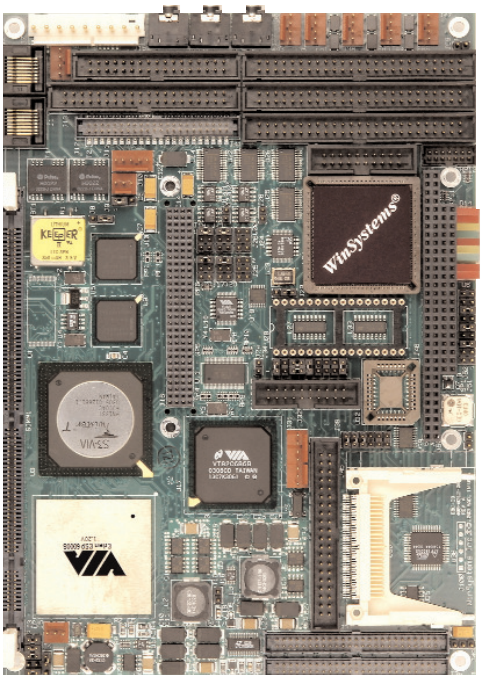
WinSystems®
EMBEDDED EBX COMPUTERS

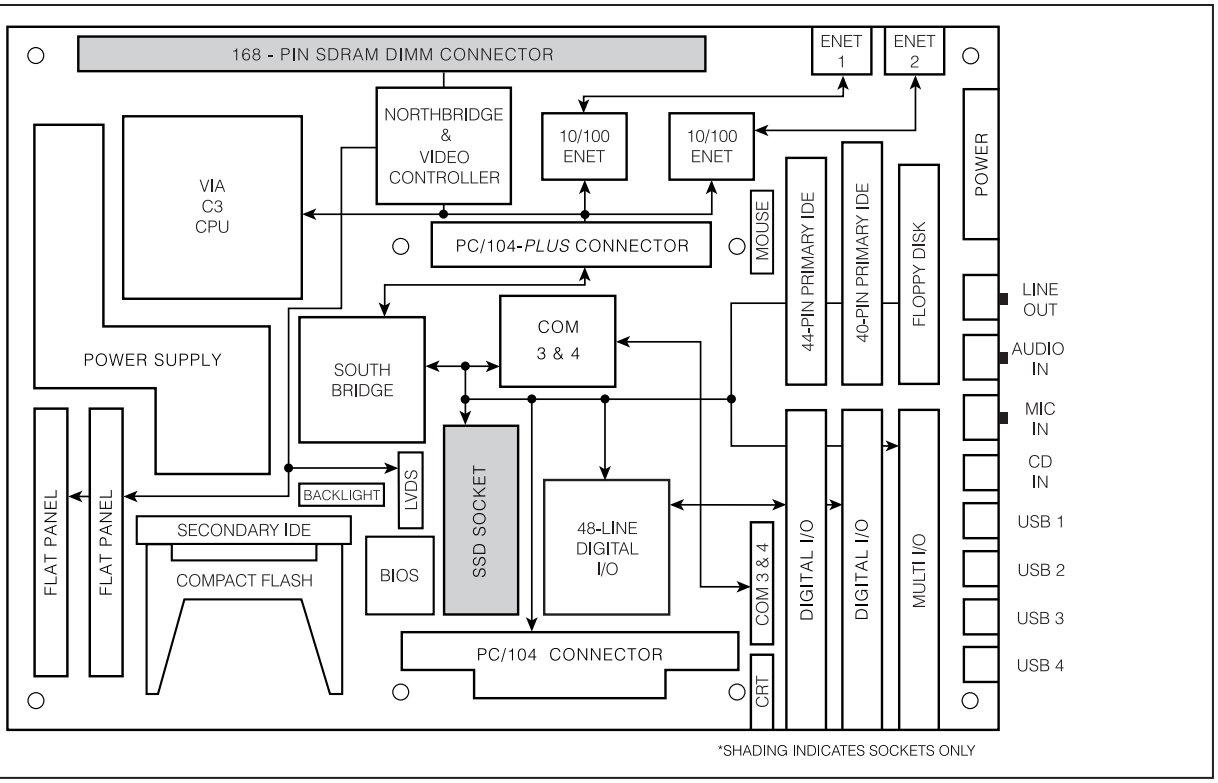
EBC-H-C3PLUS
Low Cost SBC with Video & Dual 10/100 Ethernet

