



Telecommunications

DIGITAL COMMUNICATIONS SIMULATION SOFTWARE (LVSIM[®]-DCOM), MODEL 9481



GENERAL DESCRIPTION

LVSIM[®]-DCOM is a Windows[®]-based simulation software that covers the same courseware as the Digital Communications Training System, Model 8085.

LVSIM[®]-DCOM recreates a three-dimensional classroom laboratory on a computer screen. All laboratory equipment of the Digital Communications Training System is replaced with three-dimensional replicas (images), which students can manipulate on the computer screen. Using the mouse, students can install virtual Digital Communications equipment in the laboratory, connect the equipment, perform a lab exercise, and obtain the same results as with the actual Lab-Volt training equipment.

Sophisticated mathematical models accurately simulate the characteristics of the actual Digital Communications components. All modules contained in the LVSIM[®]-DCOM system feature the same functionality and appearance as the actual equipment.

Used either as a complement to the actual Digital Communications Training System or as a stand-alone product, LVSIM[®]-DCOM is a cost-effective tool that enables students to safely and accurately perform the exercises described in the courseware. Because students using LVSIM[®]-DCOM become familiar with the equipment configuration and laboratory setup before they enter the lab, their time spent in duplicating

DIGITAL COMMUNICATIONS SIMULATION SOFTWARE (LVSIM[®]-DCOM) MODEL 9481

hands-on tasks in the actual laboratory may be reduced by as much as 50%. This results in the need for less physical hardware per student. With these cost-saving features, institutions on tight budgets can deliver a quality program in Digital Communications with limited investment.

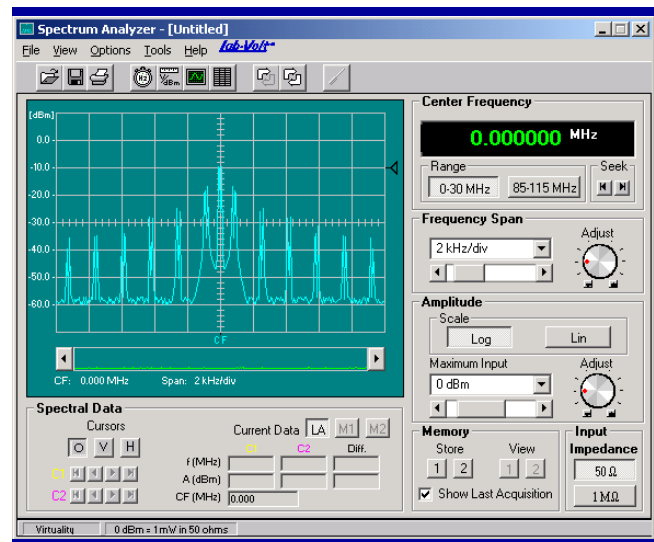
As a stand-alone package, LVSIM[®]-DCOM software familiarizes students with hands-on activities related to Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), Analog-to-Digital and Digital-to-Analog conversions, Pulse Code Modulation (PCM), Differential Pulse Code Modulation (DPCM), Delta Modulation (DM), Amplitude-Shift Keying (ASK), Frequency-Shift Keying (FSK), and more. In essence, students using LVSIM[®]-DCOM as a stand-alone product can cover most of the 8085 System courseware without actually touching the equipment.

Students may copy the LVSIM[®]-DCOM software onto their own personal computers in order to practice and prepare in advance for their lab exercises. However, measurement capability is restricted by means of a security device. Two different security devices are available with LVSIM[®]-DCOM: a single-user hardlock key to be installed on the USB port of the user's computer or a multiple-user hardlock key to be installed in the server of a computer network.

The multiple-user hardlock key is a small printed circuit board with an edge-type connector that allows installation in one of the PCI expansion slots of the computer used as the server. This key can be installed in servers running under one of the following Microsoft[®] operating systems: Windows[®] 98, Windows[®] NT Server, Windows[®] NT Workstation, Windows[®] 2000, Windows[®] XP, and Windows[®] ME. As its name indicates, the multiple-user hardlock key allows several users of a network to run LVSIM[®]-DCOM at the same time. An included user guide clearly explains how to install and use the software. This guide also

provides detailed procedures for installing the two types of security devices that can be used with LVSIM[®]-DCOM.

