

>>FPGA

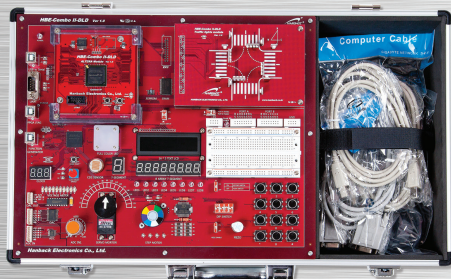
FPGA Digital Circuit Design Trainer based ALTERA/XILINX



ALTERA



XILINX



HBE-Combo II-DLD (Altera) HBE-Combo II-DLD (Xilinx)

- Available to select ALTERA and XILINX(extra option) FPGA module
- Systematic Digital Logic Design Education Theme
- Supply 16 kinds of Input Frequencies through Clock Control Block
- Use of The latest FPGA (ALTERA - Cyclone IV Series, XILINX - Spartan 6 Series) Device
- Various Experiment Themes using Various Option Modules (Fully compatible HBE-Combo II option module)

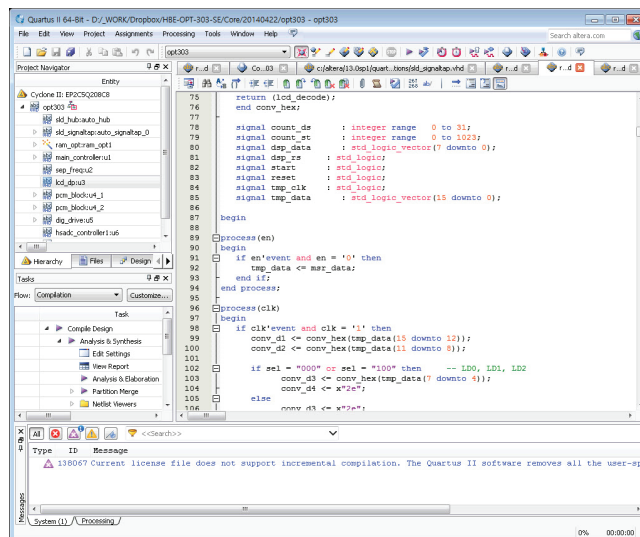
Features

- Modular design considering Flexibility and Expansibility of FPGA device enable to select ALTERA and XILINX device.
- Provides Education Theme organized by subjects of digital logic circuit theory and experiment procedure in order to understand the logic circuit easily.
- User can select the clock from user's Clock Generator which mounted at FPGA module or choose 16types of internal clock(1Hz~50MHz) from built-in Clock Control Block.
- It is fully compatible with HBE-Combo II option modules so user can use previous FPGA application theme without change.
- User can make and test of user's TTL circuit using built-in Bread Board as default
- User download program to FPGA easily using supplied USB download cable.

