DIGITAL CIRCUITS EMULATOR

STAND-ALONE LEARNING EQUIPMENT FOR DIGITAL ELECTRONICS LABORATORY (PATENT PENDING)

This digital circuits emulator is a complete stand-alone learning system for Digital Electronics Laboratories, with two main functions:

- The basic Digital Electronics is covered through the emulation of many common digital circuits. This equipment allows to test a great variety of basic digital circuits, combinational, aritmethic and sequential as well, without any mounting nor wiring.

- In an advanced phase, the equipment serves to test any digital system designed with FPGAs (1), with a maximum capacity of 5.000 equivalent logic gates.

The equipment is composed of:

- Software to handle the emulator function from a personal computer (PC).
- Software to control the PC parallel port in order to test the FPGA applications.
- Hardware equipment + FPGA and configuration as EMULATOR.
- Printed documentation additional files and utilities in 3 ¹/₂ diskette.



Using the stand-alone EMULATOR.

The equipment has some switches that allow to select the circuit to test from a long list. This selection is recorded when you push the SEL button. The selected circuit is shown in the 7 segment displays and inmediately you can test its behaviour, using the switches, pushbuttons, LEDs and displays in the equipment.

How to handle from a computer (PC).

The emulator equipment has a connection to the PC parallel port, that allows the same functionality than the switches and pushbuttons from the equipment through the software included in the package. This software shows information about the circuits to test (truth table, etc.), so it serves as a complement to Digital Electronics Books.

(1) In this phase, the lab must have the Foundation or Xact CAD tools and the configuring cable Xchecker, everything from Xilinx^R.

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Using the equipment as an FPGA based development system.

If you dispose of the Foundation software from Xilinx or any other CAD tool that generates the Xilinx format FPGA programming files (.bit), this equipment serves as a test board to any digital system implemented for the XC4005E-PC84-4 FPGA, included with the equipment. The most economical option is the Xilinx Student Edition from Prentice-Hall.

This equipment has the appropriate connections to program the FPGA through the Xchecker cable (from Xilinx) or through a serial PROM. This last option allows to configure permanently an application (the FPGA is SRAM based).

Once the FPGA is configured, you can inmediately test your design, using the board switches, pushbuttons, LEDs and displays or applying the design inputs through the 8 data lines from the PC parallel port., with the software included.

TECHNICAL CHARACTERISTICS

Very simple operation.

Stand-alone equipment (PC is not needed).

Allows to test many digital circuits (see list).

Mounting or wiring is not needed.

It serves as an FPGA based development system.

Equipment elements:

- 20 switches.
- 3 pushbuttons.
- 10 LEDs.
- 2 7 segment displays.

FPGA XC4005E-PC84-4 included (5.000 equivalent logic gates).

Powered by 5V. DC or wall mounted power supply (7'5 o 9 V).

PC parallel port connection.

Ribbon cable connector (8 output lines) to handle external circuits.

Digital circuit teaching software included.

PC parallel port software included.

LIST OF EMULATED CIRCUITS

Combinational (basic):

- Logic gates: AND, OR, etc.
- Gates combinations.
- Decoders.
- Priority encoder.
- Multiplexers.

Arithmetic (basic):

- Comparator.
- Parity detector.
- Binary adder and substracter.
- BCD adder.
- Two's complement.
- Sequential (basic):
 - RS asynchronous flip-flop.
 - D latch.
 - Edge activated flip-flops.
 - JK Master-Slave flip-flop.
 - 8 bit register.
 - Binary and BCD counters.
 - Shift register.
 - Ring and Johnson counters.
 - RAM memory.

Sequential (advanced) (optional):

They allow to program a RAM to do the desired state machine.

- Register + RAM based state machine (8 states, 1 input, 1 output).

- Counter + RAM state machine.

- Register + RAM or Counter + RAM complex state machines (16 states, 3 inputs, 4 outputs).