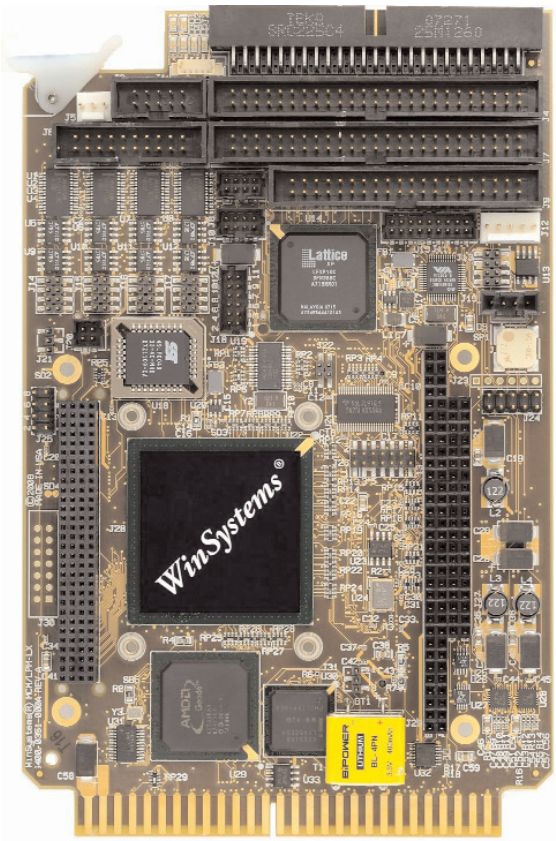
WinSystems®

CMOS STD BUS, STD BUS

LPM-LX800-G
Multifunction SBC with Video and Ethernet

FEATURES

- AMD Geode™ LX800; x86-compatible CPU
- Up to 1GB of SODIMM system SDRAM supported in a 200-pin SODIMM socket
- Socket for up to a 16GB Type I or II CompactFlash
- STD Bus compliant board
- PC-compatible supports Linux, Windows® Embedded, DOS, and other x86-compatible RTOS
- High-resolution video controller supports
  - Simultaneous analog CRT or LCD operation
  - Supports CRT resolutions up to 1920 x 1440
  - Supports panel resolutions up to 1600 x 1200
  - Color panels supported with up to 18-bits/pixel
  - Backlight power supported
  - Digital Flat Panel and LVDS support
- Custom splash screen on start up
- 10/100 Mbps Intel 82551ER Ethernet controller
- Four asynchronous serial ports with FIFO. All channels support RS-232/422/485 signal levels
- 48 bi-directional TTL digital I/O lines
- Bi-directional LPT printer port
- Four USB 2.0 ports with overcurrent protection
- Supports booting from USB
- Ultra DMA100 EIDE controller for one or two devices
- AC97 audio
- Onboard battery plus connector for off-board battery
- PC/104 and PC/104-*Plus* Bus expansion connectors
- AT keyboard controller and PS/2 mouse support
- Battery backed Real Time Clock
- Programmable Watchdog Timer with long time-out period
- 8/16-bit STD Bus interface
- Extended operating temperature -40°C to +85°C
- +5 Volt only operation
- RoHS compliant



Extended Temperature

RoHS compliant

- Extended operating temperature -40°C to +85°C
- Replaces WinSystems' MCM/LPM-6117, MCM/LPM-TX, and MCM/LPM-DX products

OVERVIEW

The LPM-LX800-G is a STD Bus single board computer based upon the AMD Geode™ LX800 MHz CPU. This chip offers Celeron 800MHz-equivalent performance while drawing less than 5 watts of power. Additional features include onboard video, a 10/100 Ethernet port, four serial COM channels, four USB ports, 48 digital I/O lines and the standard AT peripheral feature set all on a single board. It supports I/O expansion options with the STD Bus, PC/104, and PC/104-*Plus* Bus support for maximum design flexibility and reliability.

The board does not require a fan and will operate over an extended temperature range that makes it ideal for rugged applications requiring an STD Bus embedded PC. Its PC software compatibility assures easy program development, and checkout.

