# *WinSystems*®
CMOS STD BUS, STD BUS

FEATURES

- 386SX-compatible CPU operating at 33 MHz
- PC-AT software compatible
- Up to 8 Mbytes of onboard surface mounted DRAM
- Flash Disk socket supports up to 288 Mbytes of storage
- Industry standard Award BIOS
- Four RS-232 serial ports with FIFOs: COM1 & 2 with optional RS-422/485 support on both channels
- Bi-directional LPT port that supports EPP/ECP
- 48 digital I/O lines
- Each selectable as input, output or output with readback (bidirectional)
- 24 Bi-directional TTL digital I/O lines event sense lines with interrupt on change of state
- Software selectable edge polarity
- Onboard floppy disk controller
- IDE hard disk controller
- Two interrupt controllers and 7 DMA channels
- Three 16-bit timer/counters
- AT keyboard controller
- Asynchronous bus controller assures compatibility with slower I/O cards
- 16-bit PC/104 expansion connector
- Watchdog timer and power fail reset
- Real time clock with battery backup
- Status and hard disk activity LEDs
- 8/16-bit STD Bus interface
- Optional -40°C to +85°C operation (LPM-6117)

- +5 Volt only operation
- Small size: 4.5" X 7.0"
- Replaces WinSystems, Ziatech and Pro-Log's 386SX and V53 Single Board Computers (SBCs)

*SHADING INDICATES SOCKET ONLY
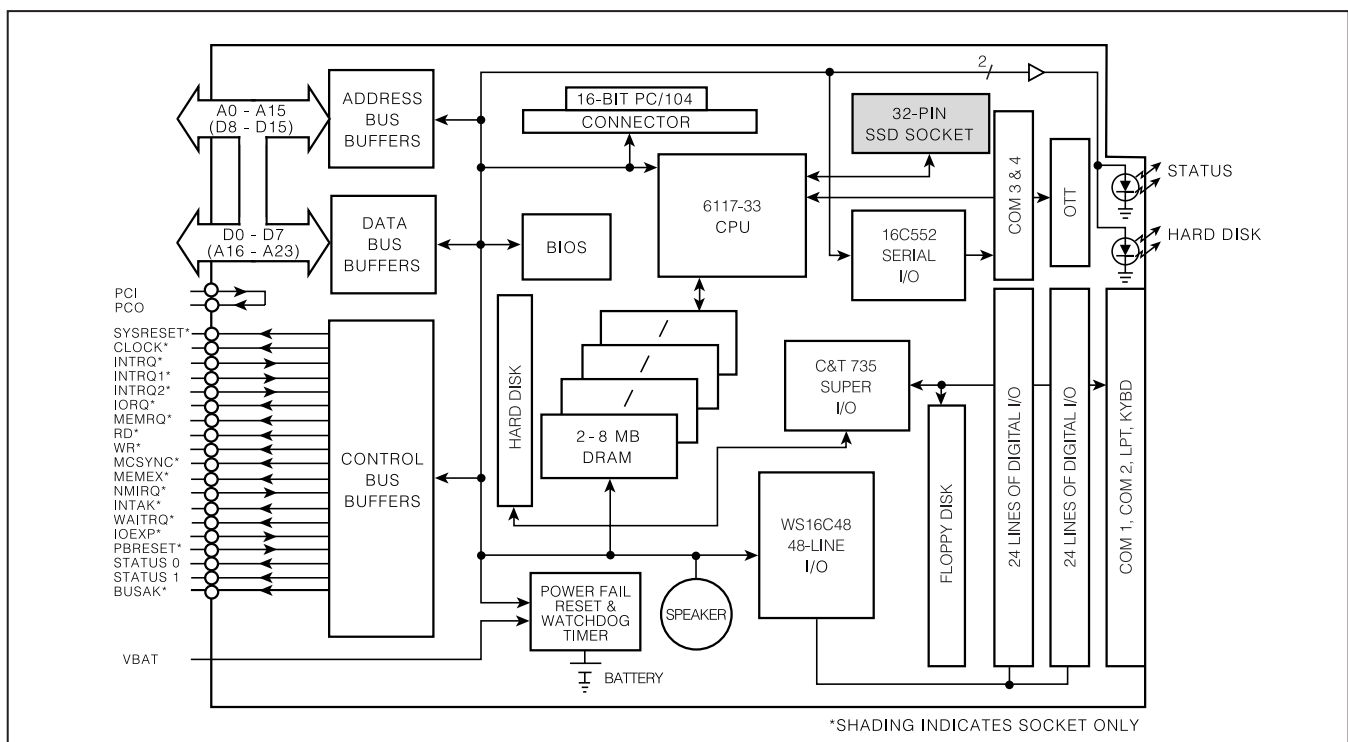
OVERVIEW

The MCM-6117 is a 386SX-compatible STD Bus SBC that provides a wide variety of I/O functions on a single card. The I/O complement includes 4 serial COM channels, 48 digital I/O lines, as well as the standard AT-peripherals of keyboard controller, real time clock, line printer port, plus IDE and floppy disk controllers

It can replace both 386SX and V53-based STD Bus SBCs from WinSystems (MCM-SBC53) plus Ziatech's V53/V40 (ZT8901, ZT8801, & ZT8802) and Pro-Log's 7871.

