Square |
| (3) Output Impedance   | : 50 ohms                |
| (4) Output Attenuation | : 0, -20dB               |
| (5) Output Amplitude   | : 10Vp-p (at open)       |

(b) Audio Generator (2)

- |                        |                          |
|------------------------|--------------------------|
| (1) Frequency          | : 10Hz-100KHz            |
| (2) Output Waveforms   | : Sine, Triangle, Square |
| (3) Output Impedance   | : 50 ohms                |
| (4) Output Attenuation | : 0, -20dB               |
| (5) Output Amplitude   | : 10 Vp-p (at open)      |
| (6) With VCF Input     |                          |

**(4) Experiment Modules**



- 2mm plugs and sockets used throughout, connected by 2mm test leads.
- Circuits symbols, blocks and components printed on the surface of each module.
- Modules secured in plastic housings, the dimension: 297 x 226 x 60mm
- With storage cabinet for all modules to be easy stored

**(5) List of Experiments**

**ANALOG COMMUNICATION**

- RF Oscillator Experiment
  - Colpitts Oscillator Experiment
  - Hartley Oscillator Experiment
- Second Order LPF & HPF Experiment
  - Second Order LPF Experiment
  - Second Order HPF Experiment
- AM Modulator Experiment
  - AM Modulator Experiment
- AM Demodulator Experiment
  - Diode Detect AM Demodulator Experiment
- DSB-SC and SSB Modulator Experiment
  - DSB-SC Modulator Experiment
  - SSB Modulator Experiment
- DSB-SC and SSB Demodulator Experiment
  - DSB-SC Demodulator Experiment
  - SSB Demodulator Experiment
- FM Modulator Experiment
  - Measuring the MC1648 Voltage Control Oscillator (VCO) Characteristics.
  - Make the FM Modulator by MC1648.
  - Measuring the LM566 VCO Characteristics
  - Make the FM Modulator by LM566.
- FM Demodulator Experiment
  - Measuring the LM565 Phase-Lock Loop Circuit (PLL) Characteristics.
  - The LM565 PLL Circuit Voltage and Frequency Exchange Characteristics Experiment.
  - Make the FM Demodulator by LM565.
  - Experiment of the FM Demodulator by the FM to AM Discriminator.

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## BASIC COMMUNICATION TRAINER/ KL-900A

### DIGITAL COMMUNICATION

1. Analog to Digital Experiment
  - a. ADC 0804 A/D Converter Experiment
  - b. ADC 0809 A/D Converter Experiment
2. Digital to Analog Experiment
  - a. DAC 0800 Unipolar Output Experiment
  - b. DAC 0800 Bipolar Output Experiment
3. PWM Modulator Experiment
  - a. Use LM741 PWM Experiment
  - b. Use LM555 PWM Experiment
4. PWM Demodulator Experiment
  - a. PWM Demodulator Experiment
5. FSK Modulator Experiment
  - a. FSK Modulator Experiment
6. FSK Demodulator Experiment
  - a. FSK Demodulator Experiment

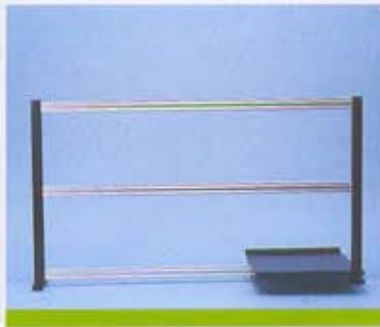
### (6) Accessories (KL-98001)

1. Connect Leads: 2mm - 2mm, 300mm L, 25 pcs
2. Connect Plugs: 2mm, 5 pcs.
3. DC Power Cable: 2 pcs.
4. AC Cord: 1 pce.
5. Experiment Manual: 1 pce
6. Instructor's Manual: 1 pce

- Option: (1) Rack Frame (KL-97001)  
(2) RF Generator (KI-2220)  
(3) Storage Cabinet (KL-99001)



Storage Cabinet (KL-99001)



Option: Rack Frame: (KL-97001)



Option: KI-2220 150MHz RF Generator