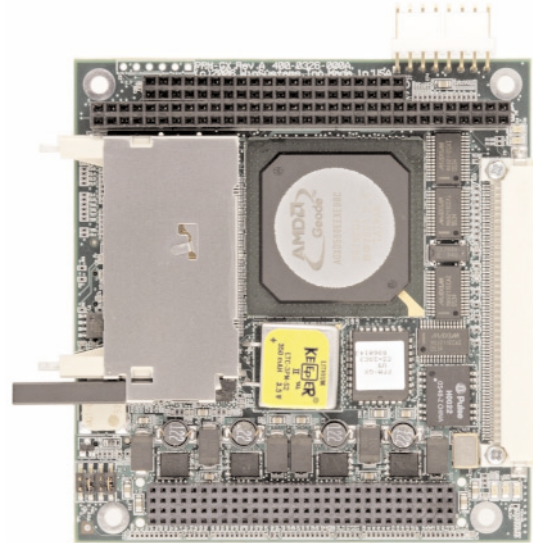


FEATURES

- AMD Geode™ GX500@1W processor
- PC/104-Plus module, 3.6" x 3.8" (90-mm x 96-mm)
- Up to 512MB of system DDR SDRAM supported in a 200-pin SODIMM socket
- Type I and II CompactFlash (CF) cards supported
- PC-compatible supports Linux, Windows® CE and XP embedded, plus other x86-compatible RTOS
- High resolution video controller supports
 - CRT or LCD operation
 - Custom splash screen on start up
 - Supports CRT resolutions up to 1600 x 1200
 - Supports panel resolutions up to 1024 x 768
 - Color panels supported with up to 18-bits/pixel
 - Backlight power supported
 - Optional LVDS adapter
- 10/100 Mbps Intel 82551ER PCI Ethernet controller
- 4 serial COM ports two RS-232 only and two with RS-232/422/485 levels
- Serial TTL port for optional external GPS receiver
- Bi-directional LPT port supports EPP/ECP
- Two USB 1.1 ports
- ATA-5 compatible controller with 33MB per second transfers in UDMA mode
- Floppy disk controller supports 1 or 2 drives
- PC/104 and PC/104-Plus expansion connectors
- AT keyboard controller and PS/2 mouse supported
- AC97 Audio with MIC, Line In, and Line Out
- Real time clock
- Activity LEDs on board for visual status



- -40°C to +85°C Operating temperature
- +5 volt only operation
- On board 350 mAH battery
- Speaker for generation of diagnostic beep codes
- Up to 300 second reset on watchdog timer
- Replacement for WinSystems' PPM-TX
- Long-term product availability
- Quick Start kits available

The PPM-GX is a highly integrated, PC/104-Plus single board computer (SBC) designed for deeply embedded, space-limited, low power applications. It is a full-featured SBC that includes a AMD GX500 x86-compatible CPU, CRT and flat panel video, 10/100 Ethernet, USB, and four RS-232 COM channels.

It also includes the standard PC controllers for floppy disk, IDE hard disk, compact flash, mouse, keyboard, AC97 audio and LPT. Its x86 PC software compatibility assures a wide range of tools to aid in your applications program development and checkout.

Its extremely low power dissipation permits fanless operation. The board operates from -40° to +85°C for rugged applications requiring an embedded PC design.

FUNCTIONAL CAPABILITY

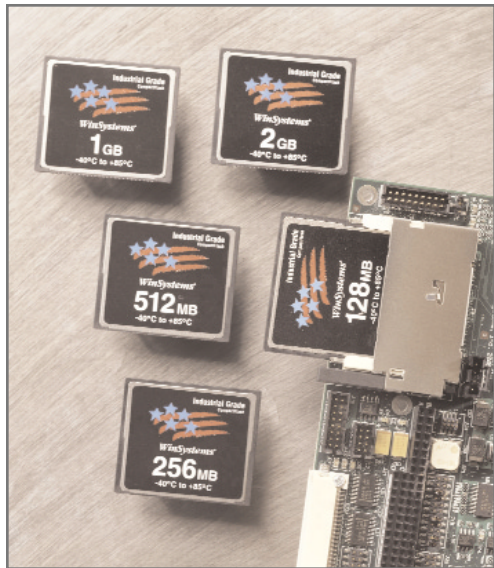
Processor - The AMD Geode™ GX 500@1.0W is the processor used on this board. It combines low power, excellent performance and small size. The actual processor speed is 367MHz which yields a performance of 500MHz. The CPU is x86-compatible and includes 32KB of level 1 cache; 16KB instruction and 16KB data. Included is an integrated, fully pipelined Floating Point Unit (FPU) that supports the IEEE 754 standard. The instruction sets supported are x87, MMX and 3DNow!

