WinSystems

- Intel® Low Power Embedded Pentium® 166 or 266 MHz CPU
- EBX-compliant board
- 512KB of pipeline burst L2 cache
- 32 to 256MB of system SDRAM supported in 168-pin DIMM
- Socket for up to 1GB bootable DiskOnChip® or BIOS extension EPROM
- PC-compatible; uses Intel 430TX chip set
- High resolution, video controller supports
  - Color panels supported with up to 24-bits/pixel
  - Supports resolutions up to 1280 x 1024
  - Simultaneous CRT and LCD operation
  - PCI local bus for high speed operation
  - Asiliant 69000 graphics accelerator
- Ethernet controller using Intel 82559
- 4 RS232 serial ports with FIFO, COM1 & COM2 with optional RS-422/485/J1708 support
- Bi-directional LPT port supports EPP/ECP
- 48 bi-directional TTL digital I/O lines with 24 capable of event sense interrupt generation
- USB supported
- Two, dual Ultra DMA/33 EIDE hard drive connectors
- Floppy disk controller supports 1 or 2 drives
- PC/104 and PC/104-*Plus* expansion connectors
- AT keyboard controller and PS/2 mouse support
- Activity LEDs onboard
- Two interrupt controllers and 7 DMA channels

OVERVIEW

The EBC-LP is a feature-rich, Pentium-based single board computer (SBC) for industrial applications. The powerful CPU gives engineers a high-performance, cost-effective, and low-power x86 engine for computational-demanding, embedded applications.

It is configured with either a 166MHz or 266 MHz CPU with 10/100 Ethernet networking capability, advanced video support, four serial channels, 48 digital I/O lines, and the standard AT peripheral feature set. The board measures only 5.75 x 8.0-inches and is EBX-compliant. It supports expansion with PC/104 and PC/104-*Plus* connectors or with USB. The 166MHz board does not require a fan and will operate over an extended temperature range that makes it ideal for rugged applications requiring an embedded PC. Its PC software compatibility assures easy program development, and checkout.

FUNCTIONAL CAPABILITY

Processor - The EBC-LP is populated with the Intel® low power embedded 166 MHz or 266 MHz Pentium® processor with MMX™ technology. It provides additional performance and low power for embedded applications. Its superscalar architecture can execute two instructions per clock cycle, and its enhanced branch prediction and separate 16KB code and data caches also increases performance.

System Controller - An Intel 430TX PCIset is the system controller for this SBC. It consists of the 82439TX System Controller (MTXC) and the 82371AB PCI-ISA-IDE Xcelerator. The MTXC provides an integrated solution for the system controller and data path components for a Pentium/K6 processor system. It has the 64-bit Host and SDRAM bus interface, 32-bit/33MHz PCI Bus interface, L2 cache controller, and it integrates the PCI arbiter.

The MTXC also implements extensive power management features. The MTXC works with the PIIX4E to provide the PCI-to-ISA/IDE bridge functions along with other features such as a fast IDE interface (PIO mode 4 and Ultra DMA/33), Plug-n-Play port (PnP), and USB controller functions. It also provides the core logic that makes the board PC/AT software compatible including integrated peripheral controllers (two 82C37 DMAs, 82C54 timer, two 82C59 PICs, RTC, and CMOS memory) and the ISA bus for PC/104 expansion.

Memory - Up to 256Mbytes of Synchronous Dynamic RAM (SDRAM) can be installed on the board by using a 168-pin DIMM. A PC-66 or PC-100 compatible part (non-registered, unbuffered) with gold-plated fingers is the recommended SDRAM. They are available from independent memory suppliers or directly from WinSystems. The board is shipped from the factory with no memory installed that permits the user to install and/or upgrade the memory capacity in the field.

The EBC-LP is shipped with 512KB of onboard pipelined burst external cache to further improve the performance of the system. A 64K x 64 SRAM is the cache device that is direct mapped in Write Back mode.

