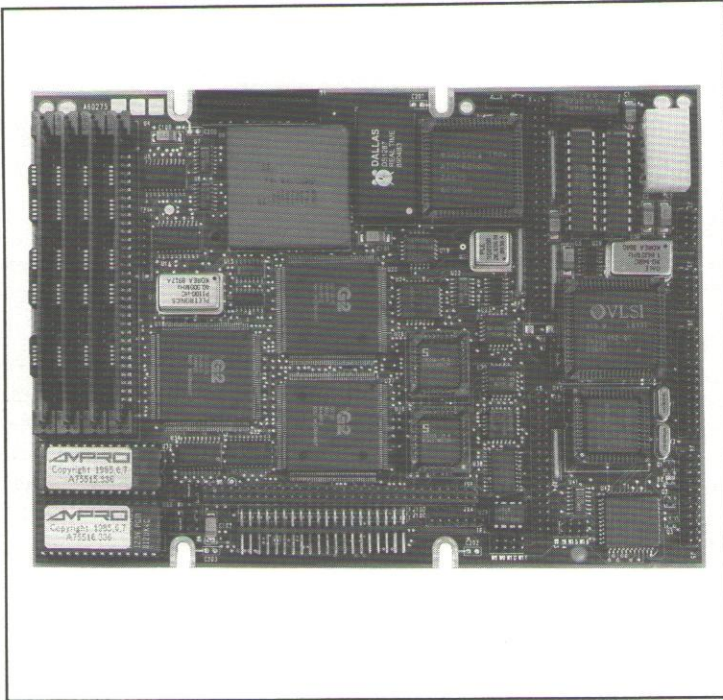


FEATURES

- 80386 AT compatible system on a single board; powerful 20 MHz CPU
- Shadow RAM for fast executing BIOS and video
- 1M or 4M bytes on-board DRAM with parity
- On-board dual serial and parallel controller
- Mini/Micro floppy controller (360K, 1.2M, 720K and 1.44M byte formats)
- SCSI controller for hard disks, tape, other SCSI devices, or general purpose digital I/O
- Diskless operation using on-board byte-wide sockets for solid state disk
- Small size, +5V only operation, and low power is ideal for embedded applications
- Easy system expansion with Ampro MiniModules™



DESCRIPTION

The Little Board/386 provides system designers with a high performance, 32-bit 80386 based AT-compatible single board microcomputer system that requires no more space than a half height 5-1/4" disk drive. This unique *single board system* is functionally equivalent to an 80386 AT motherboard and three or four expansion cards. It runs standard IBM®/PC and PC/AT software, including disk operating systems (DOS, UNIX®, QNX®, VRTX®, etc.), languages (C, Pascal, Fortran, Basic, etc.), and industrial and commercial applications software.

The Little Board/386 is ideally suited for embedded microcomputer applications where PC/AT® software, hardware, and bus compatibility are required and where low power consumption (10-12 watts typical), small size (equal to a half-height 5 1/4 " disk drive), wide operating temperature range (0-70° C), and high reliability are

critical. Its ability to use solid state devices like EPROM and nonvolatile RAM instead of normal disk drives makes the Little Board/386 especially well suited for use in harsh environments.

Typical applications for the Little Board/386 include:

- Data acquisition & control
- Portable instruments
- Protocol conversion
- Telecommunications
- Security systems
- Intelligent terminals
- Diskless workstations
- Remote data logging
- Point-of-sale terminals
- Network servers
- Machine control
- Medical instruments

The 5.75" X 8" X 1.1" Little Board/386 includes a powerful 20MHz 80386 microprocessor, standard DMA, timers, and interrupt controllers, 1 or 4 megabytes of onboard DRAM, and a full complement of AT compatible controllers. Peripheral controllers are included on the board for serial, printer, keyboard, speaker, and floppy interfacing. Provision is made for a 80387 math coprocessor. Shadow RAM capability is provided for fast executing BIOS and video display. In addition, two industry standard system expansion buses — a PC/AT Expansion Bus and a Small Computer System Interface (SCSI) — offer maximum system expansion flexibility.