FEATURES

- VIA 733MHz or 1GHz low power C3 processor EBX-compliant board
- 32 to 512MB of system PC133 SDRAM supported in a 168-pin DIMM socket
- Socket for up to 1GB bootable DiskOnChip® or 512KB SRAM or 1MB EPROM
- Type I and II CompactFlash cards supported
- PC-compatible supports Linux, Windows® CE.NET and XPe, plus other x86-compatible RTOS
- High resolution video controller supports
  - Color panels supported with up to 36-bits/pixel
  - Supports resolutions up to 1920 x 1440
  - Simultaneous CRT and LCD operation
  - 4X AGP local bus for high speed operation
  - LVDS supported
- Dual 10/100 Mbps Intel PCI Ethernet controllers
- Four RS-232 serial ports with FIFO, COM1 & COM2 with RS-422/485 support
- Bi-directional LPT port supports EPP/ECP
- 48 bi-directional TTL digital I/O lines with 24 capable of event sense interrupt generation
- Four USB ports onboard
- Two, dual Ultra DMA 33/66/100 EIDE connectors
- Floppy disk controller supports one or two drives
- AC97 Audio supported
- PC/104 and PC/104-*Plus* expansion connectors
- AT keyboard controller and PS/2 mouse support
- Activity LEDs onboard for visual status



- Two interrupt controllers and seven DMA channels
- Three, 16-bit counter/timers
- +5 volt only operation
- Upgrade for WinSystems' EBC-LP and EBC-BX
- Real Time Clock, WDT and power fail reset
- Small size: 5.75" x 8.0" (146-mm x 203-mm)



OVERVIEW

The EBC-H-C3PLUS is a full-featured, high-performance, EBX-compatible single board computer (SBC) based upon the VIA Eden™ Processor. These processors have extremely low power dissipation that allows fanless operation thereby making them ideal for industrial applications.

The board is configured with either a 733MHz or 1GHz MMX-compatible CPU with up to 512MB of PC133 SDRAM plus a CompactFlash socket. Two 10/100 Ethernet controllers, USB, video with 3D Now! support, four serial COM channels, 48 digital I/O lines, AC97 audio, and the standard AT peripheral feature set are on board. The EBC-H-C3PLUS measures only 5.75- x 8.0-inches and is EBX-compliant.

It supports expansion with the PC/104 or PC/104-*Plus* connectors or with USB. The EBC-H-C3PLUS does not require a fan and will operate over an industrial temperature range that makes it ideal for rugged applications requiring an embedded PC. Its x86 PC software compatibility assures a wide range of tools to aid in your application program development and checkout.

FUNCTIONAL CAPABILITY

Processor - The EBC-H-C3PLUS is based upon the VIA Technologies Eden™ Embedded System Platform Processor architecture. It is manufactured with 0.15/0.13-micron technology to give high-performance and low power dissipation. The board ships with a 733MHz or 1GHz MMX-compatible processor with a 133MHz front side bus. The CPU includes two 4-way 64KB Level 1 caches plus a unified 64KB Level 2 cache. The CPU and supporting chips are x86 compatible.

A separate 80-bit FPU executes x86 floating point instructions in parallel with integer instructions. The CPU also includes a separate execution unit for MMX instructions.

System Controllers - A VIA VT8606 "Twister-T" is the Northbridge that provides control of the SDRAM and implements the PCI rev. 2.2 bus controller. PCI is used for onboard peripherals and for the PC/104-*Plus* bus. The VT8606 also integrates the Savage4 graphics core for video. The video drives both CRT and flat panels and supports resolutions up to 1920 x 1440 with 64K colors.

A VIA VT82C6868 Southbridge provides the super I/O features and the PC/104 bus controller. It contains the EIDE interface, floppy disk controller, USB root hub and 4 function ports, two COM channels, LPT, mouse, and keyboard interfaces plus AC97 audio controller.

Memory - Up to 512 Mbytes of Synchronous Dynamic RAM (SDRAM) can be installed on the board by using a 168-pin DIMM. A PC-133 compatible part (non-registered, unbuffered) with gold plated fingers is the recommended SDRAM. They are available from WinSystems. The board is shipped from the factory with no memory installed. That permits the user to either install and/or upgrade the memory capacity in the field.

BIOS - An industry-standard, Award BIOS is on the board 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, keyboardless, and videoless operation plus BIOS shadowing.

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-compatible 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.

UltraDMA-100/66/33 EIDE Controller - The EBC-H-C3PLUS incorporates a dual channel master mode PCI controller supporting four Enhanced IDE (EIDE) drives. PIO Mode 4 and Bus Master IDE transfers of up to 33 Mbytes/sec are supported. Also, it supports Ultra DMA-66 transfer protocols and UDMA-100 mode 5. Both the Primary and Secondary interface channels are wired to a separate 40-pin header connector on 0.100-inch centers. The Primary channel also is wired to a 44-pin 2mm connector for more connection options and flexibility. The Secondary channel is also wired to the CompactFlash socket. 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 16Mbytes to 1 Gbyte 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.

