BASIC COMMUNICATION TRAINERS

(Analog & Digital Communication Experiment Trainers)

BCT-900

The BCT-900 trainer includes the basic modules to experiment on fundamental & higher 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.
This trainer combined the modules with experimental circuits. It can offer the beginner complete courses of basic communication.
With the optional power supply and signal unit, oscilloscope or spectrum analyzer, Student can complete various experiments independently.

BCT-900 is a open-modular design, it enables can be extended experimental range.

LIST OF EXPERIMENTS

ANALOG COMMUNICATION MODULES
- RF Oscillator Experiment
- Second Order LPF & HPF Experiment
- AM Modulator Experiment
- AM Demodulator Experiment
- DSB-SC and SSB Modulator Experiment
- DSB-SC and SSB Demodulator Experiment
- FM Modulator Experiment
- FM Demodulator Experiment
- Frequency Converter
- Signal Recovery

DIGITAL COMMUNICATION MODULES
- Analog to Digital Converter Experiment
- Digital to Analog Converter Experiment
- PWM Modulator Experiment
- PWM Demodulator Experiment
- FSK Modulator Experiment
- FSK Demodulator Experiment
- ASK Modulator Experiment
- ASK Demodulator Experiment
- PSK Modulator Experiment
- PSK Demodulator Experiment

LIST OF MODULES

(A) Analog Communication Modules (ACT-1000)

(1) ACT-1000-11 (Module One) : Second Order Active Filters and RF Oscillators
(2) ACT-1000-12 (Module Two) : AM Modulation and Demodulation
(3) ACT-1000-13 (Module Three) : DSB-SC and SBB Modulation and Demodulation
(4) ACT-1000-14 (Module Four) : FM Modulation and Demodulation
(5) ACT-1000-18 (Module Eight) : Frequency Converter and Signal Recovery

(B) Digital Communication Modules (DCT-1000)

(1) ACT-1000-17 (Module Seven) : ADC and DAC Converter
(2) DCT-1000-22 (Module Two) : Pulse Width Modulation and Demodulation
(3) DCT-1000-26 (Module Six) : ASK Modulation and Demodulation
(4) DCT-1000-27 (Module Seven) : FSK Modulation and Demodulation
(5) DCT-1000-28 (Module Eight) : PSK Modulation and Demodulation

(C) Function Generator, DC Power Supply and RF Generator Module (ACT-1000-PG)

(A) Analog Communication Modules (ACT-1000)

Curriculum Outline

1. Design and implementation of second order RF filters and RF oscillators.
2. Design and implementation of AM and FM modem.
3. Design and implementation of DSB/SC and SSB modem.
4. Design and implementation of FDM multiplexer and demultiplexer.
5. Design and implementation of frequency converter and signal recovery.

Curriculum Objectives:

1. To understand the basic theory of analog communication system.
2. Design and implementation ability training of analog modem.
3. To understand the applications of balanced modulator circuit.
4. To understand the applications of analog modem.

Lists Of Modules & Experiments

Module One: Second Order Active Filters and RF Oscillators

(ACT-1000-11)

Chapter 1: Second Order Active Filters

Experiment 1: Second Order Active Low-pass Filter (Low-pass -3 dB 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 Bandpass Filter (Center Frequency: 10 kHz - 100 kHz, Bandwidth: 6 kHz - 60 kHz.)
Experiment 4: Second Order Active Bandstop Filter (Cutoff Frequency: 10 kHz - 100 kHz, Bandwidth: 6 kHz - 60 kHz.)

Chapter 2: RF Oscillators

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.)

Module Two: AM Modulation and Demodulation

(ACT-1000-12)

Chapter 3: AM Modulator

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.)

Chapter 4: AM Demodulator
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.)

Module Three: DSB-SC and SBB Modulation and Demodulation

(ACT-1000-13)
Chapter 5: DSE3-SC and SSB Modulator
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.)

Chapter 6: DSB-SC and SSB Demodulator
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.)

Module Four: FM Modulation and Demodulation

(ACT-1000-14)
Chapter 7: FM Modulator
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.)

Chapter 8: FM Demodulator
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.)

Module Seven: ADC and DAC Converter

(ACT-1000-17)
Chapter 13: Analog-to-digital Converter
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, Clock Frequency; 120 kHz.)

Chapter 14: Digital-to-analog Converter
Experiment 1: R-2R Digital-to-analog Converter (Digital Input: 4 bits, Analog Output: 0 V - 5 V.)
Experiment 2: Unipolar DAC 0800 Digital-to-analog Converter (Digital Input: 8 bits, Analog Output: 0 V - 5 V, Step Value: 0.019 V.)
Experiment 3: Bipolar DAC 0800 Digital-to-analog Converter (Digital Input: 8 bits, Analog Step Value: 0.038 V.)

Module Eight: Frequency Converter and Signal Recovery

(ACT-1000-18)
Chapter 15: Frequency Converter
Experiment 1: Frequency Multiplier (Carrier Signal: I
Experiment 2: Up/Down Frequency Converter (Card Carrier Signal @ RF port: 120 kHz.)

Chapter 16: Signal Recovery
Experiment 1: Carrier Signal Recovery Circ Experiment 2: Clock Recovery Circuit (Clock Frequency: 5 kHz ,

(B) Digital Communication Modules (DCT-1000)

Curriculum Outlines:

1. Design and implementation of ADC and DAC converter.
2. Design and implementation of PWM modem.
3. Design and implementation of ASK, FSK and PSK modem.

