

VLSI/EMBEDDED SYSTEM TRAINER (Model : XPO-EST)

(CPLD/FPGA/89C51RD2/PIC16F//18F/AVR/ARM7 etc.)

[a family of training systems]



Technical Specifications : Following onboard resources are offered for experimentation however not every resource can be used fully with particular ECU due to paucity of its IO capacity

Speed	16 MHz crystal operated multi-output clock source to operate various resources on Mother Board like CPU, Baud rate, T/C etc.	
I/O Pins	48 I/O lines through 2 Nos. of 26 pin FRC header.	
Serial Interface	RS-232c serial interface using RS232 driver IC through 9 Pin male D connector.	
Parallel Interface	25 pin male D connector for Parallel interface for JTAG based programming.	
Display (Choose one option)	16 x 2 LCD (Backlit)	20 x 4 LCD (Backlit)
Key Board (Optional)	Keyboard interface to support 101 keys PC AT/PS2 keyboard.	
Battery Backup	Lithium battery (3V/48mAH) provided to supply power to RTC.	
Additional Resources	<ul style="list-style-type: none"> • Ext. L/S (8 /0.5W) I/F for experiments on frequency synthesis. • Reset push button. • Variable Slow CLK (2Hz-64Hz) provided for internal timers/counter functions applications. • Variable Pot (0 -5V) to stimulate analog I/P for built in ADC wherever applicable. • General purpose bicolor (green,red) 8 x 2 LEDs & 8 Push Button Switches & DIP switches. • I2C based 24C512 (EEPROM), DS1307(RTCOptional) and SPI based 93C46 [EEPROM] 	
Power Supply Options (SMPS), 2 options	Select one of 2 options I) 5V /2.5 Amp SMPS with RCA plug. II) 5V /2.5 Amp SMPS with RCA plug +12 V/ 850 mA, -12V/250 mA with 4 pin reliamate SMPS.	
Application Modules (Optional)	1.VGA (For FPGA) 2. *Smart Card 3. *USB (For USB enabled uc) 4. Ethernet (RTL 8019) 5.RS485 6. Graphic LCD (128 x 64) adaptor (89C51RD2)	
ISP cables	1) 9 pin female to 9 pin male RS-232C cable 2) 26 pin FRC I/O cable 3) 25 pin female to 25 pin male cable for Parallel Interface.	
Mechanical Details	Aesthetically designed Injection molded plastic enclosure of size 215(L)x165(W)x75(H)mm. Weight = 900 gm.(1.5 Kg with manuals)	

Choice of VLSI IC's/Embedded Controller : ECU wise specifications

CONTROLLER DEVICE	MC68HC11E9/E1*	89C51RD2 (89V51RD2)	MICROCHIP	PIC 16F877	PIC 18F4520 (4550)	CPLD XC95108	FPGA XC2S50	FPGA* XC3S400	FPGA* EP2K8	AVR ATMEGA32L	ARM LPC2138 (LPC2148)
Manufacturer Model	Motorola	ATMEL/Philips/NXP	MIRCOCHIP	MIRCOCHIP	MIRCOCHIP	XILINX	XILINX SPARTAN-II	XILINX SPARTAN-III	ALTERA CYCLONE-II	ATMEL	PHILIPS
PACKAGE	52 pin PLCC	40 pin DIP package	40 Pin DIP	40 Pin DIP	40 Pin DIP	PLCC 84 pin	PQ 208 pin	PQ 208 pin	PQ 208 pin	40 PIN DIP	LQFP64(SMD)
CAPACITY											
ON CHIP RAM	512 Bytes	256 Bytes (1KB)	256 Bytes	256 Bytes	256 Bytes	108 Macrocells	32 Kb	288 Kb	162 Kb	2KB Internal SRAM	32 KBytes
FLASH/EEPROM	512 Bytes	8 KB (64KB)	8KB	8KB	32KB	1600 gates	50K gates	400K gates	8256LEs	32KB /1024 bytes	512KBytes
OPERATING FREQ.	8 MHz	16 MHz	4 MHz	4 MHz	16 MHz	16 MHz	16 MHz	16 MHz	16 MHz	8 MHz	14 MHz
I/O CAPACITY	5 X 8 I/O ports (40)	4 X 8 I/O ports. (32)	24 + 9 I/O	24 + 9 I/O	36 (35)	36+26	140	264	182	32	47
OPERATING SYSTEM	Window / XP	Window / XP	Window / XP	Window / XP	Window / XP	Window / XP	Window / XP	Window / XP	Window / XP	WinXP	WinXP
ICSP SW	WinBug11	Flash Magic (WinIsp)	PIC Boot loader	PIC Boot loader	P1618QP(HIDBL)	Xilinx Web Pack Ver. 10.1 containing simulation facility	Quartus II 9.1	Quartus II 9.1	Quartus II 9.1	AVROSPII	FlashMagic
PC PORT	Com Port	Com Port	Com Port	Com Port	Com Port (USB)	parallel port JTAG (For USB, Refer cable no. 4 below)	parallel port JTAG	parallel port JTAG	parallel port JTAG	Com port	Com port or JTAG
SPECIAL PURPOSE I/Os	2 Nos. XIRQ / , IRQ	7 interrupt sources, depending on device.	3 * 16 bit TC 14 Ints	3 * 16 bit TC 14 Ints	1*8 bit, 3*16 bit TC 20 Ints	Global clock with low skew and global set / reset				10 Bit ADC 4 PWM	10 Bit ADC, DAC 1 PWM
EXECUTION METHOD	From internal RAM	From Flash	From flash	From flash	From flash	From Flash	From SRAM	From SRAM optionally PROM XCF02S(256KB)	From SRAM optionally PROM EPCS4(242KB)	From Flash	From Flash
PROGRAMMING LANGUAGE +	C Language or Assembly Language	C Language Assembly Language	C Language (Optional) Assembly Language	C Language (Optional) Assembly Language	C Language	VHDL / VERILOG / Schematics / Behavioural Simulation				C Language	IDE -PN, GNUARM, C & assembly tools

