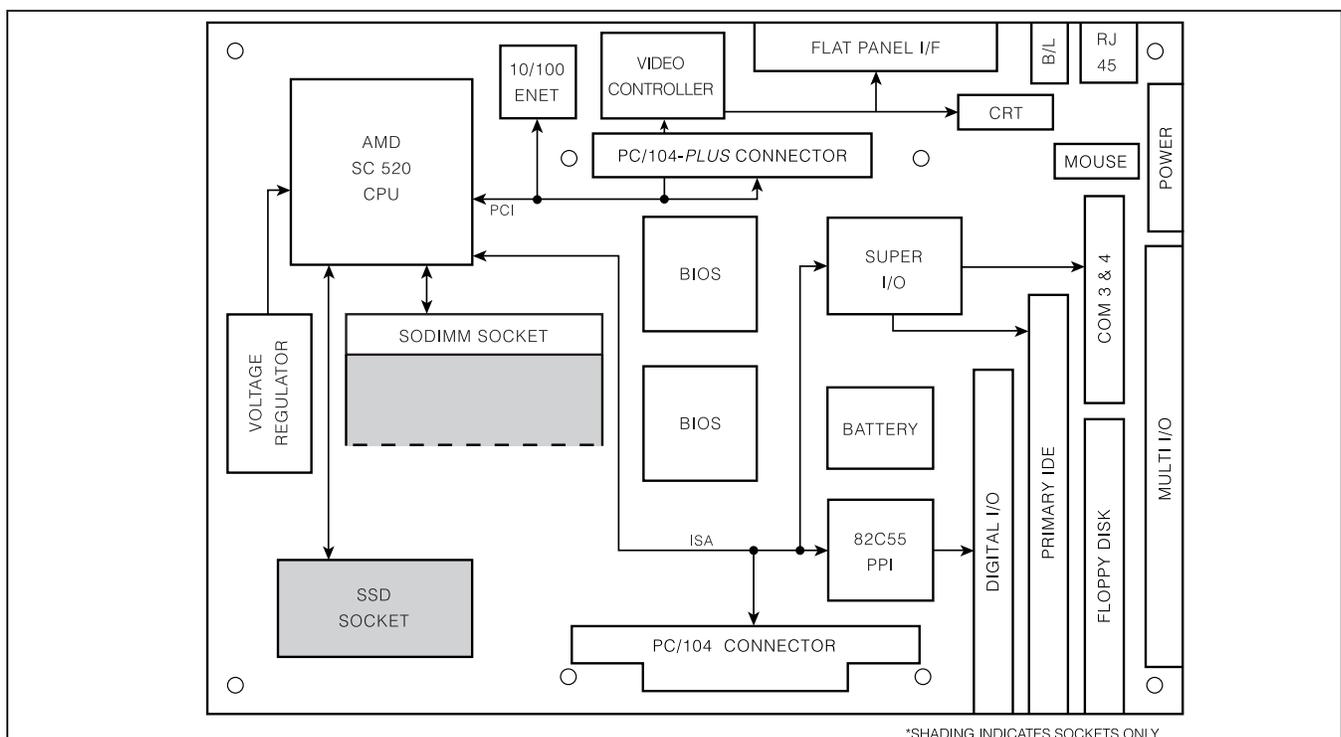


FEATURES

- AMD SC520 CPU operating at 133 MHz
- PC software compatible with industry standard BIOS
- Up to 256 Mbytes of SDRAM using SODIMM
- Solid state disk socket supports a bootable M-Systems' DiskOnChip Flash SSD with up to 512 Mbytes
- Intel 82551ER 10/100 ENET controller
- 4 RS-232 COM ports with 16-byte FIFOs; 2 channels also support RS-422/485.
- High-resolution CRT and flat panel controller with hardware Windows accelerator
 - Supports simultaneous CRT and LCD operation
 - Panel support with up to 36-bit interfacing for AMLCD, STD, EL, and Plasma panels.
 - BIOS compatible with VGA standards
- Flat panel display resolutions and color depth
 - 640x480 x 24bpp , 800x600 x 24bpp
 - 1024x768 x 16bpp, 1280x1024 x 8bpp
- Bi-directional LPT port
- 24 general purpose TTL digital I/O lines (82C55A)
- IDE hard disk interface
- Floppy disk controller
- Two interrupt controllers and 7 DMA channels
- Keyboard controller and PS/2 mouse port
- 16-bit PC/104 expansion connector
- 32-bit PC/104-Plus expansion connector
- Watchdog timer and power fail reset
- Real-time clock with battery backup
- Status, hard disk and Ethernet activity LEDs