Memory - The system memory bus is 64-bits wide. Up to 512Mbytes of non-registered, unbuffered Double Data Rate (DDR) SDRAM with gold-plated fingers can be installed for the main systems memory.

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, and -512 which are 128MB, 256MB, and 512MB RoHS-compliant memory devices qualified for use on this board.

CompactFlash - A connector is on the board that will accept Type I and II CompactFlash (CF) cards. The connector is wired to the IDE controller. A designer can use CompactFlash 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 provide operational SSD storage 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 allows over 2 million write cycles to the part. These RoHS-compliant modules will fit into any computer, SBC, or instrument with a CF socket. www.industrialcompactflash.com



WinSystems' Industrial CompactFlash

BIOS - An industry standard 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 videless operation.

For video-based applications, the start-up splash screen can be customized. Contact the factory for details.

Floppy Disk Support - Up to two 3.5" floppy disk drives are supported by the on board controller. Two drives can be daisy chained on a single cable. A USB floppy disk drive can be attached which also has legacy DOS support.

Hard Disk Support - The PPM-GX incorporates an ATA-5 compatible (UDMA/33) bus mastering IDE interface. The IDE interface supports two devices that can operate in PIO modes 1 to 4, MDMA modes 0 to 2, or UDMA/33 modes 0 to 4.

The interface provides a variety of features to optimize system performance, including 32-bit disk access, post write buffers, bus master, MDMA, look-ahead read buffer and prefetch mechanism. A red LED blinks automatically while data is transferred to provide visual status information.

The IDE controller is wired to the CompactFlash socket and to the multi-I/O connector on the edge of the board.

Video - A high performance 2D graphics controller is integrated into the AMD GX 500@1W processor that supports both CRT and flat panel displays. It provides resolutions up to 1600 x 1200 for a CRT and 1024 x 768 for a flat panel.

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.

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 not supported.

Flat Panel Display Support - The PPM-GX 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. Please contact a WinSystems' Applications Engineer or visit our web site www.winsystems.com for the current listing.

WinSystems uses a 31-pin flat panel interface system that connects to different panel technologies and

suppliers. It has power, timing and control signals for various panel types. The logic levels are 3.3 volts but are 5.0 volts tolerant.

WinSystems also supports a LVDS adapter board. It converts the 31-pin parallel cable data into a serial data stream for longer cable runs for panels that support low voltage differential signaling (LVDS).

Ethernet Controller - An Intel 82551ER is a 32-bit PCI Ethernet controller chip that is 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 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 PPM-GX. The configuration information describing the device's architecture, address, interrupt, etc. is stored in a serial EEPROM.

USB - The PPM-GX has two Universal Serial Bus 1.1 ports that offer connectivity with peripheral devices. Each port has overcurrent and inrush protection provided by a National Semiconductor LM3526 power switch. The LM3526 is a dual stage design including a thermal protection circuit. During a short-circuit/overcurrent 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.

The USB ports are wired to an 8-pin connector. An optional CBL-275-1 is the interface cable adapter with two standard female USB connectors.

Serial Communications - Four independent, full-duplex, RS-232 serial asynchronous channels are on board. All serial channels are configured as Data Terminal Equipment (DTE). 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. Plus an independent on-chip software programmable baud rate generator is selectable from 50 through 115.2 kbits/sec. 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 PPM-GX only requires +5 volts to operate.

COM1 and COM2 also has software selectable RS-422/485 support. No jumpers are required. The RS-422/485 provides separate balanced transmit and receive signal pairs. For RS-485 multi-drop lines, one signal pair can be used for "party line" network structures.

Additional Serial Port for GPS - A TTL-compatible port with RX and TX only is also available. It is the IR port from the on board AMD CS5535. WinSystems has an ADP-GPS board that will cable directly to the board for use with location and time-base measurement applications. Please contact the factory for details.

Line Printer Port - The PPM-GX has a parallel port that may be operated in standard (SPP) bi-directional as well as Extended Capabilities Port (ECP - IEEE-1284) and Enhanced Parallel Port (EPP) modes. The output drivers can support 14mA per line.