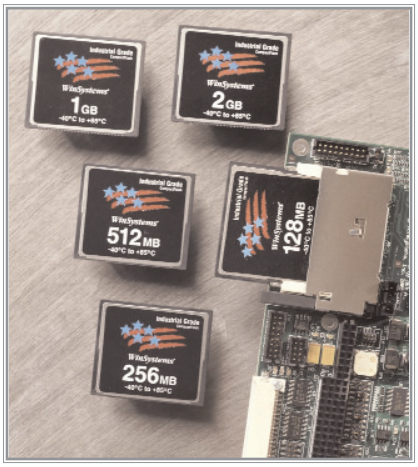
This RoHS-compliant board is an upgrade for existing WinSystems' STD Bus CPUs as well as replacing Ziatech , Pro-Log, and VersaLogic's STD Bus Pentium-class high-performance processor cards. Please contact WinSystems' applications engineering department for further details.

FUNCTIONAL CAPABILITY

Processor - The LPM-LX800-G is built with the low power AMD Geode™ LX800MHz 0.9W with 64KB of I-cache, 64KB of D-cache and 128KB of L2 cache. Its 32-bit x86/87 core allows PC compatible software to run. Also, the integrated FPU supports the Intel MMX™ and AMD 3DNow!™ technology instruction sets for increased performance for communications and multimedia applications. The CPU supports a PCI 2.2-compliant 32-bit interface operating at 33MHz.

System Controller - An onboard AMD CS5536 contains integrated controllers for audio (AC97), hard disk drive (ATA-6) USB 2.0, and power management. It also provides the core logic that makes the board PC/AT software compatible including integrated peripheral controllers (two 82C37-compatible DMAs, 82C54-compatible timer, two 82C59-compatible PICs), RTC with CMOS RAM, SMBus controller, and LPC Bus.

Memory - The board supports up to 1GB of 64-bit wide DDR-1 terminated 200MHz Synchronous DRAM that plugs into a 200-pin socket on the back of the board. The board is shipped from the factory with no memory installed. A 200-pin SODIMM connector permits the user to either install and/or upgrade the memory capacity in the field. WinSystems can supply the SODIMM200-G-27-128, -256, -512, and -1G which are 128MB, 256MB, 512MB, and 1GB RoHS-compliant memory modules qualified for use on this board.



WinSystems' Industrial CompactFlash Cards

CompactFlash - A connector is on the back of the board that will accept Type I and II CompactFlash (CF) cards. The connector is wired to the primary IDE channel. A designer can use bootable CompactFlash cards as data storage for applications where the environment is too harsh for rotational hard disks or floppy disk drives while offering significant speed advantage.

WinSystems offers industrial-grade CompactFlash cards that can be used to boot and store data like a solid state disk drive while operating from -40° to +85°C for high capacity harsh embedded applications. The sustained data transfer rate is very fast, plus an on-card wear leveling algorithm extends the number of write cycles to the part. These RoHS-compliant cards will fit into any computer, SBC, or instrument with a CompactFlash socket. For more information, please visit www.industrialcompactflash.com.

BIOS - The LPM-LX800-G uses the Insyde BIOS. It supports advanced features such as custom splash screen, APM 1.2 and ACPI 1.0b power management modes. The BIOS also supports legacy operation of a USB keyboard and mouse, as well as booting from a USB floppy disk, USB keys, and other USB-connected mass storage devices. The LPM-LX800-G can boot from a CompactFlash device.

The BIOS is located in an EEPROM that can be customized without removing the storage device from the board. It will support diskless, keyboardless, and videoless operation. Other customizable features such as a customer logo displayed during startup and customizable BIOS setup parameters are supported.

Networking - The LPM-LX800-G supports remote booting for use as a diskless network computer. Contact a WinSystems' application engineer for companies that supply remote boot software.

IDE Controller - The LPM-LX800-G incorporates an ATA-6 compatible IDE controller. This interface is for hard disks, CompactFlash, and other devices. This controller supports UDMA (up to UDMA mode 5), MDMA, and PIO modes. The controller can support one channel (two devices). One channel is wired to the IDE connector and the other to the CompactFlash connector. A red activity LED blinks during data transfer to provide visual status information.

Floppy Disk Support - Floppy disk support is through the use of USB compatible drives.

Video - A high-performance BitBLT/vector engine is integrated into the graphics processor in the AMD LX 800 CPU that supports both a standard analog SVGA and flat panel displays simultaneously. The video controller uses a shared memory architecture and includes hardware frame buffer compression to improve memory efficiency. The controller supports a wide variety of TFT active LCD panel displays as well as standard CRTs. It can support

resolutions up to 1920 x 1440 x 32 bpp at 85Hz for CRTs and 1600 x 1200 for flat panels with a 24-bit interface.