CompactFlash - CompactFlash cards offer small, inexpensive, removable solid state disk storage with capacities up to 1GB. A connector is on the board that will accept Type I and II CompactFlash cards. The connector is wired to the secondary EIDE controller.

Ethernet Controllers - Two Intel 82551ERs are the 32-bit PCI Ethernet controller chips used for high-speed data transfer. Each controller 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 per controller that provide status information. The red LED indicates 100BaseT, the yellow indicates Link, and the green is the Rx/Tx packet data.

The 82551ER 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-H-C3PLUS. The configuration information describing the device's architecture, address, interrupt, etc. is stored in a serial EEPROM.

Networking - The EBC-H-C3PLUS supports remote booting with an onboard EPROM socket for use as a diskless network computer. Contact a WinSystems' application engineer for suppliers of remote boot software.

For OEM quantities, WinSystems can populate one of the Ethernet channels with an Intel 82559QM. This device has advanced Ethernet controller capabilities. There are also pads for a Flash device to be soldered to the board to support the NetBoot protocol. Contact an applications engineer for more information.

Video - A ProSavage4 2D/3D video controller is standard on the EBC-H-C3PLUS. It is a 4X AGP, high-performance PCI flat panel/CRT controller that provides a sophisticated graphics accelerator video engine. It can support 2D/3D resolutions up to 1920 x 1440. The video controller uses a shared memory architecture. The controller supports a wide variety of monochrome and color LCD panel displays as well as standard CRTs.

CRT Video Interface - 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-H-C3PLUS 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 36-bits per pixel.

It has power, timing and control signals for various panel types. The logic levels are 3.3 volts but are 5.0 Volt tolerant. Also, 4 lines are assigned to allow the EBC-H-C3PLUS 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' application engineer with your specific panel requirements.

Software drivers are available with high-resolution drivers for various software packages including Linux, Windows CE.NET, NT4.0, 2000, and Windows XP.

LVDS - The EBC-H-C3PLUS supports a 2-channel 110MHz LVDS interface. It is wired to a 20-pin, 0.100" header.

USB - This board has a root hub and four function ports. It supports USB v1.1 and Intel Universal HCI v1.1. Each USB port is wired to a 4-pin connector at the edge of the card. An optional WinSystems' 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 have a 16-byte FIFO. Each UART is a 16C550 compatible for 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 such 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-H-C3PLUS only requires +5 volts to operate. Also RS-422 and RS-485 electrical levels are supported on COM1 and COM2.

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, that adapts each serial channel to 9-pin male "D" connectors.

48-line parallel I/O - The EBC-H-C3PLUS 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 ribbon cable connects the EBC-H-C3PLUS to one I/O rack.

Audio - The EBC-H-C3PLUS board has a AC97 digital audio controller. It is SoundblasterPro™ compatible. Connectors provide Line Out, Audio In, Microphone In and CD Inputs.

Line Printer Port - The EBC-H-C3PLUS 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 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 eight input or output only lines. The other port is configured as five input and three 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 5-pin PS/2 connector socket.

Interrupts - Two 82C59A compatible interrupt controllers accept inputs from the onboard peripherals and the PC/104 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 red status LED is 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 - A DS12885-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 256byte CMOS RAM contained within the clock section.

Watchdog Timer - A software/hardware enabled, re-triggerable watchdog timer is provided. The time period can be either 1.5 seconds to 120 seconds. 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.

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

Reset - A precision voltage monitors the +5 volt status. 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-H-C3PLUS 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-H-C3PLUS measures 5.75 x 8.0 inches (146-mm x 203-mm).

PC/104 Expansion - The EBC-H-C3PLUS 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, 802.11wireless, 1394, audio, SCSI, etc.

The EBC-H-C3PLUS 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-H-C3PLUS is an x86-compatible, Pentium™III class single board computer. It is designed to run both 16-bit and 32-bit x86 instruction set software and is compatible with Microsoft's Windows® CE and XP operating systems as well as the applications that run on them. It also supports Linux and other PC-compatible x86 operating systems such as QNX or VxWorks. It will also run other real-time executives that require a "PC-AT" hardware environment.