An expansion connector is provided onboard for an Ampro MiniModule expansion board, which attaches directly to the Little Board/386. When installed, the onboard MiniModule fits entirely within the board's outline di-

mensions. Standard PC and AT bus plug-in cards can be added to the Little Board/386 by means of one of two expansion options. The innovative StackPlane™/PC expansion option permits a PC bus card to be mounted parallel to the Little Board/386. Also available is the MiniBackplane™/ATBus which is a compact 2-slot passive backplane which accommodates two PC or AT bus cards.

Support for SCSI direct access devices as boot or data devices is included directly in the board's ROM-BIOS. This SCSI/BIOS feature allows a wide variety of hard disks, floppy drives, tape drives, and other SCSI devices to be used interchangeably, greatly enhancing the ease and flexibility of system integration, maintenance, and upgrades.

Sockets on the Little Board/386 allow onboard EPROM (up to 256K bytes) or battery-backed RAM (up to 64K bytes) to function as a bootable DOS

compatible "Solid State Disk" (SSD) drive. SSD operation offers several key advantages, including improved speed, reliability, and ruggedness. Ampro's optional SSD support software converts DOS based applications into EPROM format automatically, without the need for special programming techniques. In addition, Ampro's SSD Expansion Board, which matches the 5.75" x 8" form factor of the Little Board/386, can be used to add sixteen additional byte-wide devices for larger SSD's.

A key advantage of the AT-compatibility of the Little Board/386 is that it runs the thousands of software applications and utility packages developed for the IBM PC and PC/AT. Language compilers, debugging aids, and software support packages for graphics, windowing, multi-tasking, user interfaces, etc., are readily available. In addition, there is a large and growing selection of DOS programs targeted at industrial and commercial applications such as com-

ORDERING INFORMATION

When ordering, refer to the following model numbers:

- D16A20-30 Little Board/386

The above development packages include all controllers, interface cables, technical manuals, Award BIOS, and a copy of DR DOS. RAM must be ordered separately;

- 16A20-R1 1MEG SIMM RAM

- 16A20-R4 4MEG SIMM RAM

Contact the factory for quantity purchase ordering information.

munications, data acquisition and control, terminal emulation, protocol conversion, etc.

The Little Board/386 is a member of Ampro's growing family of IBM compatible *single board systems*. These products offer a broad range of price, performance, and feature alternatives in a consistent physical and functional format.

SPECIFICATIONS

CPU and On-board Memory

- 80386 microprocessor, 20 Mhz
- 1M or 4M bytes DRAM with parity
- Award ROM-BIOS with Ampro extensions
- Two spare 28-pin byte-wide sockets, located at D0000h and D8000h when configured for 32K devices, or D0000h and E0000h when configured for 64K devices. Used with:
 - 27C256 32K byte EPROMs
 - 27C512 64K byte EPROMs
 - Intel® 27011 128K byte page-addressed EPROMs
 - 62256 32K byte static RAMs
 - 32K byte nonvolatile RAMs
- 1K bit serial EEPROM, with 512 bits for OEM use
- Provision for 80387 math coprocessor.

AT-Compatible Controllers

- Standard DMA, interrupt & counter-timer support:
 - 7 DMA channels
 - 15 interrupt channels
 - 3 programmable counter-timers
- Two fully compatible RS-232C serial ports
- Parallel printer port with bidirectional data lines for 8 digital I/O
- AT keyboard port
- Speaker port with 0.1 watt output drive
- Battery-backed real time clock and CMOS RAM, with 10 year internal lithium battery

- AT-compatible mini (5 1/4") and micro (3 1/2") floppy controller:
 - 2 drive selects, 1-2 sided, 250/500K bps data rates
 - BIOS supports all standard formats (360K/720K/1.2M/1.44M)
 - Reliable all-digital phase-locked loop & write precompensation
 - Disk change support

SCSI Interface

- Full ANSI X3.131 (SCSI) compatible
- Uses high performance Adaptec AIC6250 asynchronous or synchronous SCSI controller (synchronous not supported by BIOS)
- Usable as 16 (9 bidirectional, 7 input only) general purpose programmed I/O lines (48 mA sink)
- Up to 3 megabyte per second data throughput