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

AC97 Audio - The PPM-GX has an AC97 digital audio controller. A 10-pin, 2-mm connector provides access to stereo Line Out, Line In, and Microphone In.

Keyboard/Mouse Controller - An 80C42-type controller supports a PC/AT-compatible keyboard. Also, a standard PS/2 mouse is supported through the multi-I/O cable as well. The mouse and keyboard can be attached via the USB cable if the operating system you choose supports this feature.

I/O Access - Connector space is limited on the PPM-GX because of its high I/O content. Two, 80-pin connectors provide access to the disk controllers, serial channels, LPT port, mouse, keyboard, Ethernet, reset and LED signals. WinSystems offers two optional cables that breakout the signals into individual connectors for each I/O function.

CBL-251-1 is a 1 foot long, multi-I/O cable for COM1 through COM4, LPT1, push button reset, PS/2 mouse, Ethernet, and keyboard controllers. COM1, COM2, COM3, and COM4 are 9-pin male "D" with strain relief. LPT1 is a 25-pin "D" female socket with strain relief. The keyboard is a standard 6-pin mini-DIN female PS/2 connector. The mouse is a 6-position PS/2 mouse socket. Reset is a simple 2-wire push button. The Ethernet is a RJ-45 female socket.

CBL-252-1 is a 1-foot long multi-drive cable for the floppy disk drives and IDE hard disk drives. The floppy disk portion is terminated in a 34-pin socket on 0.100" centers that can be plugged directly into a drive. The IDE cable is terminated into a 40-pin socket on 0.100" centers that can be plugged directly into a drive.

The two USB ports are wired to a 8-pin header on 2-mm centers and is accessed via a CBL-275-1.

Interrupts - Two 82C59A compatible interrupt controllers accept inputs from the on board peripherals and the PC/104 Bus for a total of twelve software 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 enabled, retriggerable watchdog timer is provided. The timeout period is software adjustable to 1.5, 30, or 300 seconds. The time period can be changed by writing to a register even after initial boot up.

If enabled, the watchdog timer 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 on board speaker is available for sound generation. A beep code is generated that corresponds to various BIOS error codes (if required) during the power up or reset sequence

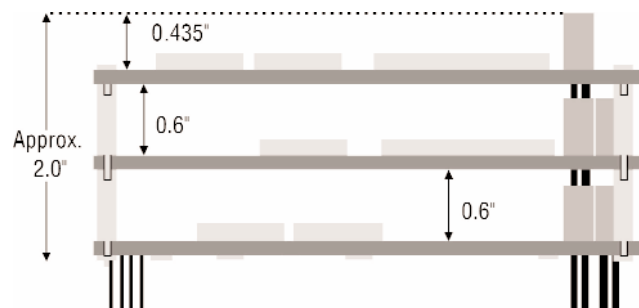
Power - Power is supplied via an 8-pin Molex connector. Both ± 12 volts are wired directly to the PC/104 and PC/104-Plus connector. The +12V is also wired to the switch for the panel back light control.

Power Fail 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 PPM-GX 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.

The board 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 after power is removed from the board.

PC/104 Expansion - The PPM-GX 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.



PC/104 and PC/104-Plus Module Stack

The PPM-GX provides a common computer core from which engineers can add off-the-shelf or user-designed, application-specific PC/104 and PC/104-Plus modules. These 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, 90-mm x 96-mm, and are offered by WinSystems and a number of third party companies worldwide. Module functions include communications specialty serial I/O, digital I/O, analog I/O, GPS, GSM or CDMA cellular modems, ZigBee, SCSI. Please visit our web site for additional PC/104 information which includes white papers, products, and specifications.

<http://pc104.winsystems.com/products/pc104/index.html>

PPM-TX Upgrade and Replacement - This board is designed to be a performance/feature upgrade and replacement for current users of WinSystems' PPM-TX boards. For question about any differences in the two boards or new software drivers that may be needed, please contact the factory.

SOFTWARE SUPPORT

Software - The PPM-GX is an x86-compatible SBC. 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 embedded operating systems (OS) as well as the applications that run on them. It also supports Linux and many other PC-compatible x86 OS such as QNX, VxWorks or other real-time executives that require a PC hardware environment.

Developer Kits - WinSystems offers Developer Kits to provide the necessary hardware, software and cables to begin program development with the PPM-GX board. The kit's packaging permits easy access to the SBC, PC/104 modules and peripherals during program development.

