# STD BUS 80386SX Computer SB8386

## Features

- ✓ 32-bit 80386SX CPU, 16/20/25 MHz
- ✓ 80387SX math coprocessor socket
- ✓ 8MB RAM with EMS 4.0 support
- ✓ 1.8MB EPROM/flash/BRAM
- ✓ Full set of AT™-compatible peripherals
- ✓ VGA graphics and hard disk options
- ✓ Watchdog timer
- ✓ SBX local I/O expansion
- ✓ DOS 5.0, Windows 3.1®, OS/2®
- ✓ Multiprocessor option

The SB8386 Single Board Computer offers the system designer the full 386 architecture for embedded AT systems with or without DOS, disks, or keyboards.

The Intel 386 architecture, with its true 32-bit protected mode, virtual memory, and virtual machine capabilities, is the worldwide choice for advanced systems. 386 protected mode offers enhanced system reliability by providing protection mechanisms that can eliminate the possibility of errors in one task from corrupting other tasks or the operating system. It also offers up to 16MB of unsegmented physical memory. Many modern operating systems, DOS extenders, and system software products directly support the 386 protected mode and will not run fully on earlier generation processors. The SB8386 assures compatibility with current and future generations of system software and extends product lifetimes.

### Software Support

*DOS emulation, RUN.EXE™*
*MSDOS™ 5.0 in ROM*
*Turbo Debugger™*
*Comm library, CommBLOK™*
*PID loop library, PidBLOK™*
*BITBUS™ library, NetBLOK™*
*OPTOMUX™, OptoBLOK™*
*C, BASIC, Pascal compilers*
[Items above in Section 6]
*Third party PC libraries*

### Compatible Hardware

*STD BUS and SBX I/O cards*
*SB8700 disk drive cards*
*LCD and keypad interface, LCDKBD1*
[Items above in Section 4]
*VGA monitors, flat panels*
*AT keyboards*
*RS232, RS485 devices*
*Floppy and IDE drives*
*Custom*

### Mounting/Packaging

*STD BUS cardracks*
*MR8800, MR8800-PS*
[Items above in Section 5]

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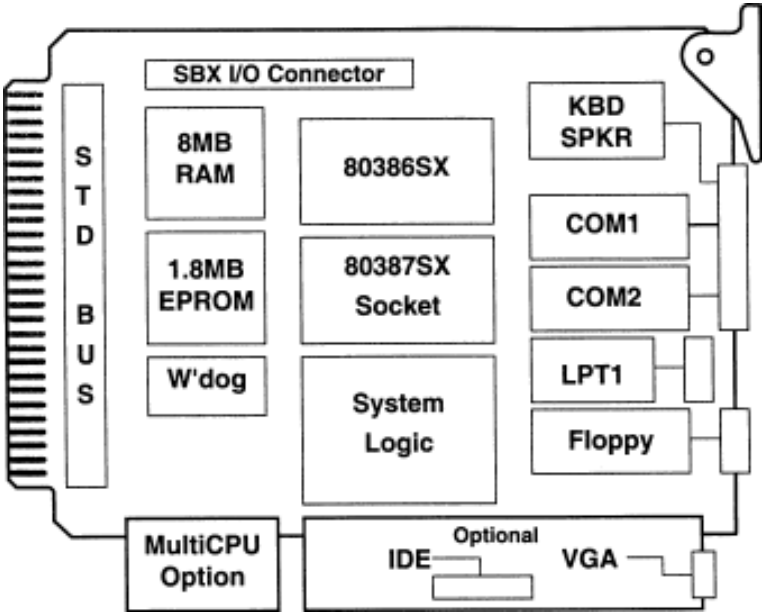


## *Technical Details:*

The SB8386 core implements a full '386-AT computer. The SBC can be used in embedded, standalone applications by merely fastening it to a panel and connecting +5V. To form the basis of a larger system, the SB8386 can be installed in an STD BUS cardrack with additional cards. The SB8386 core includes the '386SX CPU, 80387SX coprocessor socket, up to 8MB RAM, up to 1.8MB of user-supplied EPROM, flash EPROM, and battery-backed RAM, as well as AT-compatible controllers for timer, DMA, interrupt, COM1 (RS232/RS485), COM2, LPT1, real-time clock, keyboard, and floppy. An 8/16-bit SBX connector option allows application-specific local on-board I/O to be added.