CRT Video Interface - The SVGA video output signals are wired to a 14-pin dual-in-line connector at the edge of the board. An optional CBL-234-G-1-1.375 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 LPM-LX800-G supports most flat panel display technologies. The board properly sequences the power for logic voltage and the backlight inverter to provide intelligent and safe power sequencing to the panel. Go to www.winsystems.com or contact a factory application engineer for the most up-to-date flat panel listing.

The LPM-LX800-G has both a 31-pin flat panel and a 10-pin LVDS connector to support different panel technologies, interfaces, and suppliers. It has power, timing and control signals for various panel types. The logic levels are 3.3 volts but are 5 volt tolerant.

Ethernet Controller - An Intel 82551ER is the 32-bit PCI Ethernet controller chip that provides high-speed data transfers. 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 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 LPM-LX800-G.

The Ethernet is wired to a 12-pin, 2mm connector. An optional WinSystems' CBL-342-G-1-1.5A is an adapter cable assembly for use with this board.

USB - The LPM-LX800-G has four USB 2.0 ports to provide simple connectivity with peripheral devices.. Each port has overcurrent and in-rush protection provided by a National Semiconductor LM3526 power switch. Each device is a dual stage design including a thermal protection circuit. During a short-circuit/over-current event, the switch dissipating excessive heat is turned off, allowing the second switch to continue to function uninterrupted. Therefore,a fault on one channel will not affect the other. No fuses are required since protection is done electronically by the circuit.

The four USB ports are wired to two, 8-pin 2-mm connectors. The CBL-275-G-2-0.50 is the optional interface cable adapter that has two standard female USB connectors.

Serial Communications - Four independent, full-duplex, 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 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-232/422/485 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 the LPM-LX800-G only requires +5 volts to operate.

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

Digital Input/Output - The LPM-LX800-G contains a versatile 48-line digital I/O controller. There are 48 bits of TTL-compatible digital I/O divided into two, 8-bit x 3 ports. 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. This allows direct control of up to 48 optical isolated signal conditioning modules to a single card for high density I/O support.

The major feature of the onboard digital I/O controller is its ability to monitor the 24 of lines of Port 0, 1, and 2 for either rising or falling digital edge transitions, latch them,

and then interrupt the host processor notifying it 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.

I/O Connectors - The LPM-LX800-G has the 48 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 a +5 volt source can be jumper enabled on pin 49 of each connector to supply logic power for the I/O module racks or other interface electronics. The optional CBL-115-4, 50-pin conductor ribbon cable connects the LPM-LX800-G to one I/O rack.

The pinout is compatible with the industry standard 4 to 24 position I/O module mounting racks (Dataforth®, Opto-22®, etc.) for use with high-level AC and DC opto-isolated solid state relays.

Isolated Digital I/O Modules - A broad line of solid state, miniature digital I/O modules are available in four basic types: AC input DC input, AC output, and DC output. Each module provides a safe and reliable way to interface the LPM-LX800-G to industrial applications. The module's isolation barrier is good to 4kV between the field wiring and LPM-LX800-G board. These modules are UL listed, CSA certified and CE compliant. Input modules incorporate filtering for transient-free switching.

Various input modules can sense voltage ranges of 10-60, 90-140, and 180-280VAC and also 3.3-32 and 10-60VDC. Models with low noise, fast switching and other special features are available. They conform to the industry-standard footprint and pinout.

Output modules support different ranges including 12-140 and 24-280VAC plus 0-50, 3-60, and 5-200VDC. Fast switching and other special options are available. Contact Dataforth at www.dataforth.com.

Line Printer Port - The LPM-LX800-G has a parallel LPT printer port that may be operated in a bi-directional mode. 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. It is wired to the 50-pin multi-I/O connector. The CBL-247-G-1-1 adapter cable provides the mate to a PS/2 type keyboard.

A mouse controller is on board. Its input is accessible through a 5-pin connector. WinSystems offers an optional CBL-225-G-1-1 adapter cable that interfaces the PS/2 mouse cable to this board.

Interrupt Sources - Two 82C59A compatible interrupt controllers accept inputs from the onboard peripherals, the INTRQ* lines from the STD Bus, and the PC/104 Bus interrupt sources. Also four PCI interrupt sources are supported on the PC/104-*Plus* Bus which are PnP compliant.

The LPM-LX800-G contains a 10-pin interrupt connector at the top of the card (OTT). This provides backward compatibility for WinSystems' MCM/LPM-TX, MCM/LPM-6117, and MCM/LPM-DX5 boards. It also provides five additional interrupt sources to the board in addition to those provided through the STD Bus backplane.

AC97 Audio - The LPM-LX800-G has an AC97 digital audio controller that supports 5.1 surround sound. An 18-pin, 2mm connector provides access to Line Out, stereo Audio In, and stereo Microphone In.