The kit consists of a DVD-ROM drive, floppy disk drive, hard disk drive and power supply mounted in a black, light-weight, aluminum enclosure. Also included is the selected operating system, cables, and the PCM-POST, a PC/104 module, for debugging support.

Board Support Packages for select operating systems are also available with our Developer Kits. Currently Windows XP embedded, Windows CE, Linux and DOS/sockets OS are supported. Additional support may be offered for other operating systems. Please contact a [WinSystems' Applications Engineer](#) if you need support for an OS that is not listed above.

In general, Developer Kits provide a specific OS "sample image" that is preloaded on a Flash disk and is ready to run right out of the box. Most kits also include Quick

Start Guides, documentation designed to lead you through the process of recreating the embedded OS sample image that was provided in the kit. These Quick Start Guides provide a wealth of valuable, time-saving information that will help you quickly overcome a large portion of the learning curve if you are new to a particular operating system.

Please visit the [Developer Section](#) of our website for more details about each individual kit.

SPECIFICATIONS

Electrical

PPM-GX CPU Clock:	367MHz actual, 500MHz equiv.
PC/104 Interface:	16-bit, stackthrough
PC/104-Plus Interface:	32-bit PCI, stackthrough
Ethernet:	10/100 megabits/second
USB 1.1:	Two ports
Serial Interface:	Four serial channels with RS-232 levels plus two channels of RS-422/485 on COM1 & 2
CRT:	Resolutions up to 1600 x 1200
Flat Panel:	Resolutions up to 1024 x 768
Audio:	AC97 with MIC In, Line Out, and CD Line In
LPT Interface:	Bidirectional LPT with ECP/EPP
IDE Interface:	Supports two drives (UDMA66)
Floppy Disk Interface:	BIOS supports 1.44M drives
Keyboard:	Standard PS/2 or USB interface
Mouse:	Standard 5-pin or USB interface
Vcc =	+5V ±5% at 1.5A typical

System Memory

Capacity:	Up to 512MB with a 200-pin SDRAM in a SODIMM connector (supplied and installed by user)
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Solid State Disk

Capacity:	Socket supports Type I or Type II CompactFlash card
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Mechanical

Dimensions:	3.6" x 3.8" (90-mm x 96-mm)
Jumpers:	2-mm square posts

Connectors

COM1 -4, LPT, Mouse, Keyboard, ENET, Reset:	80-pin
Floppy and IDE:	80-pin, 2-mm
CRT:	14-pin on 2-mm grid
Flat Panel:	31-pin Hirose
Backlight Power:	5-pin inline Molex

GPS Option: 8-pin on 0.05" grid
USB: 8-pin on 2-mm grid
Audio: 10-pin, 2-mm
PC/104 Bus: 64-pin, 0.100" stackthrough
 40-pin, 0.100" stackthrough
PC/104-Plus Bus: 120-pin (4 x 30, 2-mm) stack-
 through with shrouded header
Power: 8-pin in-line Molex

-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

Environmental

Operating Temperature: -40°C to +85°C
Non-condensing Relative Humidity: 5% to 95%

ORDERING INFORMATION

PPM-GX PC/104-Plus SBC with video
 and Ethernet

Developer Kits

DV-S-326-C-CF Windows CE Developer Kit,
 includes software, hardware,
 enclosure, and cables
DV-S-326-L20 Linux (2.6 kernel) Developer Kit,
 includes software, hardware,
 enclosure, and cables
DV-S-326-XP-SP2 Windows XPe Developer Kit,
 includes software, hardware,
 enclosure, and cables

System Memory - DDR PC2700 SDRAM

SODIMM200-G-27-128 128Mbyte, RoHS compliant
SODIMM200-G-27-256 256Mbyte, RoHS compliant
SODIMM200-G-27-512 512Mbyte, RoHS compliant

Cables

CBL-SET-326-1 Cable Set includes:
CBL-251-1 Multi I/O breakout
CBL-252-1 IDE/Floppy disk drive interface
CBL-234-1 14-pin Hirose to 15-pin D-sub
CBL-270-3-1.5B Audio input/output cable
CBL-275-1 Dual USB adapter cable
CBL-174-1 Power cable (unterminated)

GPS Adapter Kit

KIT-GPS-1 Kit includes adapter module,
 antenna, and cables

Flat Panel Cable and Kit

CBL-296-1-1.5A LVDS adapter to panel cable
KIT-ADP-LVDS-2 Kit includes adapter module
 and cable

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