Physical

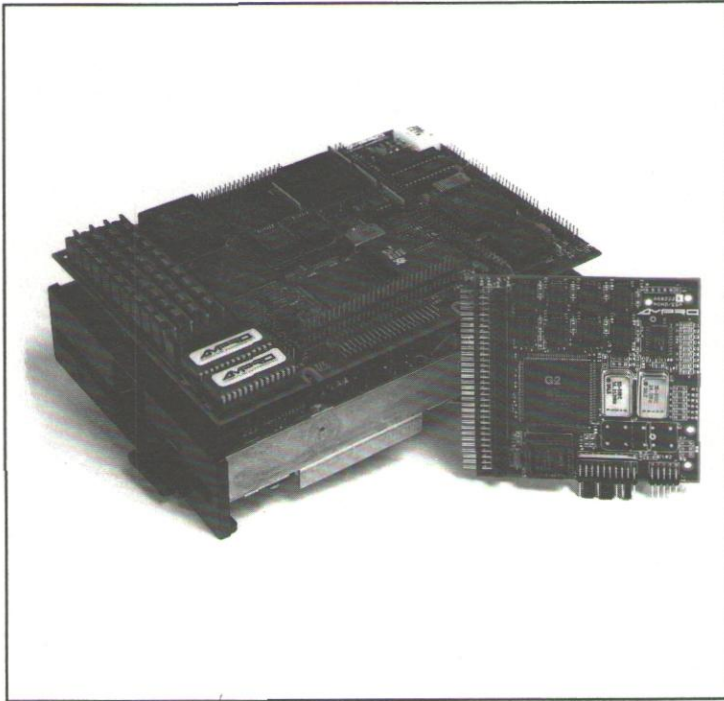
- 8.0 x 5.75 x 1.1 inches (5-1/4 disk drive form factor)
- Provision for one on-board Ampro MiniModule
- Power required: +5V +/-5% at 2A (1M DRAM) or 2.4A (4M DRAM),
- 8-layer PCB with inner ground and power planes for low noise
- Uses latest surface mount technology
- 0-70° C operating temperature (with adequate airflow)
- -55° to +85° C Storage temperature:
- 5-95% relative humidity (non-condensing)

Trademarks and Registered Trademarks - Little Board, StackPlane, MiniBackplane, MiniModule: AMPRO; AT, PC/AT, IBM: International Business Machines Corporation; Hercules: Hercules Computer Technology; MS-DOS: Microsoft, Inc.; Arcnet: Datapoint Corporation; DR DOS: Digital Research, Inc.; UNIX: American Telephone and Telegraph; QNX: Quantum Corporation; VRTX: Ready Systems, Inc.

AMPRO
COMPUTERS, INCORPORATED

AMPRO COMPUTERS, INCORPORATED

990 Almanor Avenue, Sunnyvale, California 94086
TEL (408) 522-2100—FAX (408) 720-1305



FEATURES

- Choice of a 12MHz 80L286 or 16MHz 80C286 CPU
- All the functions of an AT® motherboard and 3 or 4 expansion cards on one board
- Up to 4M bytes DRAM, 256K bytes EPROM
- On-board dual serial and parallel controller
- Mini/Micro floppy controller (360K, 1.2M, 720K and 1.44M byte formats)
- SCSI controller for hard disks, tape, other SCSI devices, or general purpose digital I/O
- Diskless operation using onboard byte-wide sockets for Solid State Disk
- Small size, +5V only operation, and low power consumption; ideal for embedded applications
- Expandable with Ampro MiniModules™ or standard PC or AT bus cards

GENERAL DESCRIPTION

The Little Board/286 provides system designers with a high performance, PC/AT-compatible single board micro-computer system that requires no more space than a half height 5-1/4" disk drive. This unique *single board system* is functionally equivalent to an AT motherboard and three or four expansion cards.

The Little Board/286 is ideally suited for embedded microcomputer applications where IBM® PC/AT software, hardware, and bus compatibility are required and where low power consumption (under 9 watts), small size (5.75" x 8" x 1.1"), wide temperature range (0-70° C), and high reliability are critical. In addition, its ability to use rugged media like EPROM and nonvolatile RAM instead of disk drives makes the Little Board/286 especially well suited for use in harsh environments.

