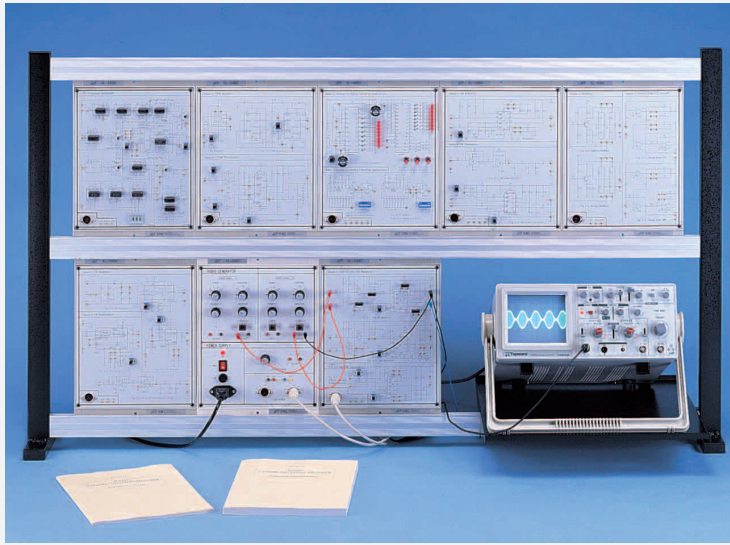


KL-900A

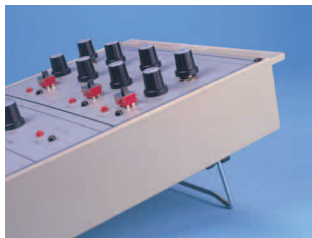
BASIC COMMUNICATION TRAINER



The KL-900A trainer includes the basic modules to experiment on fundamental-level topics of a telecommunication 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 trainer combines the basic modules with experimental circuits. It can offer the beginner complete courses of basic communication
- With the equipped power supply and signal unit, students only have to add the oscilloscope or Spectrum Analyzer, then they can complete various experiments independently
- KL-900A is an open-modulized design, it enables to extend experimental range

EXPERIMENT MODULES



1. 2mm connect leads are used throughout the system
2. The building blocks and components symbols of the circuits are printed on the surface of each module
3. All modules are secured in plastic housings (297 x 226 x 60mm)
4. Storage cabinet for all modules to be easily stored
5. Completed experimental manual and teacher's guide

LIST OF MODULES

1. 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
- (5) KL-93005 PLL Frequency Synthesizer

2. Digital Communication Modules (KL-900A2)

- (6) KL-94001 A/D \ D/A Converter Applications
- (7) KL-94002 PWM Modulator/Demodulator
- (8) KL-94003 FSK Modulator/Demodulator
- (9) KL-94004 CVSD Modulator/Demodulator, Manchester Code Encode/Decode
- (10) KL-94005 ASK Modulator/Demodulator
- (11) KL-94006 PSK/QPSK Modulator
- (12) KL-94007 PSK/QPSK Demodulator

3. Power Supply & Audio Generator Modules (KL-92001)

- (13) KL-92001

Analog Communcional Modules



KL-93001



KL-93002



KL-93003



KL-93004



KL-93005

1. KL-93001

- (1) RF Oscillator
 - a. Oscillator Frequency : 500KHz , 10MHz
 - b. Power Supply : +12V
- (2) Second Order LPF and HPF
 - a. Low Pass -3db Frequency : 1KHz , 10KHz
 - b. High Pass -3db Frequency : 800Hz , 8KHz
 - c. Power Supply : +12V , -12V

2. KL-93002

- (1) AM Modulator
 - a. Carrier Signal : 100KHz ~ 2MHz
 - b. Audio Signal : 1KHz ~ 3KHz
 - c. Power Supply : +12V, -5V
- (2) AM Demodulator
 - a. Carrier Signal : 100KHz ~ 2MHz
 - b. Audio Signal : 1KHz ~ 3KHz
 - c. Power Supply : +12V, -12V

