Digital Electronics Program Model H-CAI-DE

The Hampden H-CAI-DE Kit prepares students to design, diagnose and verify standard digital circuits. Complete resources for the quick assembly and disassembly of simple breadboard experiments included. (No Soldering Required)

A student workbook guides students in the connection of circuits, making measurements and observations, and arriving at conclusions. All experiments are performed at low voltage levels. Each concept is presented simply with easy-to-follow circuit diagrams.

Description

This kit provides all necessary components and breadboarding apparatus required to complete the topics covered in **Tokheim's Digital Electronics Principles and Applications**.

The Components are coordinated with Tokheim's *Digital Electronics Principles and Applications* text and *Experiment Manual for Digital Electronics* book. This modern module provides a concise explanation of TTL circuits. The lab experiments introduced are comprehensive in scope, providing a solid grounding in basic digital theory, circuit simplification and design techniques.

Each component is permanently secured to its own sturdy plastic base—Velcro® backed for fast and easy assembly of circuits on the supplied Velcro work board. This "Velcro" attachment system has become the preferred method for laboratory circuit assembly due to its simplicity, ease of use and durability.

All components are secured to Velcro-covered sliding trays. All kits can be ordered as drawer storage kits using the supplied glue-on tray support panels (two per drawer) or with heavy-duty lockable cabinets. (Specify -D or -C)

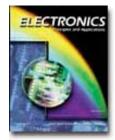**Optional Drawer Storage Available**

Hardware Features

- Lockable Storage & Carrying Case
- Neat Work Areas
- Ease of Circuit Assembly & Disassembly
- Individually Mounted Components
- Low Voltage

Courseware Features

- Background Theory
- Easy to Follow Sequence
- Experiments and Tests

All the necessary components & breadboarding apparatus required to complete ▶

Tokheim's Digital Electronics

■ Topics

Digital Electronics
What Is a Digital Signal?
Why Use Digital Circuits?
Where are Digital Circuits Used?
How Do You Generate a Digital Signal?
How Do You Test for a Digital Signal?

Numbers We Use in Digital Electronics
Counting In Decimal and Binary
Place Value
Binary To Decimal Conversion
Decimal To Binary Conversion
Electronic Translators
Hexadecimal Numbers
Octal Numbers
Bits, Bytes, Nibbles, and Word Size

All Hampden units are available for operation at any voltage or frequency

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Digital Electronics Program Model H-CAI-DE

■ Topics - Continued

Logic Gates
The AND Gate
The OR Gate
The Inverter and Buffer
The NAND Gate
The NOR Gate
The Exclusive OR Gate
The Exclusive NOR Gate
The NAND Gate as a Universal Gate
Gates With More Than Two Inputs
Using Inverters to Convert Gates
Practical TTL Logic Gates
Practical CMOS Logic Gates
Troubleshooting Simple Gate Circuits
IEEE Logic Symbols
Simple Logic Gate Applications
Logic Functions Using Software
    (BASIC Stamp Module)

Combining Logic Gates
Constructing Circuits from Boolean
    Expressions
Drawing a Circuit from a Maxterm
    Boolean Expression
Truth Tables and Boolean Expressions
Sample Problem
Simplifying Boolean Expressions
Karnaugh Maps
Karnaugh Maps With Three Variables
Karnaugh Maps With Four Variables
More Karnaugh Maps
A Five-Variable Karnaugh Map
Using NAND Logic
Computer Simulations: Logic
    Converter
Solving Logic Problems: Data Selectors
Programmable Logic Devices (PLDs)
Using De Morgan's Theorems
Solving a Logic Problem (BASIC Stamp
    Module)

IC Specifications and Simple Interfacing
Logic Levels and Noise Margin
Other Digital IC Specifications
MOS and CMOS ICs

Interfacing TTL and CMOS w/ Switches
Interfacing TTL and CMOS w/ LEDs
Interfacing TTL and CMOS IC's
Interfacing TTL and CMOS w/ Buzzers,
    Relays, Motors, and Solenoids
Optoisolators
Interfacing with Servo and Stepper
    Motors
Using Hall-Effect Sensors
Troubleshooting Simple Logic Circuits
Interfacing the Servo (BASIC Stamp
    Module)

Encoding, Decoding, & 7-Segment Displays
The 8421 BCD Code
The ECESS-3 Code
The Gray Code
The ASCII Code
Encoders
Seven-Segment LED Displays
Decoders
BCD-To-7-Segment Decoder/Drivers
Liquid-Crystal Displays
Using CMOS To Drive An LCD
    Display
Vacuum Fluorescent Displays
Driving a VF Display
Troubleshooting a Decoding Circuit

Flip-flops
The R-S Flip-Flop
The Clocked R-S Flip-Flop
The D Flip-Flop
The J-K Flip-Flop
IC Latches
Triggering Flip-Flops
Schmitt Trigger
IEEE Logic Symbols
Application: Latched Encoder-Decoder
    System

Counters
Ripple Counters
Mod-10 Ripple Counters
Synchronous Counters
Down Counters
Self-Stopping Counters
Counters as Frequency Dividers

TTL IC Counters
CMOS IC Counters
A Three-Digit BCD Counter
Counting Real-Worls Events
Using a CMOS Counter in an Electronic
    Game
Using Counters - An Experimental
    Tachometer
Troubleshooting a Counter

Shift Registers
Serial Load & Parallel Load Shift
    Registers
A Universal Shift Register
Using the 74194 IC Shift Register
An 8-Bit CMOS Shift Register
Using Shift Registers: Digital Roulette
Troubleshooting a Simple Shift Register

Arithmetic Circuits
Binary Addition
Half Adders
Full Adders
Three-Bit Adders
Binary Subtraction
Parallel Subtractors
IC Adders
Binary Multiplication
Binary Multipiers
2s Complement Notation, Addition,
    & Subtraction
2s Complement Adders/Subtractors
Troubleshooting a Full Adder

Memories
Overview of Memories
Random-Access Memory (RAM)
Static RAM ICs
Using a SRAM
Read-Only Memory (ROM)
Using a ROM
Programmable Read-Only Memory
    (PROM)
Nonvolatile Read/Write Memory
Memory Packing
Computer Bulk Storage Devices
Digital Potentiometer: Using NV Memory

Simple Digital Systems
Elements of a System
A Digital System on an IC
Digital Games
The Digital Clock
The LSI Digital Clock
The Frequency Counter
An Experimental Frequency Counter
LCD Timer with Alarm
Simple Distance Sensing
JTAG/Boundary Scan

Computer Systems
The Computer
The Microcomputer
Microcomputer Operation
Microcomputer Address Decoding
Data Transmission
Detecting Errors in Data Transmissions
Data Transmission in a Computer System
Programmable Logic Controllers (PLCs)
Microcontrollers
The BASIC Stamp Microcontroller
    Modules
Digital Signal Processing
DSP in a Digital Camera
Microcontroller: Photo Input and Servo
    Motor Output

Connecting with Analog Devices
D/A Conversion
Operational Amplifiers
A Basic D/A Converter
Ladder-Type D/A Converters
An A/D Converter
Voltage Comparators
An Elementary Digital Voltmeter
Other A/D Converters
A/D Converter Specifications
An A/D Converter IC
Digital Light Meter
Digitizing Temperature

Solder and the Soldering Process

2s Complement Conversions

■ Courseware

Text: **Digital Electronics, Principles, and Applications**, Roger Tokheim
Manual: **Experiment Manual for Digital Electronics**, Roger Tokheim

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