LVSIM[®]-DCOM comes bundled with Lab-Volt's Data Acquisition and Management for Communications (LVDAM-COM) software, which enables students to perform voltage, frequency, and power measurements, as well as waveform analysis, in both the time and frequency domains. These tasks are achieved by simply clicking on the desired instrument icon on the Instrument Bar.



PAM signal analysis using the Spectrum Analyzer

LVSIM[®]-DCOM comes with three student manuals: Pulse Modulation and Sampling, Digital Modulation, and Modems and Data Transmission. An instructor guide containing the measurement results as well as the answers for each hands-on exercise of the student manuals, is also included.

Features

LVSIM®-DCOM enables students to perform the following tasks by simply using a computer:

- Install, move, rotate, and remove Digital Communications equipment.
- Connect Digital Communications components.
- Modify or remove Digital Communications component connections.
- Change the cable color.
- Launch and run the LVDAM-COM application within LVSIM®-DCOM.



Frequency setting using buttons or a control knob

- Zoom in or out to adjust the view.
- Apply virtual power to the equipment.
- Observe waveforms on a virtual oscilloscope.
- Observe spectral information on a virtual spectrum analyzer.
- Perform voltage and power measurements using a virtual True RMS voltmeter / power meter.
- Perform frequency measurements using a virtual frequency counter.
- Record measurements in a data table.
- Plot graphs using recorded data.
- Print display screens.
- Save and restore equipment setups, data, and waveforms.

Digital Communications Equipment

The following components are simulated in LVSIM®-DCOM:

- Table
- Cables and Accessories
- Power Supply / Dual Audio Amplifier
- Dual Function Generator
- RF / Noise Generator
- Virtual Test Equipment Interface
- Enclosure / Supply Regulator
- Clock Generator
- Pseudo-Random Binary Sequence Generator
- Bit Error Rate Indicator
- Logic Analyzer
- DC Voltmeter / DC Source
- Low Pass Audio Filter
- Synchronous Audio Generator
- Signal Interruptor/Selector
- Noise Measurement Filters
- PAM/ASK Generator
- PAM/ASK Receiver
- PWM/PPM Generator
- PWM/PPM Receiver
- PCM Encoder
- PCM Decoder
- DPCM Encoder
- DPCM Decoder
- FSK Modem
- BPSK Modulator
- BPSK Demodulator
- Delta/CVSD Encoder
- Delta/CVSD Decoder

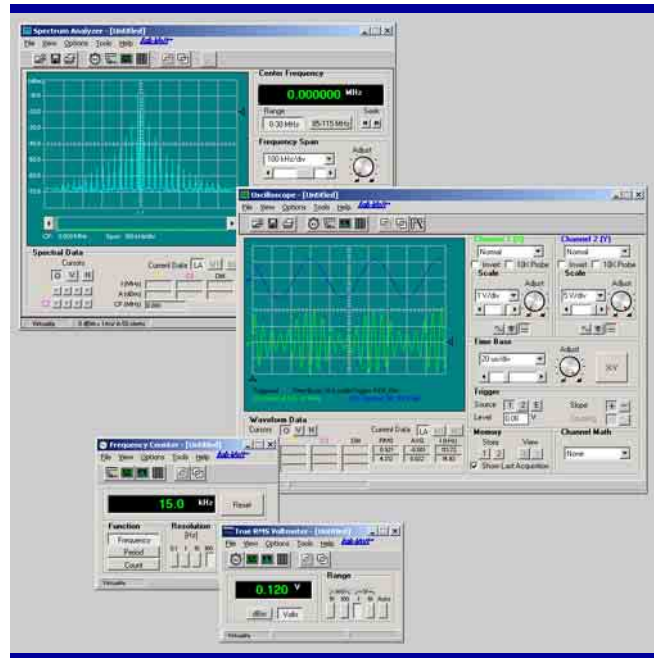
DIGITAL COMMUNICATIONS SIMULATION SOFTWARE (LVSIM®-DCOM) MODEL 9481

LVDAM-COM

The Lab-Volt Data Acquisition and Management for Communications (LVDAM-COM) system is a full instrumentation package that runs on an IBM® PC or compatible computer, under the Microsoft® Windows® operating environment. Virtual instruments provide instructors with the opportunity to clearly demonstrate concepts that, until now, could only be presented using traditional textbook methods and static drawings. Dedicated software, fully developed and maintained by Lab-Volt, consists of virtual instruments that provide all the standard measurements associated with voltage, frequency and RF power. The LVDAM-COM software also enhances the overall presentation of course material with built-in capabilities for waveform observation, spectral analysis, data storage, and graphics.