BIOS - An industry-standard, Award BIOS is onboard to provide configuration flexibility, performance and AT-compatibility. It is set with a factory default that can be modified by the user. The BIOS is located in an EEPROM that can be modified without removing the storage device from the board. It will support diskless, keyboard-less, and videoless operation as well as BIOS shadowing.

Also BIOS extensions can be programmed into another EPROM for remote boot from the Ethernet, video extensions, etc. This socket is shared with the SSD.

Direct Memory Access (DMA) - Seven DMA channels are supported with Channel 2 dedicated to the floppy disk controller. The LPT is jumper selectable for ECP operation. The other DMA channels are wired to the PC/104 connector.

Floppy Disk Support - Up to two 3.5" or 5.25" drives from 360KB through 1.44MB formats are supported by the CMOS 765B floppy disk controller. It has an enhanced advanced digital data separator for different data rates, programmable pre-compensation rates, plus underflow and overflow protection. Open drain, push-pull drivers are wired to a standard, single 34-pin connector on 0.100-inch centers. Both drives can be daisy chained from a single cable.

UDMA/33 EIDE Hard Disk Interface - The EBC-LP incorporates a PCI EIDE local bus interface for independent timing of up to 4 drives. PIO Mode 4 and Bus Master IDE transfers of up to 14 Mbytes/sec are supported. Also, it supports Ultra DMA/33 synchronous DMA mode transfers up to 33 Mbytes/sec. Both the Primary and Secondary interface channels are wired to a separate 40-pin header connector on 0.100-inch centers. Each channel has an LED that blinks during data transfer to provide visual status information.

Solid State Disk (SSD) Support - A JEDEC standard 32-pin, machine-tooled socket is provided to accept an M-Systems' DiskOnChip® (DOC). The DOC offers from 8 to 1GB storage capacities in a single device. It includes an internal flash file system that provides hard disk read/write compatibility, automatic bad block

management, and wear-leveling. A designer can use an onboard semiconductor device for applications where the environment is too harsh for mechanical hard disks or floppy disk drives while offering significant speed advantages.

Ethernet Controller - An Intel 82559 is the 32-bit PCI Ethernet controller chip used for high-speed data transfer. It has auto negotiation capability for speed, duplex, and flow control. It supports IEEE 802.3 10-BaseT and 100BaseT in either full- or half-duplex mode at both 10 and 100 Mbps. In full-duplex mode, it adheres to the IEEE 802.x Flow Control Specification.

Two large 3Kbyte transmit and receive FIFOs help prevent data underruns and overruns. It has fast back-to-back transmission support with minimum interframe spacing. It also has improved dynamic transmit chaining with multiple priorities transmit queues. There are three LEDs on the board that provide status information. The red LED indicates 100BaseT, the yellow indicates Link, and the green is the Rx/Tx packet data.

The 82559 chip is very popular both in the commercial and industrial PC-compatible market. This means that most PC-compatible drivers, utilities and 10/100 Ethernet supported operating systems will work directly with the EBC-LP. The configuration information describing the device's architecture, address, interrupt, etc. is stored in a serial EEPROM.

Networking - The EBC-LP supports remote booting with an onboard EPROM socket for use as a diskless network computer. Optionally, a 64KB Flash can be populated for boot block support. The Intel 82559 is supported by numerous network OSs and kernels.

Video Controller - An Asiliant 69000 high-performance PCI flat panel/CRT controller provides a sophisticated graphics accelerator video engine. It supports a wide variety of monochrome and color active and passive LCD panel displays. The 69000 can support up to 16.7M colors on 24-bit, active matrix LCDs. Programmable horizontal and vertical stretching capabilities are also available for text and graphics modes for optimal display on 800x600, 1024x768 and 1280x1024 panels. It also has support for 16:9 aspect ratio panels.

Resolution	Color (bpp)	Refresh Rate
640 x 480	8	60, 75, 85
640 x 480	16	60, 75, 85
640 x 480	24	60, 75, 85
800 x 600	8	60, 75, 85
800 x 600	16	60, 75, 85
800 x 600	24	60, 75, 85
1024 x 768	8	60, 75, 85
1024 x 768	16	60, 75, 85
1280 x 1024	8	60

Two Megabytes of video memory is on the chip which is sufficient to support the screen resolutions and maximum number of colors displayed required by most applications.