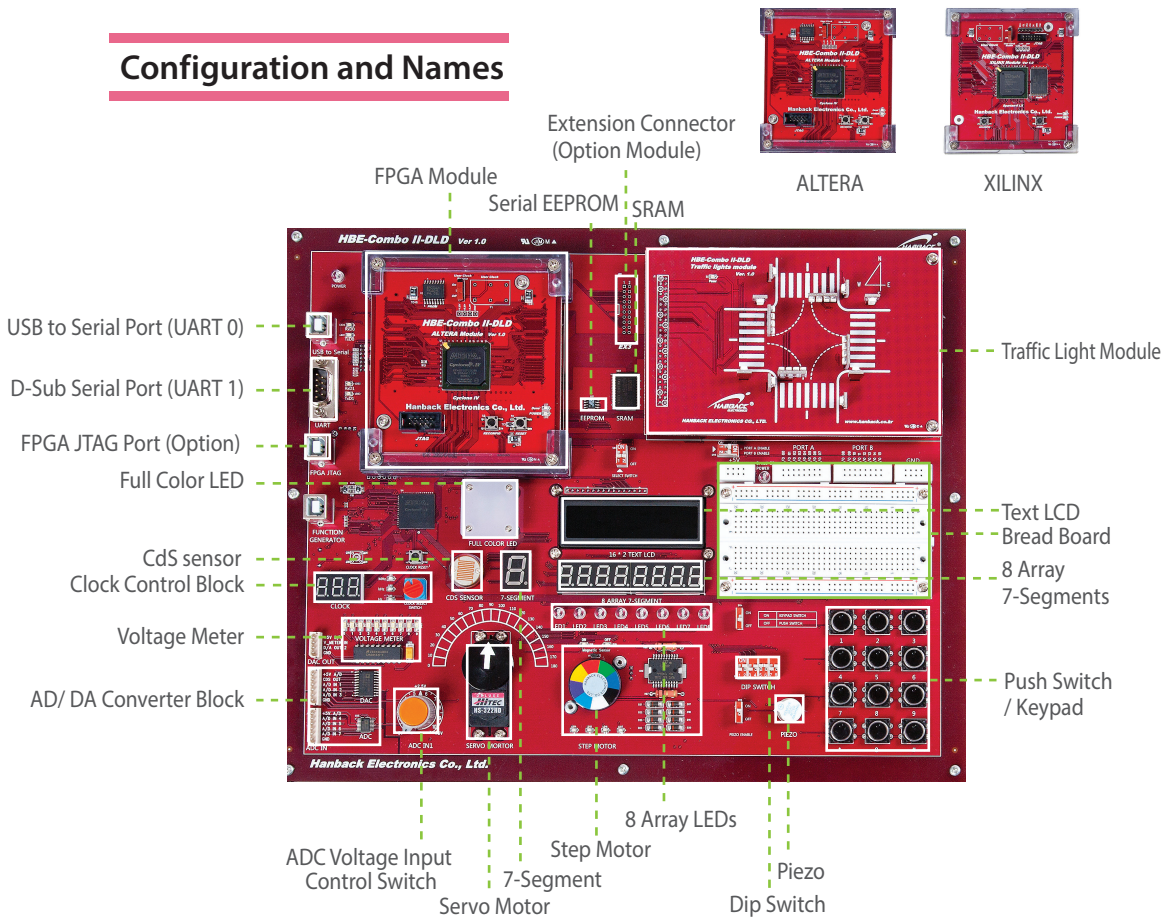
Design Environment

- ALTERA : Quartus II Web Edition
- XILINX : ISE Webpack Design Software

Design software is available to download free of charge from each device homepage (Altera/Xilinx).