Typical applications for the Little Board/286 include:

- Data acquisition
- Portable instruments
- Protocol conversion
- Telecommunications
- Security systems
- Intelligent terminals
- Diskless workstations
- Point-of-sale terminals
- Network servers
- Distributed processing
- SCSI device control
- Vending machines
- Medical instruments
- Robot & machine control

The Little Board/286 includes a powerful 12MHz 80L286 or 16 MHz 80C286 microprocessor, up to 4M bytes of on-board DRAM, and a full complement

of AT compatible controllers. Peripheral controllers are included on the board for standard serial, printer, keyboard, speaker, and floppy interfacing. In addition, two industry standard system expansion buses — a PC/AT Expansion Bus and a Small Computer System Interface (SCSI) — offer maximum system expansion flexibility.

A PC/AT bus expansion connector is provided for Ampro MiniModule expansion boards which attach directly to the Little Board/286. When installed, an onboard MiniModule fits entirely within the Little Board/286's outline dimensions.

Standard PC and AT bus plug-in cards can be added to the Little Board/286 using ribbon cable from the PC/AT bus expansion connector. The innovative Ampro StackPlane™ expansion option permits a PC bus card to be mounted parallel to the Little Board/286 without

additional mounting hardware. Also available is a compact 2-slot passive backplane which accommodates two PC or AT bus cards.

Support for SCSI direct access devices as boot or data devices is included directly in the board's ROM-BIOS. This *SCSI/BIOS* feature allows a wide variety of hard disks, floppy drives, bubble memory drives, tape drives, and other SCSI devices to be used interchangeably, greatly enhancing the ease and flexibility of system integration, maintenance, and upgrades.

Sockets on the Little Board/286 allow onboard EPROM (up to 256K bytes) or battery-backed RAM (up to 64K bytes) to function as a bootable DOS compatible Solid State Disk (SSD) drive. SSD operation offers several key advantages, including improved speed, reliability, and ruggedness, as well as reduced power consumption. Ampro's

optional SSD support software converts DOS based applications into EPROM format automatically, without the need for special programming techniques. In addition, Ampro's SSD Expansion Board, which matches the 5.75" x 8" form factor of the Little Board/286, can be used to add sixteen additional byte-wide devices (EPROM or battery-backed RAM) sockets for larger SSD's.

A key advantage of the AT-compatibility of the Little Board/286 is that it runs the thousands of software applications and utility packages developed for the IBM PC and PC/AT. Language compilers, debugging aids, and software support packages for graphics, windowing, multi-tasking, user interfaces, etc., are readily available. In addition, there is a large and growing selection of DOS programs targeted at industrial and commercial applications such as communications, data acquisition and con-

ORDERING INFORMATION

When ordering, refer to the following model numbers:

- D7BN12-30 Little Board/286, 12MHz
- D7BC16-30 Little Board/286, 16MHz

The above development packages include all controllers, interface cables, technical manuals, Award BIOS, and a copy of DR DOS. Contact the factory for quantity purchase ordering information.

trol, terminal emulation, protocol conversion, etc.

The Little Board/286 is a member of Ampro's growing family of IBM compatible *single board systems*. These products offer a broad range of price, performance, and feature alternatives in a consistent physical and functional format.

SPECIFICATIONS

CPU AND ONBOARD MEMORY

- 12MHz 80L286 or 16MHz 80C286 microprocessor
- Half speed option for CPU and/or expansion bus
- 512K, 1M, 2M, or 4M bytes DRAM with parity
- Award ROM-BIOS with Ampro extensions
- Two spare 28-pin byte-wide sockets, located at D0000h and D8000h. Used with:
 - 27C256 32K byte EPROM's
 - 27011 128K byte page mode EPROM's
 - 62256 32K byte static RAM's
 - 32K byte nonvolatile RAM's
- 1K bit serial EEPROM, with 512 bits for OEM use
- Provision for 80287/80C287 math coprocessor

AT-COMPATIBLE CONTROLLERS

- Standard DMA/Interrupt/Timer support
 - 15 interrupt channels
 - 7 DMA channels
 - 3 programmable counter/timers
- Two fully compatible RS232C serial ports
- Parallel printer port with bidirectional data lines for 8 digital I/O
- Standard AT keyboard port
- Speaker port with 0.1 watt output drive
- Standard battery-backed real time clock and CMOS RAM, with 10 year internal lithium battery