3. KL-93003

- (1) DSB-SC and SSB Modulator

DSB-SC Modulator

 - a. Carrier Signal : 500KHz ~ 1MHz
 - b. Audio Signal : 1KHz ~ 2KHz
 - c. Power Supply : +12V, -5V

SSB Modulator

 - a. Carrier Signal : 453KHz
 - b. Audio Signal : 1KHz ~ 2KHz
 - c. Power Supply : +12V, -5V

- (2) DSB-SC and SSB Demodulator

DSB-SC Demodulator

- a. Carrier Signal : 500KHz
- b. Audio Signal : 1KHz ~ 3KHz
- c. Power Supply : +12V

SSB Demodulator

- a. Carrier Signal : 453KHz
- b. Audio Signal : 2KHz
- c. Power Supply : +12V

4. KL-93004

- (1) Frequency Modulator

MC 1648 Modulator

- a. Carrier Signal : 2MHz ~ 3MHz
- b. Audio Signal : 3KHz ~ 8KHz
- c. Power Supply : +5V

LM566 Modulator

- a. Carrier Signal : 2KHz ~ 20KHz
- b. Audio Signal : 1KHz ~ 5KHz
- c. Power Supply : +5V, -5V

- (2) Frequency Demodulator

LM 565 Demodulator

- a. Carrier Signal : 2KHz ~ 20KHz
- b. Audio Signal : 1KHz ~ 5KHz
- c. Power Supply : +5V, -5V

FM-to-AM Demodulator

- a. Carrier Signal : 500KHz ~ 2MHz
- b. Audio Signal : 1KHz ~ 5KHz
- d. Power Supply : +5V, -5V

5. KL-93005 PLL Frequency Synthesizer

- (1) Frequency Select Range : 1KHz ~ 1.5MHz
- (2) Reference Frequency : Crystal osc. 1KHz or 10KHz
- (3) Phase Detector & VCO : IC 4046
- (4) Adjustable Capture Range
- (5) Adjustable Lock-in Range

Digital Communication Modules



KL-94001



KL-94002



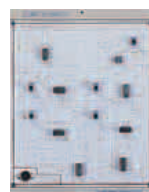
KL-94003



KL-94004



KL-94005



KL-94006



KL-94007

6. KL-94001

- (1) Analog to Digital Converter
 - a. Resolution : 8 bits or 256 steps
 - b. Clock Frequency : 100KHz~800KHz
 - c. Input Voltage Range : 0~5V
 - d. Power Supply : +5V
- (2) Digital to Analog Converter
 - a. Digital Input : 8 bits
 - b. Output Voltage Type : Single or Bipolar
 - c. Power Supply : +12V, -12V

7. KL-94002

- (1) PWM Modulator

[Use LM741 PWM](#)

 - a. Carrier Signal : 1.5KHz~2KHz
 - b. Audio Signal : 500Hz
 - c. Power Supply : +12V, -12V

[Use LM555 PWM](#)

 - a. Carrier Signal : 5KHz~10KHz
 - b. Audio Signal : 1KHz
 - c. Power Supply : +12V
- (2) PWM Demodulator
 - a. Audio Signal : 500Hz~700Hz
 - b. Modulation Signal : 5KHz~6KHz
 - c. Demodulation Signal : 500Hz~700Hz
 - d. Power Supply : +12V

8. KL-94003

- (1) FSK Modulator
 - a. Space Signal : 1270Hz
 - b. Mark Signal : 1070Hz
 - c. Output Voltage : 0~5V
 - d. Power Supply : +12V, -12V
- (2) FSK Demodulator
 - a. Space Signal : 1270Hz
 - b. Mark Signal : 1070Hz
 - c. Output Voltage : 0~5V
 - d. Power Supply : +5V, -5V

9. KL-94004

- (1) Manchester Code Encode & Decode
 - a. Encode of Manchester Code
 - b. Decode of Manchester Code

