MICROPROCESSOR / MICROCONTROLLER TRAINER (Model : XPO-KIT) *[a family of training systems]*

CPU WISE SPECIFICATIONS

MODEL CPU (bits)	XPO-85/Z80 8085/Z80 (8)	XPO-88/86 8088/86 (8/16)	XPO-51/31 8051/31(8)	XPO-97/196 8096/196(16)	XPO 68K 68000(16/32)	XPO 11 68HC11 (8)
MEMORY CAPA. Monitor EPROM Battery Back Up Scratch Pad **(Expandability)**	 36KB(64 KB) 16KB(64 KB) 4KB(8 KB)	 128 KB 64 KB (128 KB) 64 KB (64 KB)	 36 KB 16 KB (64KB) 2 KB (8KB)	 24KB 16KB 8KB	 128KB 64KB (128 KB) 64KB	 24KB 20KB 8KB
ADVANCED S/W **Assembler** **Disassembler** **(Optional)**	1 Pass line assembler 2 pass Assembler 2 pass Disassembler Basic Interpreter Hex Dump	Line assembler Disassembler, Hex Dump.	1 Pass line assembler Disassembler	Disassembler and assembler facility with S/W on floppy.	1 Pass line assembler Disassembler	1 Pass line assembler Disassembler
ADDITIONAL **SERIAL AND** **PARALLEL I/O**	SID/SOD Based (8085) NA (Z80)	NA	• Using built-in TxD/RxD • Unused pins of P1 port offered through 10 pin reliamate.	Using built-in TxD/RxD	Using built-in TxD/RxD (6850)	Using built-in TxD/RxD
INTERRUPTS	8 Nos.Using 8259(8085) 4 Nos. Using CTC(Z80)	8Nos. Using 8259A	Built in CPU 2no. of ints.	Built in CPU 8 no. of Ints.	Built in CPU 7 no. of Ints.	Built in CPU 7 no. of Ints.

8088/8086- Sockets provided for NDP 8087 And I/O controller 8089 **.**

8051/8031- Optionally I2C Bus Using 24C02 (512 x 8)EEPROM and Optionally RTC DS1307.

8097/196 - 8 nos. of Quasi Bi-directional port lines (CPU Ports),High Speed I/O Lines : 8 High Speed TTL, 4 dedicated I/O Lines & 4 Nos. Programmable I/O Lines. A/D converter 8 Channel 10 Bit A to D Converter with onboard Potentiometer for demonstration.

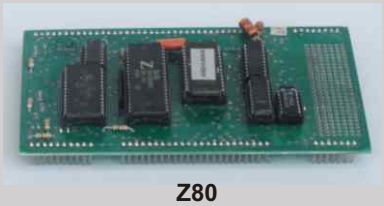
Timers - 2 Nos. of 16 Bit Timers from 8097/196,and 3 Nos from 8253.**Watch Dog** Timer from 8097.

PWM O/P - PWM O/P (Provides Pulse Train with variable duty cycle).Inbuilt 256 bytes RAM.

8085 and 8086 - Optional study card set (**PERIWARES**) compatible to trainers with LED's for indicating signals like READ, WRITE, CHIP SELECT, DATA LINES, etc, for peripheral IC's 8251, 8253, 8255, 8257, 8155, 8279, 8259, 6116, with bus converter (cum RE) Card & two 50 pin FRC cables to attach.

CPU CARD:


8085


Z80


8086


8051


68K


68HC11

TECHNICAL SPECIFICATIONS

User Manual	1) Student Workbook 2) Instructor Guide and Technical Reference 3) Optionally Lab Exercise Book common for 85, 86 & 51.		
Speed	20 MHz crystal operated multi-output clock source to operate various resources on Mother Board like CPU, Baud rate, T/C etc.		
Parallel I/O	48 I/O lines using two 8255 through 2 Nos. of 26 pin FRC header, printer I/F.		
Serial I/O	RS-232c serial interface using 8251 and RS232 driver IC through 9 Pin male D connector.		
Timer counter	3 Nos. T/C using 8253 pins brought out on 6 pin reliamate.		
Display(Choose one option)	16 X 2 LCD (Backlit)	16 X 2 Jumbo LCD (Backlit)	20 X 4 LCD (Backlit)
Key Board (Optional)	Single chip micro- controller 89C2051 to support 101Keys PC AT / PS2 Keyboard and LCD		
System Bus	50 Pin FRC buffered Bus to connect periware cards as well as to facilitate ROM Emulation of 8 bit/16 bit system memory using external ROM emulation card cum converter card.		
Battery Backup	Rechargeable NiCd battery (3.6/60maH) provided to supply power to battery backup memory and Optional RTC 58167.		
Onboard Features	• External Loud Speaker (8ohm/0.5W) interface for experiments on frequency synthesis. • Reset and Single Step/Interrupt push button. • EP socket for experiments with Cassette recorder interface. • Programmable Wait state generator • Real Time Clock IC 58167 (Optional) • 11 Nos. fault links to teach troubleshooting skills by introducing faults in the circuit. • PALs-All glue logic like Memory I/O decoders are implemented using 4(5) nos. of EEPROM PALs 16V8		
Power Supply (SMPS) (Optional)	**Select one of 2 options** I) 5V /2.5 Amp SMPS with RCA plug. (Only for Kit) II) 5V /2.5 Amp SMPS with RCA plug +12 V/ 850 mA , -12V/250 mA with 4 pin reliamate SMPS.		
Mechanical	Aesthetically designed Injection molded plastic enclosure of size 215(L)X165(W) X 75(H) mm.		