The LVDAM-COM software includes a dual-input Oscilloscope, a Spectrum Analyzer, a Frequency Counter, and a True-RMS Voltmeter / Power Meter. Data can be logged in a Data Table (ASCII format) for data analysis, and students can plot graphs using the data recorded in the Data Table.

Signals can be observed in the time domain on the virtual memory oscilloscope and in the frequency domain on the virtual spectrum analyzer. The software can operate in either acquisition, simulation, or virtual mode.



In simulation mode, signals are generated from user-defined parameters. Configuration, data, and simulation files can be saved and restored. All display screens can be printed on a laser printer (not included).

PERSONAL COMPUTER REQUIREMENTS

A Pentium personal computer, running under one of the following Microsoft® operating systems: Windows® 98, Windows® NT, Windows® 2000, Windows® XP, and Windows® ME, is required to run this software.

COURSEWARE

	ORDERING NUMBERS ¹
Student Manuals	
Pulse Modulation and Sampling	27695-00
Digital Modulation	27696-00
Modems and Data Transmission	27697-00
Instructor Guide	
Digital Communications	27695-10
User Guide	
Virtual Laboratory and Equipment	32359-E0

¹ The ordering numbers shown apply to the English 120-V version. Other versions are available. Refer to the Ordering Numbers section.

TABLE OF CONTENTS OF THE STUDENT MANUALS

Pulse Modulation and Sampling (27695-00)

- **Pulses**
 - Time Characteristics of Pulses
 - Frequency Characteristics of Pulses
 - Band-Limiting
 - Noise and Signal Power Measurement
- **Pulse Amplitude Modulation (PAM)**
 - PAM Signals
 - Spectral Characteristics of PAM Signals
 - Aliasing and Nyquist Rate
 - Pre-filtering
- **Demodulating PAM Signals**
 - PAM Signal Demodulation
 - Aliasing
 - PAM Signal Transmission in the Presence of Noise
- **Pulse-Time Modulation (PWM / PPM)**
 - PWM and PPM Signals
 - The Effects of Noise and Band-Limiting on Pulse-Time Modulated Signals
- **Demodulating PWM / PPM Signals**
 - PWM and PPM Signal Demodulation
 - The Effects of Noise and Band-Limiting on PWM/PPM Signal Demodulation

Digital Modulation (27696-00)

- **Analog-to-Digital and Digital-to-Analog Conversions**
 - Binary and Hexadecimal Numbers
 - Analog-to-Digital Conversion
 - Digital-to-Analog Conversion
- **Distortion and Quantization Noise**
 - Distortion in PCM systems
 - Characteristics of Quantization Noise
 - Quantization Noise Measurement
- **Pulse Code Modulation (PCM)**
 - Information Transmission with a PCM System
 - Resistance of PCM to Noise and Distortion
 - Effect of μ -Law Companding on the Performance of a PCM System
 - Effect of A-Law Companding on the Performance of a PCM System

- **Differential Pulse Code Modulation (DPCM)**
 - Principles of a DPCM System
 - Dynamic Operation of a DPCM System
- **Delta Modulation (DM)**
 - Linear Delta Modulation (LDM) System
 - Adaptive Delta Modulation (ADM) System
 - Signal-to-Noise Ratio in Delta Modulation

Modems and Data Transmission (27697-00)