On-board memory is composed of four sections: RAM, BIOS, user word-wide, and user byte-wide. All addresses not in these 4 blocks are off-board STD BUS memory. From 512K to 8M of 16-bit wide on-board dynamic RAM is located at the bottom of the 80386SX memory map.

The BIOS ROM socket is accessed as 8-bit memory, and is mapped at the top of memory, including the power-on vector. EPROM and flash EPROM are supported. RUN.EXE and VGA BIOS firmware options are also installed in this socket. BIOS socket can be copied to 'shadow RAM' to increase BIOS speed.

A pair of user word-wide sockets accepts up to 1MB of EPROM or flash EPROM. These sockets are accessed as 16-bit memory, and start at address B00000. This section is in extended memory space, and is where a user .EXE file is installed when running under RUN.EXE firmware. On 512K RAM units, 128K of this word-wide space is also mapped to start at 080000 to allow real mode access.

The user byte-wide socket accepts a variety of byte-wide devices. The socket can be powered by an external battery for battery-backed static RAM. On 512K RAM units, 64K of this socket is also mapped to start at 0D0000 to allow real mode access.

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Two serial ports are implemented. The COM1 port is jumper selectable between RS232 and RS485. 2-wire or 4-wire operation is supported in RS485 mode. The second serial port is mapped as COM2, and is RS232 only. COM2 can be used to debug SB8386 applications through Turbo Debugger on an attached PC. Both serial ports share a 34-pin header that also includes keyboard and speaker signals. Pinout is such that ribbon cable goes directly to two 9-pin AT-pinout male D connectors (cable available from Micro/sys).

RUN.EXE firmware maps keyboard and screen BIOS calls to COM1 if the VGA option is not installed. Therefore, C statements "printf()/scanf()" and Pascal statements "Writeln/Readln" directly access the COM1 serial port.

The parallel port may be used for standard parallel printer operations, or general purpose TTL I/O operation. In parallel printer mode, a ribbon cable attached between the 26-pin header and a 25-pin female D connector creates an AT parallel printer pinout (cable available from Micro/sys).

The Advanced Peripherals Option adds VGA graphics and IDE hard disk interfaces to the SB8386. VGA, EGA, CGA, Hercules, and MDA modes are supported on VGA monitors and flat panel displays. The IDE interface allows direct attachment to hard disks.

With the Advanced Peripherals Option, the SB8386 is a full 386-AT, and therefore directly supports DOS, Windows 3.1, UNIX, OS/2, and all other AT operating systems. A full system BIOS is supplied with every SB8386. A VGA BIOS is included if the Advanced Peripherals Option is installed.

For embedded or dedicated applications, especially where disk drives are not used, Micro/sys offers the innovative RUN.EXE firmware on the SB8386.

This firmware includes DOS emulation capabilites that allow OEMs to create PC language programs (compiled with Microsoft, Borland, or other PC compilers) to be executed directly from EPROM or flash EPROM.

RUN.EXE includes built-in drivers for execution with Borland's Turbo Debugger™ running in remote mode. By attaching a PC to the SB8386 COM2 port and running Turbo Debugger, full source-level symbolic debugging is easy. Remote Turbo Debugger is fully operational on SB8386s that have no keyboard, video, or disks.

A multiprocessing option allows the SB8386 to operate with up to 7 other CPU cards in the same STD BUS cardrack, sharing global memory and I/O. True multiple bus-master operation is supported.