- AT-compatible mini (5-1/4") and micro (3-1/2") floppy controller:
 - 2 drive selects, 1-2 sided, 250/500K bps data rates
 - BIOS supports all standard formats (360K/720K/1.2M/1.44M)
 - Reliable all-digital phase-locked loop & write precompensation
 - Disk change sense line support

SCSI INTERFACE

- Full ANSI X3.131 (SCSI) compatible
- Uses high performance Adaptec AIC6250 SCSI, async or sync controller (sync not supported by BIOS)
- Usable as 16 (9 bidirectional, 7 input only) general purpose programmed digital I/O lines (48 mA sink)
- Over 1.5 megabyte/sec data throughput

PHYSICAL

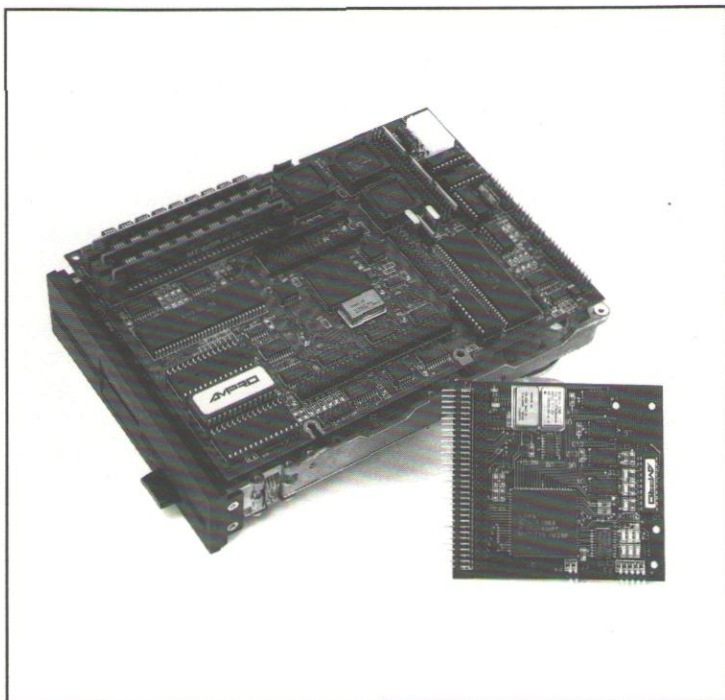
- 8.0 x 5.75 x 1.1 inches (5-1/4 disk drive form factor)
- Provision for one onboard Ampro MiniModule
- Power requirement (with 512K bytes RAM):
 - 80C286 CPU: +5V +/- 5% at 1.6 A (typ.)
 - 80L286 CPU: +5V +/- 5% at 1.8 A (typ.)
- 8-layer PCB, with 2 ground layers for low noise
- Operating environment:
 - 0-70° C
 - 5-95% relative humidity (non-condensing)
- Storage temperature: -55° to +85° C

Trademarks and Registered Trademarks - Little Board, StackPlane, MiniBackplane, MiniModule: AMPRO; AT, PC/AT, IBM: International Business Machines Corporation

AMPRO
SINGLE BOARD SYSTEMS

AMPRO COMPUTERS, INCORPORATED

1130 Mountain View/Alviso Road, Sunnyvale, California 94089
TEL (408) 734-2800 - TLX 4940302 - FAX (408) 734-2939



FEATURES

- All the functions of a PC/XT® motherboard and 4 expansion cards in the space of a half-height 5-1/4" disk drive
- Up to 768K bytes RAM, 256K bytes EPROM
- Two serial ports and a parallel printer port
- Mini/Micro floppy controller (360K, 1.2M, 720K, and 1.44M byte formats)
- SCSI controller for hard disks, tape, other SCSI devices, or general purpose digital I/O
- Diskless operation using on-board byte-wide sockets for Solid State Disk
- Small size, +5V only operation, and low power consumption; ideal for embedded applications
- Expandable with Ampro MiniModules™ or standard PC or AT bus cards

GENERAL DESCRIPTION

The Little Board/PC provides system designers with a highly compact, self-contained, low power, PC-compatible *single board system* that requires no more space than a half height 5-1/4" disk drive. This unique *single board system* is functionally equivalent to a PC/XT motherboard and three or four expansion cards.