The MCM prefix on the MCM-6117 card designates a standard STD Bus board. The LPM prefix designates a CMOS STD Bus board. A MCM/LPM prefix indicates the card has the same features and functionality and is available in both CMOS and regular NMOS/TTL logic. The differences between these two are the power requirements and operational temperature range.

FUNCTIONAL CAPABILITY

Processor - The 386SX-compatible processor and core logic chipset are integrated into a highly efficient single chip device that includes the DRAM controller, bus interface and integrated peripheral controllers. The AT-class peripherals include two 8237 DMAs, 8254 timer, two 82C59 interrupt controllers, real time clock and CMOS memory. The processor operates at system clock speed of 33 MHz.

Memory - Up to 8 Mbytes of surface mounted DRAM is populated on the board. These parts are soldered directly to the board to improve reliability for applications subject to shock and vibration. The factory supplied memory sizes are 2MB, 4MB or 8MB.

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, keyboard-less, and videoless operation as well as BIOS shadowing.

16-Bit IDE Hard Disk Interface - A 40-pin header connector handles all command, data, and status I/O lines to an industry standard interface. A status LED provides a visual status during data transfers.

Floppy Disk Support - Up to two 3.5" or 5.25" drives from 360KB through 1.44MB formats are supported by the floppy disk controller. Both drives can be daisy chained on a single cable wired to a 34-pin connector on 0.100-inch centers.

Solid State Disk (SSD) - A JEDEC standard, 32-pin machine-tooled socket is supported but not populated. It can hold an M-Systems DiskOnChip®, Atmel PEROM or additional BIOS extensions. The DiskOnChip® can store up to 288 Megabytes of data. It also includes TrueFFS® that is an embedded flash file system. This file system provides hard disk read/write compatibility, automatic bad lock 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.

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.

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 such as loop-back 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 MCM/LPM-6117 only requires +5 volts to operate.

Also RS-422, RS-485 or J1708 electrical levels can be supported on COM3 and COM4 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 MCM/LPM-6117 contains a highly versatile WS16C48, 48-line digital I/O controller that is TTL compatible. 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 MCM/LPM-6117 to one I/O rack.

Line Printer Port - The MCM/LPM-6117 has a parallel port that may be operated in standard and bi-directional 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 Controller - An 80C42 equivalent controller supports a PC/AT-compatible keyboard. It is wired to the 50-pin multi-I/O connector. The CBL-247-1 adapter cable provides the mate to a PS-2 type keyboard.

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. The MCM/LPM-6117 contains a 10-pin interrupt connector at the top of the card (OTT). This provides backward compatibility for WinSystems' MCM/LPM-286, MCM/LPM-386SX, MCM/LPM-486SLC, 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.

STD Bus I/O - The MCM/LPM-6117 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 red 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, re-triggerable watchdog timer is provided. This timer must be updated at least once every 1.5 seconds 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 piezo transducer 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. Also, a 3-pin header is provided for the speaker output. An optional ADP-SPEAKER is available from WinSystems that includes an amplifier and speaker for remote mounting.

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 MCM/LPM-6117 the 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.

Expansion Options - The MCM/LPM-6117 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 2 different modes: STD Bus or PC/104 bus.

STD Bus - This board 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.

As the approved IEEE-961 standard, the STD Bus is popular worldwide. It 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.


STD Bus Card Cage

The backplanes and card cages work with STD Bus processors from the original Z80 to the newest Pentium CPUs. WinSystems has correctly designed our backplanes to minimize noise and crosstalk while maintaining good power distribution, massive ground planes and a constant characteristic impedance on the signal lines. Our card cages do not require termination. Termination adds unwanted capacitance and loads the bus drivers which results in slower data transitions and skewed signals.

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 for lightweight and strength.