## *Specifications:*

**Mechanical:**

- ❑ Meets STD BUS mechanical specifications, except card length and DRAM height
- ❑ 4.5" x 7.8" x 0.85"
- ❑ Standard card ejector location for use in any STD BUS cardrack
- ❑ Three 0.125" mounting holes for use without cardrack
- ❑ Advanced Peripherals Option adds 0.4" to height
- ❑ SBX option adds 0.9" to height when SBX module installed

**Power Requirements:**

- ❑ +5V ± 5% at 850mA max
- ❑ External battery, 4.5V - 6.7V at 100 µA max, can use AT-type battery packs with 4-pin connector

**Environmental:**

- ❑ 0° - +70°C operating
- ❑ -25° - +85°C storage
- ❑ 5%-95% relative humidity, non-condensing

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**Processor Core Section:**

- ❑ Full '386-AT computer core
- ❑ 80386SX CPU
- ❑ 16, 20, or 25 MHz clock rate
- ❑ Math coprocessor socket for 80387SX
- ❑ AT-compatible DMA and timers
- ❑ AT-compatible interrupt controllers
- ❑ AT keyboard and speaker interfaces
- ❑ AT real-time clock

**On-board Memory:**

- ❑ 512K to 8M of 16-bit wide on-board dynamic RAM based at 000000
- ❑ EMS 4.0 extended memory supported with on-board EMS registers
- ❑ BIOS socket up to 256K based at FC0000 and shadowed at FC000, supporting 27C010-27C020 and 28F256-28F020 devices
- ❑ BIOS can be 'shadowed' into faster 16-bit RAM
- ❑ Chips and Technologies AT BIOS included
- ❑ Up to 1M of even/odd byte memory sockets based at B00000, supporting 27C010-27C040 and 28F256-28F020 devices

| COM1/COM2/KBD/SPKR Connector | | | | | |
|---|---|---|---|---|---|
| Direction | Signal | Pin | Pin | Signal | Direction |
| I | DCD1 | 1 | 2 | DSR1 | I |
| I | RXD1 | 3 | 4 | RTS1 | O |
| O | TXD1 | 5 | 6 | CTS1 | I |
| O | DTR1 | 7 | 8 | RI1 | I |
| | GND | 9 | 10 | DCD2 | I |
| I | DSR2 | 11 | 12 | RXD2 | I |
| O | RTS2 | 13 | 14 | TXD2 | O |
| I | CTS2 | 15 | 16 | DTR2 | O |
| I | RI2 | 17 | 18 | GND | |
| | GND | 19 | 20 | 485TX+ | O |
| O | 485TX- | 21 | 22 | 485RX+ | I |
| I | 485RX- | 23 | 24 | 485RTS+ | O |
| O | 485RTS- | 25 | 26 | +5V | |
| | +5V | 27 | 28 | KBDCLK | I/O |
| I/O | KBDDAT | 29 | 30 | SPKR | O |
| I | KBDCLK | 31 | 32 | RSETPB | I |
| | GND | 33 | 34 | GND | |

| Memory Map | |
|---|---|
| Start | Usage |
| 000000 | 640K RAM |
| 0A0000 | Video RAM |
| 0C0000 | VGA BIOS / RUN.EXE |
| 0D0000 | EMS Pages |
| 0E0000 | Offboard |
| 0F0000 | Shadow BIOS |
| 100000 | 1M or 7M RAM |
| 800000 | -------- |
| A00000 | Offboard |
| A80000 | U1 byte-wide RAM/EPROM |
| B00000 | U4/U11 word-wide EPROM |
| F00000 | U8 BIOS EPROM |

- ❑ Up to 512K byte wide memory socket based at A80000, supporting 27C010-27C040, 28F256-28F020, and 128K-512K static RAM devices, can be backed by off-board battery