CRT Video Interface - A triple 8-bit integrated RAM-DAC provides CRT support. The CRT video output signals are wired to a 14-pin dual-in-line connector at the edge of the board. An optional CBL-234-1 interface cable adapts it to a standard female 15-pin "D-Sub" type connector commonly used for VGA. Simultaneous operation of the CRT and LCD is supported.

Flat Panel Display Support - The EBC-LP supports most flat panel display technologies including plasma, electroluminescent (EL), active matrix TFT/MIM LCD, passive STN and single panel, Single Drive (SS). It will support mono and color displays. The board properly sequences the power for logic voltage and the backlight inverter to provide intelligent and safe power sequencing to the panel.

FP-100 Interface - Since there is not an electrical or mechanical interface standard for flat panels, WinSystems has developed a flat panel interface system configuration to work with the different interface signals, timing requirements, and connectors that vary between panel technologies and suppliers. The FP-100 video bus supports panels up to 24-bits per pixel. It has power, timing and control signals for various panel types. The logic levels are 3.3 volts but are 5.0V tolerant. Also, 4 lines are assigned to allow the EBC-LP to read an ID jumper setting on the personality module or cable to auto configure the BIOS for the correct panel type.

Two, 50-pin, 2-mm connectors are used for the flat panel interface. Most connections can be made directly with a modified cable, others will require a flat panel adapter module. Contact a WinSystems factory application engineer with your specific panel requirements.

Software drivers are available with high-resolution drivers for various software packages including Linux, DOS, Windows 98/CE/NT, and certain RTOS applications. A BIOS extension in the onboard EPROM provides PC video compatibility for the various modes of operation for the different panels. Video BIOS modifications can be made for custom panel types.

USB - The Universal Serial Bus offers users simple connectivity with peripheral devices. This board has a USB port that supports transfers at either 1.5 or 12 Mbits/sec. The USB is wired to a 4-pin connector. An optional CBL-249-1 is the interface cable adapter to a standard female USB connector.

Serial Communications - Four independent, full-duplex, RS-232 serial asynchronous channels are onboard. Both the send and receive registers of each channel has a 16-byte FIFO. This device is a dual 16C550 compatible UART that offers software compatibility with PC-type driver programs.

Independent control of transmit, receive, line status and data set interrupts are on all channels. Each channel is setup to provide internal diagnostics as loopback and echo mode on the data stream. An independent on-chip software programmable baud rate generator is selectable from 50 through 115.2 kbits/sec. Individual modem handshake control signals are supported for all channels.

RS-232 interface levels are supported on all channels. The RS-232 drivers have an on-chip charge pump to generate the plus and minus voltages so that the EBC-LP only requires +5 volts to operate.

Also RS-422, RS-485 or J1708 electrical levels can be supported on COM1 and COM2 by removing the RS-232 transceivers and installing the optional CK-75176 chip kit.

All serial channels are configured as Data Terminal Equipment (DTE). COM1 and COM2 are wired to a 50-pin connector at the edge of the board. WinSystems offers the optional CBL-247-1, which adapts each serial channel to 9-pin male "D" connectors. COM3 and COM4 are wired to a 20-pin connector on the board. WinSystems offers the optional CBL-173-1, which adapts each serial channel to 9-pin male "D" connectors.

48-line Parallel I/O - The EBC-LP contains a highly versatile WS16C48, 48-line digital I/O controller. Each I/O line is individually programmable for input, output, or output with read-back operation. Each output channel is latched and has an open collector driver (with a pull-up resistor) capable of sinking 12mA of current.