Configuration and Names

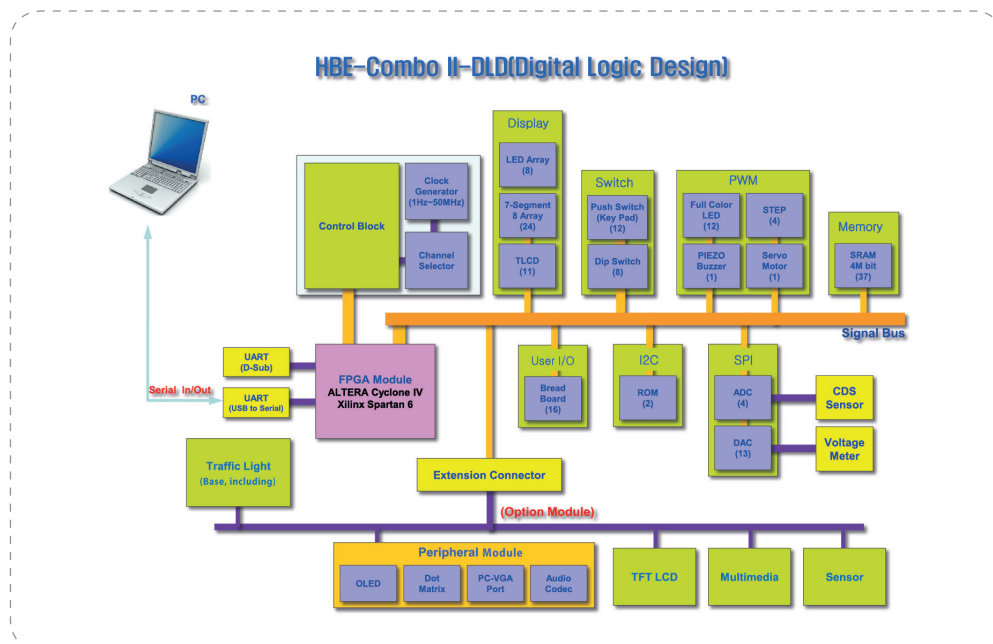


FPGA

HBE-Combo II-DLD

HBE-Combo II

Block Diagram



FGPA

>>HBE-Combo II-DLD

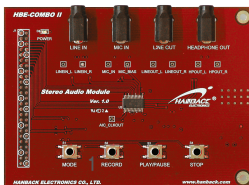
Hardware Specifications

Items	Specifications
FPGA Device	HBE-Combo II-DLD (Altera) : Cyclone IV Series (EP4CE30F, EP4CE40F) HBE-Combo II-DLD (Xilinx) : Spartan 6 Series (XC6SLX45)
Clock Control	1 Hz ~ 50MHz Changeable Clock
Memory	4Mbit SRAM, 16kB 2Wire Serial EEPROM
Display	Text LCD, 8 Array LED, 4 Cell Full Color LED, 7-Segment, 8 Array 7-Segment
Actuator	1EA Servo Motor, 1EA Step Motor
AD/DA	SPI ADC : 1 Channel 8Bit 1MHz Sampling, Parallel DAC : Dual Voltage Output 8-Bit DAC
Sensor	CdS, Voltage Meter (LED)
Etc	PIEZO, Bread Board, Dip Switch, Push Switch
UART	2 Channel UART (USB to Serial 1 Port , D-Sub 9 Pin 1 Port)
Extension Connector	2EA 50pin Connector (FPGA I/O 84Pin) , Combo II, Combo III App Module Fully Compatible
Project Module	Traffic Light Module
Option Module	TFT-LCD, Stereo Audio Codec, Vending Machine, Sensor, Multimedia module

※ Specifications can be changed without notice

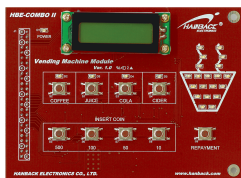
Option Module

• Stereo Audio Codec



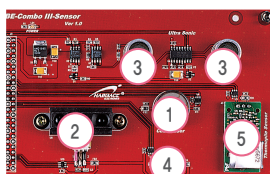
- 4EA Stereo-Audio Jack (MIC IN, Line In, Line Out, Headphone Out)
- 4EA Control Button Switch
- AIC23B (Stereo Codec)
 - 90dB SNR ADC
 - 100dB SNR DAC
 - 8KHz ~ 96 KHz Sampling Frequency

• Vending Machine



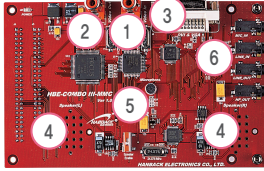
- Implemented by Module
- Text LCD
 - 16 x 2
 - Display of Status, Item and Price
- Button S/W
 - Item select
 - Cash Insert and Refund
- LED
 - Indicate status of Item output and Button input

• Sensor Module



- 1) CdS : Photo Sensor, 10 Lux
- 2) PSD : Infrared distance measurement sensor, 10 ~ 80 cm
- 3) Ultra Sonic : Ultrasonic distance measurement sensor, 40KHz, 115dB
- 4) GAS : VOC Gas sensor, 10 ~ 1,000 ppm
- 5) Thermopile Sensor : Non-contact temperature measurement sensor module, -40°C ~ +145°C

• Multimedia Module



- 1) Video In : 8-bit video input processor, 27MHz data rate, I2C bus control
- 2) Video Out : 24-bit video output processor, 27MHz data frequency
- 3) VGA & DVI port : 1024 * 768 resolution 24 bit-RGB color (VGA) 12~24 bit data interface, 25 ~165 MHz (DVI)
- 4) Speaker : 0.7~1.4 W , 91dB, 700Hz, Stereo
- 5) Microphone : Sensitivity 48dB, 50 ~10000Hz, 1~10V, Mono
- 6) Audio Codec : AC'97 2.2 compliant, 20 bit DAC, 18 bit ADC

FPGA

HBE-Combo II-DLD

HBE-Combo II

Contents

• Designing Digital Logic Circuit with HBE-Combo II-DLD

1. Introduction to Digital Logic Circuit(Fundamental Logic Gate Experiment)
2. Combinational Logic Circuit Experiment 1(Adder, Encoder and Decoder and 7 Segment Decoder Design)
3. Combinational Logic Circuit Experiment 2 (Multiplexer and Demultiplexer, Comparator and Code Converter)
4. Sequential Logic Circuit Experiment 1(Clock, Flip-Flop and Latch)
5. Sequential Logic Circuit Experiment 2(Register Design)
6. Counter Experiment 1(Asynchronous Counter and Synchronous Counter)
7. Counter Experiment 2(Clock Divider Circuit and Clock Design with Counter)
8. PWM control Experiment (Full Color LED and Servo Motor control with PWM)
9. Parallel Interface Experiment (SRAM control and Text LCD control)
10. Serial Interface Experiment (I²C Interface Design and SPI Interface Design)
11. State Machine Experiment 1(Moore machine and Mealy machine)
12. Design Project Experiment 1(8 Array 7-Segment output Stop Watch Design)

Components



HBE-Combo II-DLD



User's Manual and CD



AC Power Cable



USB Cable (A to B Type)



Serial cable