Cables & CD : 9 Pin Female to 9 Pin Female RS-232c Cable, 26 Pin FRC IO Cable, Centronics Interface cable (26 pin FRC to 36 pin Centronics female), USB to RS232 Cable (optional), Sample program on CD .

Fault Links:

- Shorts 2 Pins of Address Bus.
- Shorts Address pin to Data Bus.
- Increasing Battery Discharge.
- Disables 7 Segment Scanning.
- Disables 7 Segment Data.
- Disables RD/ & WR/ into BBK RAM
- Shorts 2 Pins of Data Bus.
- Permanent Wait State.
- Stops 20MHz Clock.
- Permanent Reset State.
- Disables Baud Rate Clock.

SALIENT FEATURES

- Ergonomical injection molded Plastic enclosure.
- Use of standard PC 101/PS2 Keyboard for programming.
- Emphasis on Hardware troubleshooting through on board short links.
- Exhaustive Didactic Courseware.
- Critical & delicate ICs are protected under acrylic cover from below.
- All in one Logical IO® Monitor design Supports both serial IO & Keyboard display console IO.

Application Board (Optional):

Note : 1] Compatible with XPO KIT as well as XPO EST. 2] 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 :

TLLC

Traffic light of 2 intersections cum logic study card with 24 tags and 24 LED's.Optionally following Opto-coupler, Relay, Buzzer.

SCAN TECH

Scanning Techniques illustrating 8X8 LED Matrix, 4X4 Keypad 7 segment 8 digit red LED display study card.

STDC MOTOR

Stepper motor and 12V DC Motor Interface card with motors mounted to illustrate speed, direction control**.**
Optional:
1) RPM measurement.
2) LM35 temperature Sensor 0-12V)

IOOC

Opto-isolated 24 Vdc 12 Input and 10 Output IO card with 2 relay output card.

AD-DA-I

Temperature Controller with MINI OVEN with 8 bit ADC- 8 bit DAC cum Instrumentation Opamp study card.

TLLC+Thumbwheel

Traffic light of 2 intersections cum logic study card with 24 tags and 24 LED's. Optionally following - Thumb-Wheel Switch Module, Opto-coupler, Relay, Buzzer.

AD-DA-II

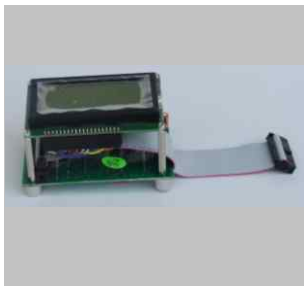
8 bit 8 channel ADC & 8 bit DAC (0-5V), Digital gain amplifier with built in L/S interface Electret micro-phone with preamplifier, light sensor, analog bar graph, voice sampling & relay.

TLLC+ Elevator

Traffic light of 2 intersections cum logic study card with 24 tags and 24 LED's. Optionally following - Elevator SAP consisting of 3 floors, Floor request keys, child protection lock, Opto-coupler, Relay, Buzzer.

AD-DA-III

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**,** 16 differential channel MUX & variable gain instru. OPMP.



LCD IO Adaptor

Adaptor PCB mountable on 26-pin FRC IO box connector to facilate attachment of external LCD {Graphic/text}module or additional 8255/8155 IC.

Bus based Application Board (optional)

Note : VCRO CARD applicable for XPO-KIT & not EST.

VCRO Card:

VGA monitor(64X32) / Oscilloscope (18 X 8) interface card to use them as console out device for the kit in place of LCD/7seg. Use 20MHz CRO with Z Input (1.25MHz Band width) & Ext. Triggering facility.

Ethernet Application Module (RTL 8019)

- Ethernet card applicable for XPO-EST & not for XPO-KIT.
- Operates on 22 Pin Bus [data (8), address (18), control]

Periwares Study Card Set
Optional for Kit 85/86/51 Kit.

ROM Emulation cum converter Card

2 No. 28 pin DIP connectors for 8 bit/16 bit ROM connection of target uc, two 50 pin FRC cables to attach for periware.

It consists of buffers, switches & debounce circuits for software single stepping of every access, 1 no 6116 (RAM) with tags for applying Interrupts, Vcc tags, Leds to display status.

Memory IO

It consists of buffers, switches & debounce circuits for software single stepping of every access. It is provided with one 8 bit I/O port. It displays the data transferred (DMA Read) from memory to the port on the LEDS.

8257

It consists of buffers, switches, debounce ckts for software Single Stepping, one 8255 with tags for all I/O ports, VCC & GND tags, LEDs to display status.

8255

It consists of buffers, switches and debounce circuit for software single stepping of every access to the 8279 card and LEDs to display status. Switch S1 is used to enable Single stepping or to keep CPU in free running mode.

8279

It consists of buffers, switches, debounce circuits for software Single Stepping, one 8253 with tags for all the counters, VCC & GND tags, LEDs to display status.

8253

It consists of buffers, switches & debounce circuits for software single stepping of every access, 2 nos of 8259 with tags for applying Interrupts, Vcc tags, Leds to display status.

8259

It consists of buffers, switches, debounce circuits for software Single Stepping, one 8251 with tags for all the required input output pins, Vcc & Ground tags, LEDs to display status

8251