**Serial Ports:**

- ❑ AT-compatible devices and mapping for COM1 and COM2
- ❑ Full modem controls per AT 9-pin connector definition
- ❑ COM1 can be configured as RS232, RS422, or RS485
- ❑ COM2 is RS232
- ❑ 50 - 115,200 baud operation

**Keyboard and Speaker:**

- ❑ Standard AT keyboard input and speaker output
- ❑ Signals on same 34-pin header as COM1 and COM2

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| Printer Port Connector | | |
|---|---|---|
| Pin | Direction | Signal |
| 1 | O | Strobe* |
| 2 | O | AutoFD* |
| 3 | I/O | D0 |
| 4 | I | Error* |
| 5 | I/O | D1 |
| 6 | O | Reset* |
| 7 | I/O | D2 |
| 8 | O | Set In* |
| 9 | I/O | D3 |
| 11 | I/O | D4 |
| 13 | I/O | D5 |
| 15 | I/O | D6 |
| 17 | I/O | D7 |
| 19 | I | Ack* |
| 21 | I | Busy |
| 23 | I | Paper Out |
| 24 | | |
| 25 | I | Select |
| 26 | | |
| Even pins 10-26 are GND | | |

**Watchdog Timer:**

- ❑ Program must refresh watchdog timer every 0.6 seconds, or board will be reset

**Parallel Printer Port:**

- ❑ Complete Centronics interface, per AT standard
- ❑ 8 bidirectional lines, 5 inputs, and 4 open collector outputs

**SBX I/O Expansion Option:**

- ❑ Logic and connector for SBX I/O
- ❑ SBX mounts to rear of SB8386
- ❑ 8 and 16-bit I/O operation
- ❑ Analog I/O, communication, GPIB, TTL I/O available
- ❑ SBX interrupts and DMA supported
- ❑ Ideal for adding dedicated local I/O to multiprocessor SB8386 (not accessible to other CPUs, no bus arbitration needed to access)

| Floppy Disk Connector | | | | | |
|---|---|---|---|---|---|
| Direction | Signal | Pin | Pin | Signal | Direction |
| I | DskChg* | 1 | 2 | HdSel* | O |
| I | Track0* | 3 | 4 | WrProt* | I |
| | GND | 5 | 6 | RdData* | I |
| | GND | 7 | 8 | WrGate* | O |
| | GND | 9 | 10 | WrData* | O |
| | GND | 11 | 12 | Step* | O |
| | GND | 13 | 14 | Dir* | O |
| O | Motor1* | 15 | 16 | DrvSel0 | O |
| O | DrvSel1* | 17 | 18 | Motor0* | O |
| I | Index | 19 | 20 | RPM* | O |

**Floppy Disk Interface:**

- ❑ Supports 5 1/4" and 3 1/2" drives
- ❑ 360K, 720K, 1.2M, and 1.44M disks
- ❑ Supports two drives on single cable

**STD BUS Interface:**

- ❑ STDMG STD-80 Series standard timing
- ❑ 24-bit addressing presented for both memory and I/O cycles
- ❑ 8-bit and 16-bit STD BUS data transfers, off-board width set by mapping PALs
- ❑ Capable of responding to interrupts on STD BUS pins 46 (NMIRQ*), 44 (INTRQ*), and 37 (INTRQ1*)
- ❑ IOEXP driven low for I/O accesses in selected port address range (default 110-1DF) to allow unique area for I/O cards with 8-bit addressing
- ❑ 470/4.7K pull-ups on STD BUS control lines, socketed for removal if installed as secondary multiprocessor

| DMA/Interrupt Connector | | | | |
|---|---|---|---|---|
| Direction | Signal | Pin | Pin | Signal |
| I | EXTDRQQ | 1 | 2 | GND |
| O | EXTDACK* | 3 | 4 | GND |
| O | TC | 5 | 6 | GND |
| I | IRQ9 | 7 | 8 | GND |
| I | IRQ14 | 9 | 10 | GND |

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**Advanced Peripherals Plug-in Option:**