The major feature of this controller is its ability to monitor 24 of the lines for both rising and falling digital edge transitions, latch them and then interrupt the host processor notifying that a change-of-input status has occurred. Transition polarity is programmable and enabled on a bit-by-bit basis. Each line's transition is latched by the event so that even short duration pulses will be recognized. An interrupt ID register is maintained for each line for writing more efficient Interrupt Service Routines. This is an efficient way of signaling the CPU of real-time events without the burden of polling the digital I/O points.

The WS16C48 has its I/O lines connected to two, 50-pin connectors. Twenty-four data lines are alternated with 24 ground lines for reduced noise and crosstalk. Also +5 volts and ground are included in the cable. The pinout is compatible with the industry standard 4 to 24 position I/O module mounting racks (Opto-22, etc.) for use with high-level AC and DC opto-isolated solid state relays. An optional CBL-115-4, 50-pin conductor ribbon cable connects the EBC-LP to one I/O rack.

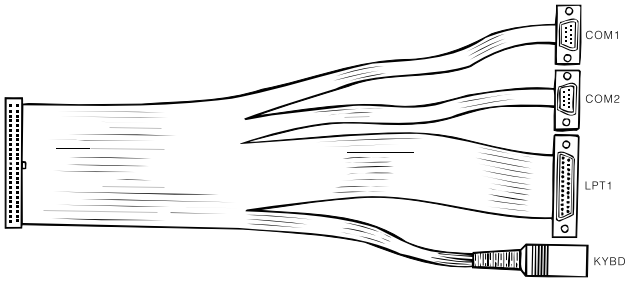
Printer Port - The EBC-LP has a parallel port that may be operated in standard and bidirectional as well as Extended Capabilities Port (ECP - IEEE-1284) and Enhanced Parallel Port (EPP) modes. The controller chip is designed to provide enhanced ESD and latch-up protection of up to 4KV/300mA.

The printer port can also be used as two additional general-purpose I/O ports if a printer is not required. The first port is configured as 8 input or output only lines. The other port is configured as 5 input and 3 output lines.

Keyboard/Mouse Controller - An 80C42 equivalent controller supports a PC/AT-compatible keyboard. The optional CBL-247-1 adapter cable provides the mate to a PS/2 type keyboard plug.

A standard mouse controller is on board. Its input is accessible through a 5-pin connector. WinSystems' optional CBL-225-1 adapter cable interfaces the mouse cable connector to this board.

Multi-I/O Connector Cable Adapter - WinSystems offers the optional CBL-247-1, Multi-I/O cable adapter for the COM1, COM2, LPT1 and keyboard. These four ports are combined into one 50-pin header at the edge of the board. The CBL-247-1 is a 1-foot adapter cable that offers a more convenient termination. COM1 and COM2 are 9-pin male "D" connectors with strain relief. LPT1 is a 25-pin "D" female socket with strain relief. The keyboard is a standard 6-pin PS/2 connector socket.



CBL-247-1

Interrupts - Two 82C59A compatible interrupt controllers accept inputs from the onboard peripherals and the PC/104 Bus for a total of twelve selectable interrupt sources. Also four PCI interrupt sources are supported on the PC/104-*Plus* Bus which are PnP compliant.

Status LED - A green status LED is also available to monitor system activity. Under a user's program control, it can indicate error conditions or blink different patterns to provide a visual indication of system status.

Real Time Clock - An MC146818A-compatible clock supports a number of features including periodic and alarm interrupt capabilities. In addition to the time and date keeping functions, the system configuration is kept in CMOS RAM contained within the clock section.

Watchdog Timer - A software/hardware enabled, retriggerable watchdog timer is provided. This timer must be updated at least once every 1.5 or 15 seconds (jumper selectable) otherwise a failure is assumed and the board will be reset. This circuit is important for use in remote and unattended applications.

Timers - Three, independent 82C54 compatible 16-bit timers are supported. Channel 0 is wired to interrupt Channel 0, Channel 1 generates the DRAM refresh using DMA Channel 0, and the speaker port uses Channel 2.

Speaker - An onboard speaker is available for sound generation. A beep code is generated that corresponds to any BIOS error codes (if required) during the power up or reset sequence

Power - Power is supplied via a 9-pin connector. For most applications, the board only requires +5 volts. However, some flat panels may require +12 volts for the backlight inverter. Additional the ±12V is wired to the PC/104 connector.