Software Developers Kit - WinSystems offers software developer kits to provide the necessary hardware, software and cables to begin program development with the EBC-H-C3PLUS board. The configuration consists of an operating system, CBL-247-1 Multi-I/O cable, CD-ROM drive, a 20GB or larger hard disk plus controller cable, a 1.44MB 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.

The power supply is an 80-Watt universal switcher that will accept input voltages from 85 to 264 VAC. Output voltages are +5 volts at 12A, +12 volts at 3A, and -12 volts at 1A. The power supply, CD-ROM drive, floppy disk, and hard disk drives are mounted in a black, light-weight, 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-H-C3PLUS along with the RDK of your choice,

WinSystems will jumper the CPU, program and install the Flash part into your EBC-H-C3PLUS. The RDK includes a PS-80W-1 external power supply, PCM-POST, DiskOnChip Flash memory, ROM-DOS, cables, and utility software. For more information, please contact your factory applications engineer.

SPECIFICATIONS

Electrical

CPU Clock:	733MHz or 1GHz VIA Eden
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:	Four serial channels with RS-232 levels plus RS-422/485 on COM1 and COM2
LPT Interface:	Bidirectional LPT with ECP/EPP
Parallel Interface:	48 I/O lines, TTL compatible Output: I_{OL} = 12mA at 0.6 volts Input: 10K nominal pull-up resistor
UDMA100/66/33 EIDE Interface:	Supports two drives
Floppy Disk Interface:	BIOS supports one or two 360K/720K/1.2M/1.44M drives
Vcc =	+5V ±5% at 3.3A typ. 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 512Mbytes 168-pin SDRAM (supplied and installed by user)

Solid State Disk

Capacity:	One, 32-pin memory sockets supports up to 4MB of EPROM or up to a 1GB DiskOnChip, plus Type I and II CFlash socket for up to 1GB of memory

Mechanical

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

Connectors

Serial, Parallel, Keyboard:	50-pin on 0.100" grid
COM3 and 4:	20-pin on 0.100" grid
Floppy Disk Interface:	34-pin on 0.100" grid
EIDE Interface:	40-pin on 0.100" grid (Primary) 44-pin on 2-mm grid (Primary) 40-pin on 0.100" grid (Secondary) 50-pin 2-mm CFlash connector
Parallel I/O:	Two, 50-pin on 0.100" grid
CompactFlash:	50-pin, 2-mm grid
CRT:	14-pin on 2-mm grid
FP-100 Panel:	Two, 50-pin on 2-mm grid
LVDS:	20-pin on 0.100" grid
Ethernet:	Two RJ-45
PC/104 bus:	64-pin 0.100" socket 40-pin 0.100" socket
PC/104-*Plus* bus:	120-pin (4 x 30; 2-mm) stack-through with shrouded header
USB:	Four, 4-pin 0.100"
Audio:	Three, 3.5-mm stereo phone jacks
Power:	9-pin in-line Molex

Environmental

Operating Temperature:	-40° to +85°C (733MHz)
Operating Temperature:	-40° to +60°C (1GHz)

Non-condensing relative humidity: 5% to 95%

ORDERING INFORMATION

EBC-H-C3PLUS-733	733MHz Via Eden SBC
EBC-H-C3PLUS-1G	1GHz Via Eden SBC

For OEM applications, the EBC-H-C3PLUS can be ordered with the video and/or Ethernet circuitry depopulated. Contact a applications engineer for configuration and pricing.

EBC-H-C3PLUS Development Tools

DV-R-312-R	ROM-DOS Developers Kit with 32MB DiskOnChip
DV-R-312-S-48	RDK for ROM-DOS/Sockets with 48MB DiskOnChip
DV-S-312-C-CF	Developers Kit for Windows CE.Net for CompactFlash
DV-S-312-C-DOC	Developers Kit for Windows CE.Net for DiskOnChip
DV-S-312-L20	System Developers Kit for Linux 2.6 kernel
DV-S-312-X	System Developers Kit for Windows XP-Embedded
DV-S-312-XP-SP2	System Developers Kit for Windows XP-Embedded SP2
FLASH-MD2000-Dxx	DiskOnChip, where x = storage capacities from 16MB to 1GB
CBL-115-4	4 ft. Opto rack interface cable
CBL-125-1	Floppy disk adapter cable
CBL-126-10	ATA100 IDE disk 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-234-1	14-pin ribbon to 15-pin D-sub CRT adapter cable
CBL-236-2	Power cable (unterminated)
CBL-247-1	1 ft., Multi-I/O adapter cable
CBL-249-1	4-pin USB adapter cable
CBL-SET-312-1	Six various cables for the EBC-H-C3PLUS

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