I/O - The LPM-LX800-G conforms to the PC-AT I/O map and STD Bus standard 10-bit addressing. It will support older STD Bus I/O boards that decode only 8 address bits, 8 bits with IOEXP*, and the newer 10-bit cards.

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. The time and date keeping information is stored in its CMOS RAM which can be battery backed up by using the onboard battery or WinSystems' external battery pack.

Watchdog Timer - A software enabled, retriggerable watchdog timer is provided. The timeout period is software adjustable with options from 1 to 255 seconds or 1 to 255 minutes available from the CMOS set up for boot. If enabled, it must be updated at least once during the period otherwise a failure is assumed and the board will be reset. This circuit is important for use in remote and unattended applications.

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

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 - An onboard 400 mAH battery supplies the LPM-LX800-G board with standby power for the real time clock and CMOS setup RAM. The power supervisory circuit senses the off-board voltage and automatically switches to internal power when it drops below normal. There is an optional WinSystems' external battery pack that can be plugged into the LPM-LX800-G. The battery is a 1600mAH 3.6V unit that works from -40° to +85° C.

The board also will operate without a battery since there is an EEPROM on board to store the CMOS set up data. However, current time and date information would not be maintained when the main +5V power is not present.

I/O Expansion Options - The LPM-LX800-G provides a common computer core from which engineers can add user designed or off-the-shelf boards to match their exact configuration. The board can support three different modes: STD Bus, PC/104 Bus, and PC/104-*Plus* Bus.

STD Bus - The LPM-LX800-G supports both 8- and 16-bit transfers on the STD Bus. Logic automatically detects the memory and I/O transfer data path widths and aligns the transfers accordingly.

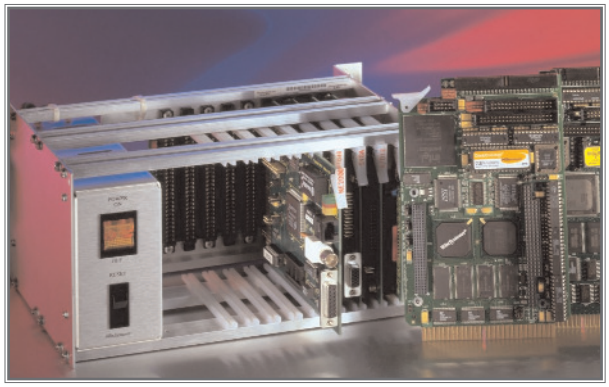
The STD Bus provides a simple-to-use I/O bus in a small card size (4.5 x 6.5-inches). The cards mount securely in card cages that can tolerate shock and vibration which makes them ideal for rugged industrial applications.

STD Bus Card Cages & Backplanes - WinSystems has a wide selection of backplanes, assembled card cages, and powered racks. These units are designed to provide the highest integrity and reliability needed as a foundation for an embedded system.

The backplanes and card cages work with STD Bus processors from the original Z80 to the newest Pentium-class CPUs. They are designed to minimize noise and crosstalk while maintaining good power distribution, massive ground planes, and a constant characteristic impedance on the signal lines.

Three mounting configurations are available for card cages: rack mount, table mount, or wall mount. Board spacing is available in either 0.625 or 0.75-inches. From 2 to 26 slots are available. All offer a vertical card orientation to take advantage of convection cooling. They are constructed of aluminum which is lightweight yet strong.

WinSystems also offers card cages with 50W or 100W power supplies. These are triple output, high-efficiency supplies that mount inside the card cage. They are universal input switchers that accept a range of 85 to 220VAC. An ON/OFF switch and momentary Reset switch are mounted on a panel for operator convenience.



WinSystems' STD Bus Card Cage and Boards

Multiple backplanes and other options can be installed in a card cage to allow more than one system to occupy a single container. To configure and price a custom backplane or card cage, contact the factory applications engineer with your specification.

PC/104 and PC104-*Plus* Bus - The LPM-LX800-G supports both the 16-bit PC/104 and a 32-bit PC/104-*Plus* interface with a connector for each. PC/104 is the ISA bus and PC/104-*Plus* is the PCI bus for I/O functions requiring higher data transfer speeds.

PC/104 and PC/104-*Plus* Bus 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. Module functions include specialty serial I/O, digital I/O, analog I/O, wireless, GPS, modem, etc.