- **Baseband Data Transmission**
 - Pseudo-Random Binary Sequences
 - Detection of NRZ Signals in Noise
- **Amplitude-Shift Keying (ASK)**
 - Generation and Reception of ASK Signals
 - ASK Performance in Noise
- **Frequency-Shift Keying (FSK)**
 - FSK Principles
 - FSK Performance in Noise
- **FSK Communications Standards**
 - CCITT V.21 and Bell 103 Modems (300 baud)
 - CCITT V.23 Mode 2 Modem (1200 baud)
 - Bell 202 Modem (1200 baud)
- **Binary Phase-Shift Keying (BPSK)**
 - Generation and Demodulation of BPSK Signals
 - BPSK Performance in Noise

**DIGITAL COMMUNICATIONS SIMULATION SOFTWARE (LVSIM®-DCOM)
MODEL 9481**

ORDERING NUMBERS

NUMBER OF USERS	120 V – 60 Hz			220 V – 50 Hz			240 V – 50 Hz
	ENGLISH	FRENCH	SPANISH	ENGLISH	FRENCH	SPANISH	ENGLISH
1	9481-00	9481-01	9481-02	9481-00	9481-01	9481-02	9481-00
5	9481-A0	9481-A1	9481-A2	9481-A0	9481-A1	9481-A2	9481-A0
10	9481-B0	9481-B1	9481-B2	9481-B0	9481-B1	9481-B2	9481-B0
15	9481-C0	9481-C1	9481-C2	9481-C0	9481-C1	9481-C2	9481-C0
20	9481-D0	9481-D1	9481-D2	9481-D0	9481-D1	9481-D2	9481-D0
25	9481-E0	9481-E1	9481-E2	9481-E0	9481-E1	9481-E2	9481-E0
30	9481-F0	9481-F1	9481-F2	9481-F0	9481-F1	9481-F2	9481-F0
35	9481-G0	9481-G1	9481-G2	9481-G0	9481-G1	9481-G2	9481-G0
40	9481-H0	9481-H1	9481-H2	9481-H0	9481-H1	9481-H2	9481-H0

Table 1. Software Ordering Numbers (with single-user hardlock key(s))

NUMBER OF USERS	120 V – 60 Hz			220 V – 50 Hz			240 V – 50 Hz
	ENGLISH	FRENCH	SPANISH	ENGLISH	FRENCH	SPANISH	ENGLISH
5	9481-P0	9481-P1	9481-P2	9481-P0	9481-P1	9481-P2	9481-P0
10	9481-Q0	9481-Q1	9481-Q2	9481-Q0	9481-Q1	9481-Q2	9481-Q0
15	9481-R0	9481-R1	9481-R2	9481-R0	9481-R1	9481-R2	9481-R0
20	9481-S0	9481-S0	9481-S2	9481-S0	9481-S0	9481-S2	9481-S0
25	9481-T0	9481-T0	9481-T2	9481-T0	9481-T0	9481-T2	9481-T0
30	9481-U0	9481-U0	9481-U2	9481-U0	9481-U0	9481-U2	9481-U0
35	9481-V0	9481-V0	9481-V2	9481-V0	9481-V0	9481-V2	9481-V0
40	9481-W0	9481-W0	9481-W2	9481-W0	9481-W0	9481-W2	9481-W0

Table 2. Software Ordering Numbers (with multiple-user hardlock key)

120 V – 60 Hz			220 V – 50 Hz			240 V – 50 Hz
ENGLISH	FRENCH	SPANISH	ENGLISH	FRENCH	SPANISH	ENGLISH
27695-00	27695-01	27695-02	27695-00	27695-01	27695-02	27695-00
27695-10	27695-11	27695-12	27695-10	27695-11	27695-12	27695-10
27696-00	27696-01	27696-02	27696-00	27696-01	27696-02	27696-00
27697-00	27697-01	27697-02	27697-00	27697-01	27697-02	27697-00
32359-E0	32359-E1	32359-E2	32359-E0	32359-E1	32359-E2	32359-E0

Table 3. Courseware Ordering Numbers

Reflecting Lab-Volt's commitment to high quality standards in product, design, development, production, installation, and service, our manufacturing and distribution facility has received the ISO 9001 certification.

Lab-Volt reserves the right to make product improvements at any time and without notice and is not responsible for typographical errors. Lab-Volt recognizes all product names used herein as trademarks or registered trademarks of their respective holders. © Lab-Volt 2005. All rights reserved.