Reset - A precision comparator monitors the status of 3 critical board voltages. Upon detection of an out-of-tolerance condition, the board is reset. This action is critically important in order to detect brownout or power fail conditions. The reset circuit also ensures that the power is nominal before executing a power-on reset.

Battery - A 350 mAH battery supplies the EBC-LP board with standby power for the real time clock and CMOS setup RAM. A power supervisory circuit senses the off-board voltage and automatically switches to internal power when it drops below normal.

Standalone Operation - The board can be used as a complete, standalone embedded controller mounted on a flat surface using a set of standoffs. The EBC-LP measures 5.75 x 8.0 inches (146mm x 203mm).

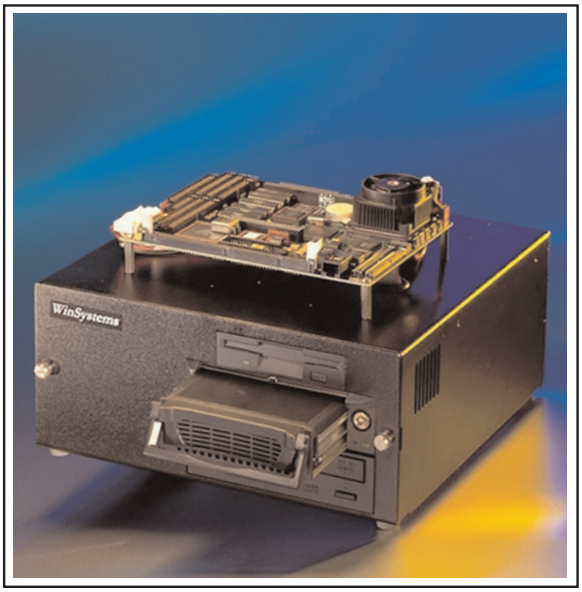
PC/104 Expansion - The EBC-LP provides a common computer core from which engineers can add off-the-shelf or user-designed, application-specific PC/104 modules. PC/104 modules are self-stacking and plug together in a "piggy back" configuration to serve as a mezzanine expansion bus. PC/104 modules are very compact, measuring only 3.6 x 3.8 inches, and are offered by WinSystems and a number of third party companies worldwide. Module functions include specialty serial I/O, digital I/O, networking, GPS, modem, audio, SCSI, etc.

The EBC-LP has both a 16-bit PC/104 and a 32-bit PC/104-Plus interface and connector. PC/104 is the ISA bus and PC/104-*Plus* is the PCI bus for I/O functions requiring higher data transfer speeds.

SOFTWARE SUPPORT

Software - The EBC-LP is designed to run both 16-bit and 32-bit x86 instruction set software. It is compatible with Microsoft's Windows operating systems, such as WindowsCE, Windows98, WindowsNT® and Windows NTE as well as the applications that run on them. It also supports Linux and other PC-compatible x86 operating systems such as QNX, VxWorks, and OS9000. It will also run other real-time executives that require a "PC-AT" hardware environment.

Software Developers Kit - WinSystems offers the SDK3-EBX-280-D software developers kit to provide the necessary hardware, software and cables to begin program development with the EBC-LP board. One of the configurations consists of DOS 7.x, CBL-247-1 Multi-I/O cable, CD-ROM drive, a 2GB or larger hard disk plus controller cable, a 1.44 MB high density 3.5 inch floppy disk plus controller cable and triple output power supply housed in an enclosure. Also a PCM-POST module is included for debugging support.



SDK3-EBC-280 Software Developers Kit

The power supply is an 80-Watt universal switcher that will accept input voltages from 85 VAC to 264 VAC.

Output voltages are +5 volts at 12A, +12 volts at 3A, and -12 volts at 1A. The power supply, floppy disk and hard disk are mounted in a black aluminum enclosure. The packaging permits easy access to the board, PC/104 modules and peripherals during program development.