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 110 to 220VAC. An ON/OFF switch and momentary Reset switch are mounted on a panel for operator convenience. 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 Bus - The MCM/LPM-6117 has a 16-bit PC/104 connector. 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.
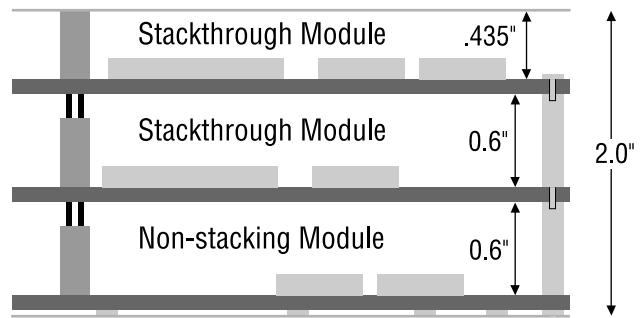
PC/104 Module Stack

For more detailed information on the PC/104 Bus and a copy of the specification, refer to WinSystems' Volume 2 or Volume 3 Data Book or write the PC/104 Consortium.

Multi-I/O Connector - 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.
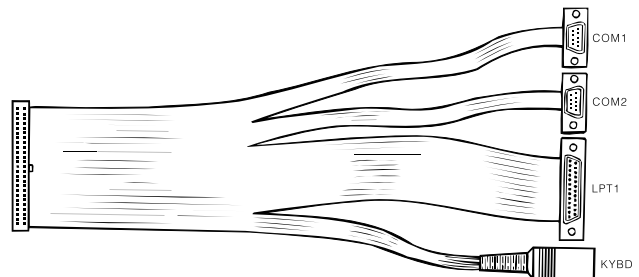
Drawing of CBL-247-1

SOFTWARE SUPPORT

Software Developers Kit - WinSystems offers the SDK2-STD-CX15 software developers kit to supply the necessary hardware, software and cables to begin program development with a STD Bus system. 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. A 15-slot, STD Bus card cage is mounted on top of the enclosure.

SDK2-STD-CX15-D Software Developers Kit

The power supply is a 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 anodized enclosure. The packaging permits easy access to the boards, PC/104 modules and peripherals during program development.

SPECIFICATIONS

Electrical
CPU Clock:	33 MHz
PC/104 Interface:	16-bit, non-stackthrough
Serial Interface:	4 Serial channels with RS-232
Levels:	COM 3&4 with optional RS-422/485 support
LPT Interface:	LPT with ECP/EPP
IDE interface:	Supports 2 drives

Floppy Disk Interface: BIOS supports one or two 360K/720K/1.2M/1.44M drives
Vcc = +5V ±5% @ 950mA: MCM-6117-8M
Vcc = +5V ±5% @ 950mA: LPM-6117-8M

System Memory
Addressing:	16 Megabytes
Capacity:	2/4/8 Megabytes DRAM

Solid State Disk
Capacity:	One, 32-pin memory sockets supports up to 2MB of EPROM, 512KB of PEROM, or up to a 288MB DiskOnChip®

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

Connectors
Serial, LPT, Keyboard:	50-pin on 0.100" grid
COM 3 & 4	20-pin on 0.100" grid
Digital I/O:	50-pin on 0.100" grid
OTT Interrupts:	10-pin on 0.100" grid
Floppy Disk Interface:	34-pin on 0.100" grid
IDE Interface:	40-pin on 0.100" grid
PC/104 Bus:	64-pin 0.100" socket 40-pin 0.100" socket
STD Bus:	56-pin 0.125" card edge

Environmental
Operating Temperature: MCM-6117: 0°C to +60°C
LPM-6117: -40°C to +85°C
Non-condensing relative humidity: 5% to 95%

ORDERING INFORMATION

STD Bus
MCM-6117-2M	386SX STD Bus SBC; 2MB System DRAM
MCM-6117-4M	386SX STD Bus SBC; 4MB System DRAM
MCM-6117-8M	386SX STD Bus SBC; 8MB System DRAM

CMOS STD Bus
LPM-6117-2M	CMOS STD Bus 386SX SBC; 2MB DRAM
LPM-6117-4M	CMOS STD Bus 386SX SBC; 4MB DRAM
LPM-6117-8M	CMOS STD Bus 386SX SBC; 8MB DRAM

ADP-SPEAKER	Power speaker adapter
CBL-125-2	Floppy disk cable
CBL-126-2	IDE disk cable
CBL-173-1	Serial Cable adapter
CBL-247-1	Multi-I/O cable
CK-75176-2	RS-422/.485 chip kit
FLASH-MD2000-DXX	DiskOnChip®; where XX = 8, 16, 32, 48, 72, 144, or 288MB
SDK2-STD-CX15-D	Software Developer's Kit

WinSystems, Inc.