Multi-I/O Connector - WinSystems offers the optional CBL-247-G-1-1, Multi-I/O cable adapter for the COM1, COM2, LPT and keyboard. These four ports are combined into one 50-pin header at the edge of the board. 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.

Replacement for WinSystems and other manufacturers STD Bus Products - This board is designed to be an upgrade and high-performance replacement for current users of WinSystems' MCM/LPM-6117, MCM/LPM-TX and MCM/LPM-DX STD Bus boards. For questions about

any differences in the boards or new software drivers that may be needed, please contact the factory.

Engineering Support - WinSystems provides free technical phone support to assist customers with system integration of our SBCs and I/O modules into your design.

Software - The LPM-LX800-G is designed to run both 16-bit and 32-bit x86 instruction set software. It is compatible with Microsoft's Windows XPe and the applications that run on it. It also supports Linux and other PC-compatible x86 operating systems such as DOS, QNX, and VxWorks. It also will run other real-time executives that require a "PC-AT" hardware environment.

SPECIFICATIONS

Electrical

CPU Clock:	500MHz
PC/104 Interface:	16-bit, non-stackthrough
PC/104-*Plus* Interface:	32-bit PCI, non-stackthrough
Serial Interface:	Four with RS-232/422/485 levels
LPT Interface:	Bi-directional LPT
EIDE Interface:	Supports two drives

Vcc = +5V @ 1.6 Amps (typ.)

System Memory

Addressing:	1Gigabyte
Capacity:	256/512/1024MB DDR SDRAM

Solid State Disk

Capacity:	One, CompactFlash sockets supports up to a 16GB Type I or II device

Mechanical

Dimensions:	4.5" x 7.0"
Jumpers:	0.025" square posts

Connectors

Serial, Parallel, Keyboard:	50-pin on 0.100" grid
COM3 and 4:	20-pin on 0.100" grid
EIDE Interface:	40-pin on 0.100" grid (Primary)
CompactFlash:	50-pin 2-mm CFlash connector
Parallel I/O:	Two, 50-pin on 0.100" grid
CRT:	14-pin on 2-mm. grid
Digital Panel:	31-pin Hirose on 2-mm grid
LVDS:	20-pin on 0.100" grid
Ethernet:	12-pin on 2-mm grid
USB Interface:	Two, 10-pin on 2-mm grid
OTT Interrupts:	10-pin on 0.100" grid
Audio:	18-pin, 2-mm connector
PC/104 Bus:	64-pin 0.100" socket 40-pin 0.100" socket
PC/104-*Plus* Bus:	120-pin, 2-mm (4x30) socket
STD Bus:	56-pin 0.125" card edge

Environmental

Operating Temperature: -40° C to +85° C
Non-condensing relative humidity: 5% to 95%

ORDERING INFORMATION

LPM-LX800-G	AMD LX 800MHz 0.9W STD Bus SBC with no system memory installed

System Memory - DDR PC2700 SDRAM

SODIMM200-G-27-256	256Mbyte RoHS device
SODIMM200-G-27-512	512Mbyte RoHS device
SODIMM200-G-27-1G	1028Mbyte RoHS device

-40°C to +85°C Industrial CompactFlash Memory

CFLASH-G-128M-I	128MB CFlash - RoHS compliant
CFLASH-G-256M-I	256MB CFlash - RoHS compliant
CFLASH-G-512M-I	512MB CFlash - RoHS compliant
CFLASH-G-1024M-I	1GB CFlash - RoHS compliant
CFLASH-G-2048M-I	2GB CFlash - RoHS compliant
CFLASH-G-4096M-I	4GB CFlash - RoHS compliant
CFLASH-G-8192M-I	8GB CFlash - RoHS compliant

Cables

CBL-115-4	Opto rack interface cable, 4 ft.
CBL-126-G-10-2	ATA100 IDE disk cable
CBL-173-G-1-1	20-pin ribbon to two, 9-pin male D (COM3 and COM4) adapter cable
CBL-225-G-1-0.3	PS/2 mouse adapter cable
CBL-234-G-1-1.375	14-pin ribbon to 15-pin D-sub CRT adapter cable
CBL-247-G-1-1	1 ft., Multi-I/O adapter cable
CBL-270-G-2-1	Stereo audio cable
CBL-275-G-2-0.50	Dual USB to 8-pin, 2-mm cable
CBL-342-G-1-1.52	Ethernet adapter cable

Optional External Battery

BAT-LTC-E-36-16-1	External 3.6V, 1600mAH battery with plug-in connector
BAT-LTC-E-36-26-1	External 3.6V, 2600mAH battery with plug in connector.

WinSystems
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