*Consult factory

Application Boards (Optional) : Note : All ECUs may not be capable of driving following Application boards in totality on account of their memory, IO, resource limitation. I/O port based :

- 1) **TLLC** : Traffic light of 2 intersections cum logic study card with 24 tags and 24 LEDs. Optionally following - Elevator Relay, Buzzer.
- 2) **STDC** : Stepper motor and 12V DC Motor Interface card with motors mounted to illustrate speed, direction control.
- 3) **SCAN TECH** : Scanning Techniques illustrating 8X8 LED Matrix, 4X4 Keypad 7 segment 8 digit red LED display study card.
- 4) **AD-DA-I** : Temperature Controller with MINI OVEN with 8 bit ADC- 8 bit DAC cum Instrumentation Opamp study card.
- 5) **IOOC** : Opto-isolated 24 Vdc 12 Input and 10 Output IO card with 2 relay output card.
- 6) **AD-DA-II** : 8 bit 8 channel ADC & 8 bit DAC (0-5V), Digital gain amplifier with built in L/S interface Electret microphone with preamplifier, light sensor, analog bar graph, voice sampling and relay.
- 7) **LCD IO adaptor** : Adaptor PCB mountable on 26-pin FRC IO box connector to facilitate attachment of external LCD {Graphic/text} module or additional 8255/8155 IC.
- 8) **AD-DA-III** select one of option: - 12 bit ADC either dual slope 7109 OR SAR 574 or SPI 3301, 12 Bit DAC: Either parallel R-2R CMOS DAC or SPI 4921, onboard voltage simulation pot, LM 35 temperature sensor (0-5V), buffered S/H amplifier.

Cables :

- 1) 9 pin Female to 25 pin male RS-232C cable
- 2) 26 pin FRC IO cable
- 3) 25 pin female to 25 pin male cable for Parallel Interface.
- 4) USB to JTAG cable (optional) provided with PC application to download bit/jed files for Xilinx devices. Does not work under ISE webpack. Needs Net framework installed. 5) USB to RS232 Cable (Optional)

SALIENT FEATURES

- ◆ We supply free on CD webpacs / evaluation software. The responsibility of using licensed version lies with users wherever applicable. (BI=Boot Loader)
- ◆ Aesthetically designed Injection moulded Plastic enclosure.
- ◆ XPO series of VLSI / Embedded trainers VIZ; CPLD, FPGA, ARM7, 89C51Rd2, PIC16F, PIC18F, AVR, etc.
- ◆ Supports use of 5V tolerant ICs (FPGA etc.) obviating need of special precautions by students.
- ◆ Set of Users Guide provided with each unit with emphasis on C Programming as well as assembly language programming.
- ◆ In circuit system programming (ICSP) supported through PC ports of COM/LPT(JTAG).
- ◆ Can interface to application boards of XPO series microprocessor trainers saving customer investment.
- ◆ I2C, SPI bus interface. Optionally Breadboard.

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