- Small size: 4.5 x 7.1-inches (114mm x 180mm)
- Only +5 volts required
- Low power, less than 6 Watts
- 40°C to +85°C operation



OVERVIEW

The SAT-520Plus is a highly integrated, PC-compatible, single board computer (SBC) with integrated Ethernet and video support. It is a combination of 3 of WinSystems' PC/104 modules: PPM-520, PPM-FPVGA, and PCM-IO48. Plus it supports PC/104 and PC/104-*Plus* expansion. The SAT-520Plus provides PC-AT power, performance and compatibility for space- and budget-limited industrial application while operating from -40° to +85° Centigrade. The board will support DOS, Linux and Windows CE operating systems as well as other x86-compatible code. Even though the board is PC-AT compatible, it will operate without disks, keyboard or a monitor.

FUNCTIONAL CAPABILITY

Processor - This board is powered by an Advanced Micro Devices (AMD) SC520 operating at 133 MHz. The SC520 is a highly integrated, 32-bit microcontroller with on chip PC/AT-compatible peripherals, PCI-host bridge and synchronous DRAM controller.

The CPU portion is a 486DX5 CPU with internal floating-point unit (ANSI/IEEE 754 standard), and 16-Kbyte write-back cache. It also integrates standard PC/AT-compatible peripherals including two serial COM channels, the programmable interval timer, real-time clock, DMA controller, and interrupt controllers. Based upon 0.25-micron process technology, it allows for low power consumption in a small BGA package.

The SC520 CPU supports the x86-compatible instruction set. This software compatibility allows the use of different operating systems, real-time executives, development tools, and applications programs that directly support the x86 architecture. This improves time-to-market and allows easy software migration to the board.

This SAT-520Plus supports the revision 2.2 version of the 32-bit PCI bus at a speed of 33 MHz. This is used both for onboard peripherals and the PC/104-*Plus* bus.

Memory - The board supports 32-, 64-, 128-, or 256-Mbytes of Synchronous Dynamic RAM (SDRAM) that is installed on the board by using a 144-pin SODIMM. A PC-66 or PC-100 compatible part (non-registered, unbuffered) with gold plated fingers is the recommended SDRAM. Memory is available from either Crucial Technologies or directly from WinSystems.

The board is shipped from the factory with no memory installed. This permits the user to either install or upgrade the SODIMM memory device in the field.

BIOS - The industry-standard Phoenix BIOS provides configuration flexibility, performance and PC-compatibility. It is pre-loaded with a default setting that can be changed by the user. The BIOS, located in an EEPROM, can be modified without removing the device from the board. It will support diskless, keyboardless, and videoless operation as well as BIOS shadowing.

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 1 Gigabyte 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.

Rotational Disk Support - Up to two, 3.5" or 5.25" floppy disk drives are supported. Also an industry-standard 16-bit IDE interface is provided to support up to 2 hard disks. A status LED provides visual status during IDE data transfers.

Direct Memory Access (DMA) - DMA is supported. Channel 2 is dedicated to the floppy disk controller. The LPT is plug and play configurable. The other DMA channels are wired to the PC/104 connectors.

Interrupts - Two 82C59A-compatible interrupt controllers accept inputs from the onboard peripherals and the PC/104 Bus connectors.