Curriculum Objectives:

1. To understand the basic theory of digital communication system.
2. Design and implementation ability training of digital modem.
3. To understand the applications of balanced modulator circuit.
4. To understand the applications of digital modem.

Lists Of Modules & Experiments

Module Seven: ADC and DAC Converter

(ACT-1000-17)

Chapter 13: Analog-to-digital Converter

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, Clock Frequency; 120 kHz.)

Chapter 14: Digital-to-analog Converter

Experiment 1: R-2R Digital-to-analog Converter (Digital Input: 4 bits, Analog Output: 0 V - 5 V.)

Experiment 2: Unipolar DAC 0800 Digital-to-analog Converter (Digital Input: 8 bits, Analog Output: 0 V - 5 V, Step Value: 0.019 V.)

Experiment 3: Bipolar DAC 0800 Digital-to-analog Converter (Digital Input: 8 bits, Analog Step Value: 0.038 V.)

Module Two : Pulse Width Modulation and Demodulation

(ACT-1000-22)

Chapter 3 PWM Modulator

Experiment 1: uA741 Pulse Width Modulator

Carrier Signal: 1.5 kHz - 2 kHz, Audio Signal: 500 Hz.

Experiment 2: LM555 Pulse Width Modulator

Carrier Signal: 5 kHz - 10 kHz, Audio Signal: 1 kHz.

Chapter 4 PWM Demudulator

Experiment 1: Pulse Width Demodulator

Carrier Signal: 5 kHz - 6 kHz, Audio Signal: 500 Hz - 700 Hz.

Module Six : ASK Modulation and Demodulation

(ACT-1000-26)

Chapter 11 ASK Modulator

Experiment 1: XR2206 ASK Modulator

Carrier Signal: 20 kHz, Data Rate: 1 kbps.

Experiment 2: MC1496 ASK Modulator

Carrier Signal: 20 kHz - 100 kHz, Data Rate: 2 kbps.

Chapter 12 ASK Demodulator

Experiment 1 : Asynchronous ASK Demodulator (I) (Using XR2206 as the modulated ASK signal)

Carrier Signal: 20 kHz, Data Rate: 200 bps - 1 kbps.
Experiment 2: Asynchronous ASK Demodulator (II) (Using MC1496 as the modulated ASK signal)
Carrier Signal: 20 kHz, Data Rate: 200 bps - 1 kbps.
Experiment 3: Synchronous ASK Demodulator
Carrier Signal: 100 kHz, Data Rate: 200 bps - 2 kbps.

Module Seven : FSK Modulation and Demodulation

(ACT-1000-27)

Chapter 13 FSK Modulator

Experiment 1: XR2206 FSK Modulator
Data Rate: 200 bps - 400 bps.
Experiment 2: LM566 FSK Modulator
Data Rate: 200 bps - 400 bps.

Chapter 14 FSK Demodulator

Experiment 1: FSK Demodulator (I) (Using XR2066 as the modulated FSK signal)
Data Rate: 200 bps - 400 bps.
Experiment 2: FSK Demodulator (II) (Using LM566 as the modulated FSK signal)
Data Rate: 200 bps - 400 bps.

Module Eight : PSK Modulation and Demodulation

(ACT-1000-28)

Chapter 15 PSK Modulator

Experiment 1: PSK Modulator
Carrier Signal: 100 kHz, Data Rate: 200 bps.

Chapter 16 PSK Demodulator

Experiment 1: PSK Demodulator

(C) Function Generator, DC Power Supply and RF Generator Module (ACT-1000PG)

Function Generator

Features

1. Two signal output ports
2. Frequency range: 10 Hz ~ 100 kHz and 100 Hz ~ 1 MHz
3. Waveforms: Sine, Triangle, Square and TTL Pulse
4. Amplitude: 10 Vpp

5. Built-in 6-digit frequency counter
6. Large 0.5" LED display
7. Overload protection

Specification
1. Waveforms: Sine, Triangle, Square and TTL Pulse
2. Amplitude: > 10 Vpp
3. Impedance: 50 ohm +/-10 %
4. Duty control: 30 % ~ 60 %
5. Display: 6-digit LED display
6. Frequency range: 10 Hz ~ 100 kHz (4 ranges) and 100 Hz ~ 1 MHz (4 range)
7. Frequency control: Separative coarse and fine tuning
8. Mode: Internal only
9. Time base: Oscillation frequency 60 Hz
10. Resolution: 0.1 Hz, 1 Hz, 10 Hz, 100 Hz, 1 kHz.

DC Power Supply

Specification
1. Triple bipolar voltage outputs
2. Constant voltage operation
3. Low ripple and noise
4. Constant voltage output: +/-5 V, +/-12 V
5. Variable voltage output: 0 V ~ +/-15 V

RF Generator

Specification

Main Output	
Frequency	100kHz ~ 150MHz (up to 450MHz on harmonics)
Range	A 100 ~ 290kHz
	B 290 ~ 900kHz
	C 0.9 ~ 3.0MHz
	D 3.0 ~ 11MHz
	E 10 ~ 35MHz
	F 32 ~ 150MHz
	(96 ~ 450MHz, calibrated harmonics)
Accuracy	±5%
Level	100mVrms approx up to 35MHz
Level control	High/Low switch able and fine control

Amplitude Modulation	
Internal	Frequency : 1kHz
	Percentage : 30% max and adjuster
External	Frequency : 50Hz to 20kHz
	Sensitivity : less than 1Vrms
AUX Output	Audio Output Frequency : 1kHz
	Level : 1Vrms MIN, fixed
Frequency Monitor	Frequency : Oscillation frequency
	Level : 50mVrms MIN