ROM-DOS Developers Kit (RDK) - WinSystems also offers several different Flash-based developers kits for those applications that do not need rotational media during development. When you order an EBC-LP along with the RDK of your choice, WinSystems will jumper the CPU, program and install the Flash part into your EBC-LP. The RDK includes a PS-80W-1 external power supply, PCM-POST, DiskOnChip Flash memory, ROM-DOS, cables and utility software. For more information contact your factory applications engineer.

SPECIFICATIONS

Electrical

EBC-LP CPU Clock: Intel 166 or 266 MHz Intel
PC/104 Interface: 16-bit, non-stackthrough
PC/104-PLus Interface: 32-bit PCI, non-stackthrough
Ethernet data rate: 10/100 megabits per second
Serial Interface: 4 Serial channels with RS-232 levels
RS-422/485 optional using the CK-75176 kit on COM1 and COM2 only
LPT Interface: Bidirectional LPT with ECP/EPP
Parallel Interface: 48 I/O lines, TTL compatible
Output: IOL = 12mA at 0.6 volts
Input: 10K nominal pull-up resistor
UDMA/33 EIDE interface: Supports 4 drives
Floppy Disk Interface: BIOS supports one or two 360K/720K/1.2M/1.44M drives
Vcc = = +5V ±5% at 2A typ: EBC-LP-166
Note: A flat panel backlight inverter usually requires +12V to operate, refer to the manufacturer's specification for their current requirements.

System Memory

Addressing: Up to 256 Megabytes
Capacity: 168-pin SDRAM supplied and installed by user
External Cache: 512Kbytes

Solid State Disk

Capacity: One, 32-pin memory socket supports up to a 128KB of EPROM or up to a 1GB DiskOnChip®

Mechanical

Dimensions: 5.75" x 8.0" (146mm x 203mm)
Jumpers: 0.025" square posts

Connectors

Serial, LPT, Keyboard: 50-pin on 0.100" grid
COM3 & 4: 20-pin on 0.100" grid
Floppy Disk Interface: 34-pin on 0.100" grid
IDE Interface: 40-pin on 0.100" grid
Parallel I/O: Two, 50-pin on 0.100" grid
CRT: 14-pin on 2-mm. grid
FP-100 Panel: Two, 50-pin on 2-mm. grid
Ethernet: RJ-45
PC/104 Bus: 64-pin 0.100" socket
40-pin 0.100" socket
Power: 9-pin in-line Molex
Mouse: 5-pin in-line Molex

Environmental

Operating Temperature:
EBC-LP-166 -40°C to +85°C w/o fan
EBC-LP-266 -40°C to +70°C
Non-condensing relative humidity: 5% to 95%

ORDERING INFORMATION

EBC-LP-166-0 166 MHz Intel Pentium SBC
EBC-LP-266-0 266 MHz Intel Pentium SBC

For OEM applications, the EBC-LP can be ordered with the circuitry depopulated. Contact a factory applications engineer for configuration, price, and delivery information.

RDK-EBC-280-xF ROM-DOS Developers Kit
SDK3-EBC-280 Software Developers Kit
FLASH-MD2000-Dxx DiskOnChip®, where xx = 8, 16, 32, 48, 144, or 288MB
DIMM168-xxM 168-pin DIMM DRAM where xx = 32, 64, 128 or 256MB
CBL-115-4 4ft. Opto rack interface cable
CBL-125-1 Floppy Disk Adapter cable
CBL-173-1 20-pin ribbon to two 9-pin male D connector adapter cable
CBL-225-1 PS/2 mouse adapter cable
CBL-236-2 Power cable for the board (unterminated)
CBL-234-1 14-pin ribbon to 15-pin D-sub CRT adapter cable
CBL-247-1 1 ft., Multi-I/O adapter cable
CBL-249-1 4-pin USB adapter cable
CBL-SET-280-1 6 various cables for the EBC-LP
CK-75176-2 RS-422/485 chip kit for 1 channel
PS-80W-1 80 watt power supply

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