Ethernet Controller - An Intel 82551ER 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 light emitting diodes (LEDs) are on the SAT-520Plus to provide a visual indication of the link status, network activity and network speed. The yellow Link Integrity LED is lit when there is a valid connection detected. The green Activity LED blinks on and off when activity is detected on the wire. The red LED is on if a 100BASE-T link is detected and off if a 10BASE-T link is detected.

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 SAT-520Plus. The configuration information describing the device's architecture, address, interrupt, etc. is stored in a serial EEPROM.

As an option, this board can support the non-"ER" version of the Ethernet controller as well. This configuration also includes a 64KB flash that is soldered on the board to support Intel's Boot Agent auto-boot software. This product allows a networked client computer to boot start using a program code image supplied by a remote server. It is compatible with legacy boot agent environments that use BOOTP protocol. Also it is customizable in pre-boot, Windows, and DOS environments. Contact WinSystems for more information on this product configuration.

Serial Communications - Four independent, full-duplex, RS-232 serial asynchronous channels are onboard. 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. 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 four channels. The RS-232 drivers have an on-chip charge pump to generate the plus and minus voltages so that the SAT-520Plus only requires +5 volts to operate. Additionally, COM1 and COM2 also support RS-422/485 levels.

COM1 and COM2 are wired to a 50-pin connector that also has the keyboard and LPT signals as well. COM3 & 4 are wired to a separate 20-pin connector.

Video Controller - An Asilant 69000 high-performance PCI flat panel/CRT controller provides a sophisticated graphics accelerator video engine. It has 32-bit wide of addressing and data on the internal PCI bus. It includes two Megabytes of video memory on the chip which is sufficient to support the screen resolutions and maximum number of colors displayed required by most applications

Software drivers are available with high-resolution drivers for various software packages including Linux, DOS, Windows 98/CE/NT, and certain RTOS applications. The video BIOS 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.

As an option, the SAT-520Plus can also be supplied with an Asilant 69030 controller. This controller has 4MB of internal video RAM rather than the standard 2MB that is integrated into the 69000 controller. More memory permits more color depth at higher resolutions. Contact a factory application engineer for more details and pricing.

CRT Support - A triple 8-bit integrated RAMDAC provides CRT support. The CRT video output signals are wired to a 14-pin dual-in-line connector. An optional WinSystems 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 SAT-520Plus supports most monochrome and color flat panel display technologies including plasma, electroluminescent (EL), active matrix TFT/MIM LCD, passive STN and single panel, Single Drive (SS). Up to 16.7M colors on 24-bit active matrix LCDs can be generated. Programmable horizontal and vertical stretching capabilities are also available for text and graphics modes for optimal display presentation on 800x600, 1024x768 and 1280x1024 panels. It also has support for panels with 16:9 aspect ratios.

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

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 SAT-520Plus 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

Parallel I/O - An 82C55A Programmable Peripheral Interface (PPI) device supports up to 24 I/O pins which may be individually programmed in two groups of 12 in three major modes of operation. The signal levels are TTL compatible. Each I/O line has a 10K ohm pull-up resistor to keep the input from floating.

The 82C55A's I/O lines are connected to a 50-pin connector. The 24 data lines are alternated with 24 ground lines for reduced noise and crosstalk. Also, the +5 volts and ground are included in the cable. The pinout is compatible with the industry standard 4 to 24 position I/O module racks (Opto-22, etc.) for use with high level AC and DC opto-isolated solid state relays. WinSystems offers the CBL-115-4 to link to the 4-, 8-, 16-, or 24-module rack.

Parallel I/O Connector

Pin	Description	Pin	Description
1	PC7	27	PB2
3	PC6	29	PB1
5	PC5	31	PB0
7	PC4	33	PA7
9	PC3	35	PA6
11	PC2	37	PA5
13	PC1	39	PA4
15	PC0	41	PA3
17	PB7	43	PA2
19	PB6	45	PA1
21	PB5	47	PA0
23	PB4	49	+5V
25	PB3	Even	Gnd

Line Printer Port - This is a multi-mode parallel printer port that supports the PS/2 standard bi-directional parallel port (SPP), Enhanced Parallel Port (EPP), or Extended Capabilities Port (ECP). The output drivers can support up to 14 mA per line.