- ❑ VGA standard
- ❑ Direct drive for VGA CRTs
- ❑ 256K dedicated video memory
- ❑ Optional LCD, EL, TFT flat panel support
- ❑ Simultaneous CRT and flat panel
- ❑ Flat panel enhancements: intelligent grayscale, frame refresh accelerator, extensive display mapping
- ❑ IDE standard hard disk connector
- ❑ Available with IDE only (no VGA)

**Multiprocessor Option:**

- ❑ Adds arbitration logic to allow up to 8 CPUs in STD cardrack
- ❑ True multiple bus-master operation
- ❑ Access global STD BUS memory and I/O
- ❑ Low priority CPUs guaranteed access to bus
- ❑ Interprocessor interrupts by writing to each CPU's unique I/O port
- ❑ Bus locking supported
- ❑ Bus transfer in 3 arbitration clock cycles (nominal 7.16MHz CNTRL* clock on backplane)
- ❑ Synchronized system-wide reset by primary CPU card
- ❑ NMI interrupt can be generated if Bus not acquired within set period
- ❑ Arbitration compatible with other STD BUS manufacturers
- ❑ DIVVY/MPX software system available for simplified development of reliable multiprocessor systems

**DK8386 Development Kit:**

- ❑ Free with first SB8386 order
- ❑ BIOS and DOS compatible O/S
- ❑ "Implied AUTOEXEC.BAT" on reset
- ❑ Allows SB8386 to directly execute programs compiled in Microsoft or Borland C/C++, Turbo Pascal, QuickBASIC, etc.
- ❑ No modified libraries or start-up code
- ❑ No DOS or other royalties
- ❑ Loads and executes standard .EXE file from user EPROMs
- ❑ Support ofr Turbo Debugger
- ❑ Download programs into on-board flash
- ❑ Includes cables, documentation

**SB8386 I/O Connections:**

- ❑ COM1/COM2/KBD/SPKR 34-pin shrouded header, breakout cable available with two 9-pin D COM port RS232 connectors, 5-pin DIN keyboard connector, and connector for RS485 terminal strip accessory
- ❑ LPT1 26-pin shrouded header, cable adapts to 25-pin D
- ❑ Floppy Disk 20-pin header, cables adapt to 3 1/2" or 5 1/4" drives
- ❑ Battery, STD BUS pin 5 or 4-pin header
- ❑ Power, STD BUS pins 1-4 or 2 pin header

**Advanced Peripherals Option:**

- ❑ CRT 15-pin D to VGA monitor
- ❑ Flat Panel 26-pin header
- ❑ IDE Disk 40-pin header to IDE drive

**SBX Option:**

- ❑ 44-pin 8/16 bit SBX connector, logic

| Battery Connector | |
|---|---|
| **Pin** | **Signal** |
| 1 | +Batt |
| 2 | N/C |
| 3 | GND |
| 4 | GND |

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## *Ordering Information:*

**Single Board Computer:**

| | |
|---|---|
| SB8386-25 | 386SX, 512K RAM, 25MHz |
| DK8386 | No charge development kit, available with first order only |
| 386OPT1 | 2MB RAM total |
| 386OPT3 | 8MB RAM total |
| 386OPT4 | 128K Battery-backed RAM |
| 386OPT5 | SBX I/O support |
| 386OPT10 | Multiprocessor option |
| 386OPT25 | Advanced peripherals Opt (VGA/ IDE) |
| 386OPT30 | 80387SX Math Coprocessor |

**Accessories:**

| | |
|---|---|
| ATBATT | AT-type battery with 4-pin connector |
| CA4021 | printer cable to female 25-pin D |
| CA4023 | COM1/COM2/KBD/SPKR breakout cable |
| CA4024-3 | dual 3 1/2" floppy cable |
| CA4025 | IDE disk cable |
| TB1485 | RS485 term strip for COM1 end of CA4023 |

Most cables nominally 15", other lengths available



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