10. KL-94005

- (1) ASK Modulator
 - a. Carrier Signal : 20KHz~200KHz
 - b. Modulated Signal : 1KHz~10KHz
- (2) ASK Demodulator

[Asynchronous Envelope Detector of ASK Demodulator](#)

 - a. Carrier Signal : 20KHz~200KHz
 - b. Modulated Signal : 1KHz~10KHz

[Synchronous Product Detector of ASK Demodulator](#)

 - a. Carrier Signal : 20KHz~200KHz
 - b. Modulated Signal : 1KHz~10KHz

11. KL-94006

- (1) PSK/QPSK MODULATOR

[Production & Measurement of Data Stream of QPSK](#)

[QPSK Modulator](#)

 - a. Data Speed : 400bps ~1000bps
 - a. Carrier signal : 7KHz
 - b. Data Speed : 400bps

12. KL-94007

- (1) PSK/QPSK DEMODULATOR
 - a. Carrier signal : 7KHz
 - b. Data Speed : 400bps

Power Supply and Audio Generator Module



KL-92001

13. KL-92001

- (1) Fixed DC Power Supply.
 - a. Output Voltage : +5V, -5V, +12V, -12V
 - b. Output Current : +5V/0.3A, -5/0.3A, +12V/0.3A, -12V/0.3A
 - c. Output Connector : 2 × 5PIN DIN Connector
 - d. Output Overload Protection
- (2) Variable DC Power Supply
 - a. Output Voltage : 0V~15V
 - b. Output Current : 0.5A
 - c. Output Overload Protection
- (3) Generator
 - Audio Generator (1)**
 - a. Frequency : 10Hz~200KHz
 - b. Output Waveforms : Sine, Triangle, Square
 - c. Output Impedance : 50 Ω
 - d. Output Attenuation : 0, -20dB
 - e. Output Amplitude : 10Vp-p (at open)
 - f. TTL Output
 - Audio Generator (2)**
 - a. Frequency : 10Hz~200KHz
 - b. Output Waveforms : Sine, Triangle, Square
 - c. Output Impedance : 50 Ω
 - d. Output Attenuation : 0, -20dB
 - e. Output Amplitude : 10Vp-p (at open)
 - f. With VCF Input

LIST OF EXPERIMENTS

ANALOG COMMUNICATION

1. RF Oscillator Experiment
2. Second Order LPF & HPF Experiment
3. AM Modulator Experiment
4. AM Demodulator Experiment
5. DSB-SC and SSB Modulator Experiment
6. DSB-SC and SSB Demodulator Experiment
7. FM Modulator Experiment
8. FM Demodulator Experiment
9. PLL Frequency Synthesizer

DIGITAL COMMUNICATION

1. Analog to Digital Experiment
2. Digital to Analog Experiment
3. PWM Modulator Experiment
4. PWM Demodulator Experiment
5. FSK Modulator Experiment
6. FSK Demodulator Experiment
7. CVSD Modulator & Demodulator, Manchester Code Encode/Decode
8. ASK Modulator/Demodulator
9. PSK/QPSK Modulator/Demodulator

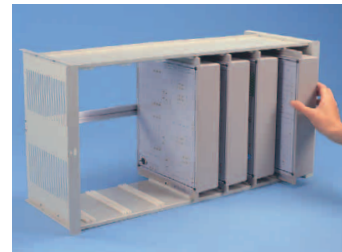
ACCESSORIES (KL-98001)

STANDARD ACCESSORIES

1. Connector leads 1 set
2. Experiment manual 1pc., and teacher guide 1 pc.
3. AC cord 1 pc.
4. Storage cabinet 2 sets (KL-99001)
5. DC Connect plug 2 pcs.

OPTIONAL ACCESSORIES

1. Rack frame (KL-97001)
2. RF generator (KI-2220)
3. Digital storage oscilloscope with FFT



Storage Cabinet (KL-99001)



Option: Rack Frame. (KL-97001)



Option: KI-2220 150MHz RF Generator