Keyboard and Mouse Controller - An integrated 80C42 equivalent keyboard controller supports a PC/AT-type keyboard. The CBL-247-1 adapter cable provides the mate to a PS/2-style keyboard plug. Additionally, a PS/2-compatible mouse is supported on the SAT-520Plus and is accessed via a 6-pin header.

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/Calendar - A real-time clock is used as the AT-compatible clock/calendar. It 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.

Power - Power is brought into the board through an 8-pin connector. Both ±12 volts are wired directly to the PC/104 connector and are not used by the SAT-520Plus. However, some flat panels require +12V for their back-light inverter.

Reset - A precision voltage comparator 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 brown out or power fail conditions. The reset circuit also ensures that the power is nominal before executing a power-on reset. This circuit also inhibits the processor's memory write line, preventing invalid data from being written to non-volatile memory during power fluctuations.

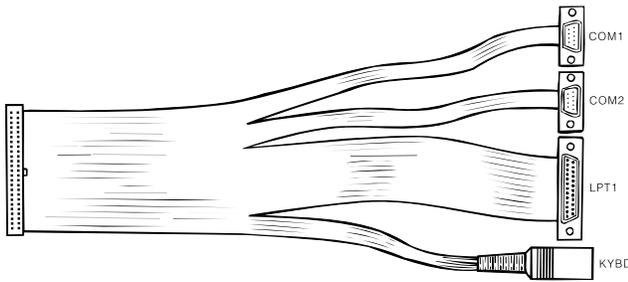
Battery Back-up - A 350-mAH battery supplies the SAT-520Plus board with standby power for the real-time clock and CMOS set-up RAM.

A power supervisory circuit contains the voltage sensing circuit and an internal power switch to route the battery or stand-by voltage to the circuits selected for backup. The battery automatically switches ON when the Vcc of the systems drops below the battery voltage and back OFF again when Vcc returns to normal.

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

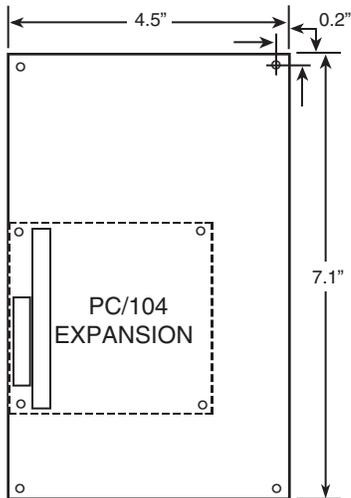
Multi-I/O Connector cable adapter - WinSystems offers the optional CBL-247-1, Multi-I/O cable adapter for the COM1, COM2, LPT1 and keyboard. These four ports are combined into one 50-pin header at the edge

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.



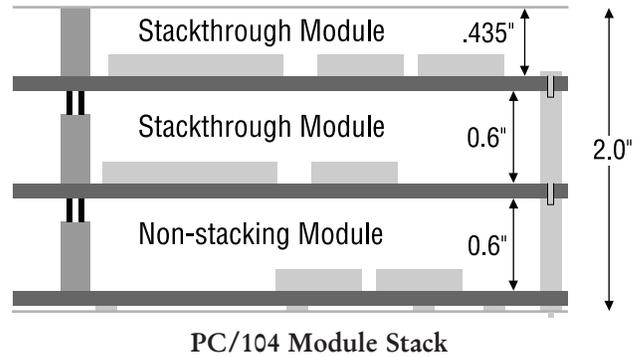
Drawing of CBL-247-1

Standalone Operation - The SAT-520Plus measures 4.5 x 7.1 inches (115mm x 180mm) board and can be used as a complete, standalone embedded controller mounted on a flat surface using a set of standoffs. It also supports both PC/104 and PC/104-Plus expansion.



