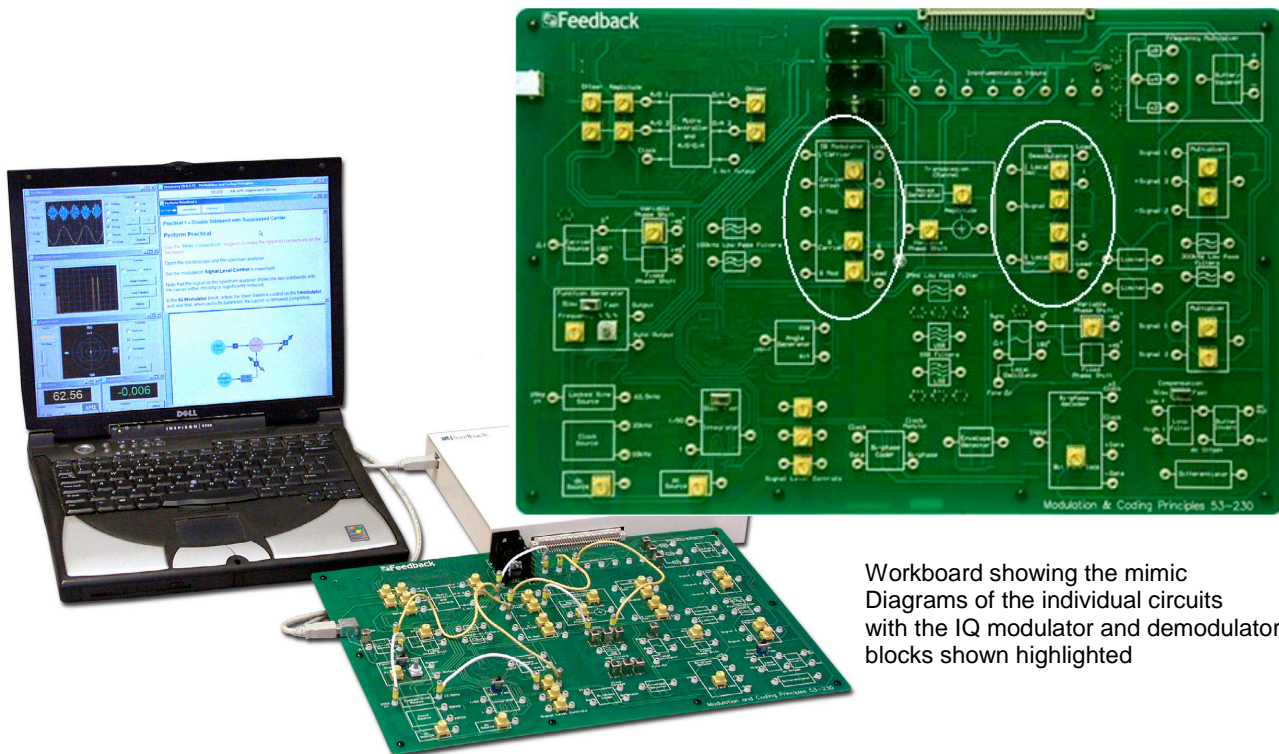


Modulation and Coding Principles

53-230



Workboard showing the mimic Diagrams of the individual circuits with the IQ modulator and demodulator blocks shown highlighted

Features

- Suitable for both technician and undergraduate teaching
- Complete trainer, requires only a PC
- Computer based assignments
- Covers an introduction to Tuned Circuits and Filters
- Integrated hardware and software environment
- On-screen background, theory and practical instructions
- Software provides embedded Instrumentation (includes Automatic Bode & Nyquist plot)
- No costly additional instrumentation required
- Stand-alone workstation

Description

This modern training system provides a learning platform that involves the interaction between hardware, software, PC and the student. It has been specifically developed to convey the theory of a wide variety of subjects in a way that enhances the learning experience through visual presentation and interaction with the subject matter.

The Modulation and Coding Principles workboard (53-230) is one of a set of three that are related to the subject of Telecommunications. Two other workboards covering Amplifiers and Oscillators (53-210) and Tuned Circuits and Filters (53-220) are available, the complete set forming a comprehensive telecommunications course.

The Modulation and Coding Principles workboard covers the principles and practice of many of the modulation and demodulation formats used in modern analogue and digital communication systems. Many individual circuits are provided that are studied individually and collectively by interconnecting the various circuits together.