Outline/dimensions of the board

PC/104 Expansion - Designers 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, wireless, etc.



The SAT-520Plus 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

The SAT-520Plus is designed to be PC-AT software compatible. This means that it will work with a host of operating systems software, executives, development tools and utilities to quickly create software for embedded systems. It works with ROM-DOS, MS-DOS, Linux, Windows NT and Windows 3.1/95/98/CE as well as other popular real-time operating systems such as QNX, and VxWorks that require a "PC/AT" hardware environment.

Software Developers Kit (SDK) - WinSystems offers the SDK3-PPM-301D software developers kit to supply the necessary hardware, software and cables to begin program development with the SAT-520Plus board. It consists of ROM-DOS 7, disk and I/O cables, a 6GB or larger hard disk, a 1.44MB high density 3.5 inch floppy disk, speaker/amplifier and triple output power supply housed in a black anodized enclosure.

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 a SAT-520Plus along with the RDK of your choice, WinSystems will jumper the CPU, program and install the Flash part in your SAT-520Plus. The RDK includes a PS-50W-1, PCM-POST, Flash memory, ROM-DOS 7, cables and utility software.

SPECIFICATIONS

Electrical

SC520 CPU Clock: 133 MHz

PC/104 Interface: 16-bit, non-stackthrough

PC/104-Plus 32-bit non-stackthrough

Serial Interface: 4 serial channels with
RS-232 levels; RS-422/485 on
COM1 & 2
Ethernet 10/100 Fast Ethernet
LPT Interface: Bidirectional Centronics
IDE Interface: 16-bit, supports 2 drives
Floppy Disk Interface: Supports either one or two
360K/720K/1.2M/1.44M

Vcc=+5V +5% @ 1.2A typ: SAT-520Plus-133 with 32MB
Note: A flat panel backlight inverter usually requires
+12V to operate, refer to the manufacturer's specifi-
cation for their current requirements.

System Memory

Addressing: 256 Megabytes
Capacity: 32, 64, 128, or 256MB of
SODIMM SDRAM

Solid State Disk

Capacity: One, 32-pin socket supports up to a 1GB
DiskOnChip®

Mechanical

Dimensions: 4.5" x 7.1" (114mm x 180mm)
Jumpers: 0.025" square posts

Connectors

COM 1 and 2, LPT, Kybd: 50-pin on 0.100" grid
COM 3 and 4: 20-pin on 0.100" grid
10/100 Ethernet: RJ-45
Parallel I/O: 50-pin on 0.100" grid
Floppy Disk Interface: 34-pin on 0.100" grid
IDE: 40-pin on 0.100" grid
CRT: 14-pin, 2mm shrouded header
FP-100 Panel Interface Two, 50-pin, 2mm headers
Backlight 7-pin, 0.100" Molex header
PC/104 Bus: 64-pin, 0.100"
40-pin, 0.100"
PC/104-Plus: 120-pin (4 x 30, 2 mm.)
Mouse: 6-pin in-line header
Power: 8-pin in-line Molex

Environmental

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

ORDERING INFORMATION

SAT-520Plus-133-0M 586-133 SBC with video and
10/100 ENET

For OEM applications, the SAT-520Plus can be ordered
with circuitry depopulated. Contact a factory applica-
tions engineer for configuration, price, and delivery
information.

SDK3-PPM-301D	Software Developers Kit
SODIMM144-128M	SDRAM
FLASH-MD2200-DXX	DiskOnChip®; where XX = 8, 16, 32, 48, 144, 288 or 512 MB
PCM-CFlash-2	PC/104 compact Flash adapter card supports Type I & II modules
PCM-IDEFLASH	IDE Flash card
PCM-SSD	PC/104 solid state disk mode
PS-80W-1	80 watt power supply
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 connector adapter cable
CBL-225-1	PS/2 mouse adapter cable
CBL-234-1	15-pin D-sub CRT adapter
CBL-247-1	1 ft., Multi-I/O adapter cable