The workboard is connected to a PC via a USB Real-time Access Terminal (92-203 RAT). The Terminal also provides all the necessary power supplies for the workboard to operate.

Integrated with the hardware is a comprehensive laboratory software package comprising full student instruction for performing the many assignments and practical activities, together with relevant background and theoretical information.

The software also provides all of the instrumentation required for the monitoring and measurement of workboard signals.

Software for editing the course content is available, Discovery Tools (93-400) and for adding multimedia materials, Discovery Course Manager (93-410).

Curriculum Coverage

A wide range of practical assignment work can be covered using this workboard. This includes seventeen assignments, each with up to four sub-practicals.

Signals in the Time and Frequency domains

Spectra of sine, triangle and square waves; filtering; noise signals

Sampling and Time Division Multiplexing

Sampling; A/D and D/A conversion; aliasing; TDM

Amplitude Modulation

Modulation and demodulation of double sideband AM with full carrier; modulation index; bandwidth; envelope detector; filtering; product detection

AM with Suppressed Carrier

DSBSC; modulation; demodulation; SSBSC; generation and demodulation

SSB Generation with an IQ Modulator

Amplitude Shift Keying (ASK)

Generating ASK; Multi-level ASK; Demodulating ASK

Frequency Modulation

Concepts of FM; generation by direct oscillator frequency shift; deviation; spectrum; bandwidth; Bessel functions; Carson's Rule; PLL demodulation

Frequency Modulation with an IQ Modulator

Frequency Shift Keying (FSK)

Generating and demodulating FSK using a PLL; minimum shift keying; multi-level FSK

Phase Modulation

Generating phase modulation using an IQ modulator; demodulation using residual carrier reference; demodulation using a frequency demodulator

Phase Shift Keying (FSK)

Generating binary phase shift keying (BPSK); demodulation of BPSK using residual carrier; demodulation using a Costas Loop and by frequency multipliers

Multi-state Phase Shift Keying

Generation and characteristics of 4-PSK (QPSK) and 8-PSK; generating BPSK & QPSK using IQ modulator; demodulation of QPSK using Double Costas Loop; carrier recovery

Quadrature Amplitude Modulation (QAM)

Generation and characteristics of QAM; QAM 16, 64, 256 constellations; effect of amplitude and phase noise on QAM; demodulation of QAM

Uncoded Binary Data Formats

NRZ and RZ in bipolar and unipolar forms

Bi-phase Data Format

Generating and decoding bi-phase data

Alternate Mark Inversion

AMI coding and its generation

Word Synchronisation

Synchronisation; sync word inserting

Specification

The instruments provided are:

- 2-channel oscilloscope
- Spectrum Analyser
- Phase scope with phasor (vector) display
- Constellation display
- Frequency meter
- Voltmeter

Dimensions & Weight

Dimensions: 410mm x 270mm x 60mm

Weight: 1 kg.

Tender Specification

- [1] A self-contained, open-based telecommunications trainer.
- [2] To be used for teaching the principles of modulation and coding principles.
- [3] The workboard to operate with a Real Time Access Terminal (RAT) enabling connection to a PC via a USB.
- [4] To be supplied with interactive software which includes teaching curricula and PC-based instrumentation.
- [5] The PC-based instruments to be allowed to be opened all at the same time in a Windows environment.
- [6] PC-based instruments to include all of the following: Oscilloscope, Spectrum Analyser, Frequency Meter, Voltmeter, Phase Meter and Gain Phase Meter.
- [7] The Phase Meter can be used as a constellation meter in 16, 64 and 256 QAM experiments.
- [8] Curriculum to cover analogue and digital modulation.
- [9] 17 assignments to be provided, each with up to 4 sub-practicals.
- [10] Can be used as a standalone workstation or networked with Discovery Lab Manager.
- [11] Workboard to have dimensions approx. 410mm x 270mm x 60mm and weight approx. 1kg.
- [12] To be supplied with an experimental manual.
- [13] To be supplied by a company offering a 2 year parts and labour warranty.

Ordering Information

Modulation and Coding Principles Workboard 53-230
USB Rapid Access Terminal (RAT) 92-203

Discovery Development Software

Discovery Tools 93-400
Discovery Course Manager 93-410



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