The Little Board/PC is ideally suited for embedded microcomputer applications where PC software and bus compatibility are required, and where low power consumption (4 watts), small size (5.75" x 8" x 1.1"), wide temperature range (0-70° C), and high reliability are critical. In addition, its ability to use rugged media like EPROM and nonvolatile RAM instead of disk drives makes the Little Board/PC especially well suited for use in rugged or harsh operating environments.

Typical applications for the Little Board/PC include:

- Data acquisition
- Portable instruments
- Protocol conversion
- Telecommunications
- Security systems
- Intelligent terminals
- Diskless workstations
- Remote data logging
- Point-of-sale terminals
- Network servers
- Distributed processing
- SCSI device control
- Vending machines
- Medical instruments
- Robot & machine control

The Little Board/PC includes a CMOS NEC V40 enhanced 8088-compatible microprocessor, up to 768K bytes of on-board RAM, and a full complement

of PC compatible controllers. Peripheral controllers are included for serial, printer, keyboard, speaker, and floppy interfacing. In addition, two industry standard system expansion buses — a PC Expansion Bus and a Small Computer System Interface (SCSI) — offer system expansion flexibility.

An expansion connector is provided onboard for Ampro MiniModule expansion boards which attach directly to the Little Board/PC. When installed, a MiniModule fits entirely within the Little Board/PC's outline dimensions.

Standard PC bus plug-in cards can be connected to the Little Board/PC using a ribbon cable from the PC bus expansion connector. The innovative Ampro StackPlane™ expansion option permits a PC bus card to be mounted parallel to the Little Board/PC without additional hardware. Also available is a

compact 2-slot passive backplane, which accommodates two PC bus cards.

Support for SCSI direct access devices as boot or data devices is included directly in the board's ROM-BIOS. This SCSI/BIOS feature allows a wide variety of hard disks, floppy drives, bubble memory drives, tape drives, and other SCSI devices to be used interchangeably, greatly enhancing the ease and flexibility of system integration, maintenance, and upgrades.

Sockets on the Little Board/PC allow onboard EPROM (up to 256K bytes) or battery backed RAM (up to 64K bytes) to function as a bootable PC-DOS compatible "Solid State Disk" (SSD) drive. SSD operation offers several key advantages, including improved speed, reliability, and ruggedness, and reduced power consumption. Ampro's optional SSD support soft-

ware converts DOS based applications into EPROM format automatically, without the need for special programming techniques. In addition, Ampro's SSD Expansion Board, which matches the 5.75" x 8" form factor of the Little Board/PC, can be used to add sixteen additional byte-wide devices (EPROM or battery-backed RAM) for larger SSDs.

A key advantage of the PC compatibility of the Little Board/PC is that it runs the thousands of software applications and utility packages developed for the IBM® PC. Language compilers, debugging aids, and software support packages for graphics, windowing, multi-tasking, user interfaces, etc., are readily available. In addition, there is a large and growing selection of DOS programs targeted at industrial and commercial applications such as com-

ORDERING INFORMATION

When ordering, refer to the following model numbers:

- D4B-30 Little Board/PC development package

The above development package includes all controllers, interface cables, technical manuals, Award BIOS, and a copy of DR DOS. Contact the factory for quantity purchase ordering information.

munications, data acquisition and control, terminal emulation, protocol conversion, etc.

The Little Board/PC is a member of Ampro's growing family of IBM compatible *single board systems*. These products offer a broad range of price, performance, and feature alternatives in a consistent physical and functional format.

SPECIFICATIONS

CPU AND ONBOARD MEMORY

- NEC V40 CPU (8088 superset), 7.16 MHz
- 256K, 512K, or 768K bytes DRAM with parity
- Vadem ROM-BIOS with Ampro extensions
- Two spare 28-pin byte-wide memory sockets at E0000h to EFFFFh and F0000h to F7FFFh. Used with:
 - 27C256 32K byte EPROM's
 - 27C512 64K byte EPROM's
 - 27011 128K byte page mode EPROM's
 - 62256 32K byte static RAM's
 - 32K byte nonvolatile RAM's

PC-COMPATIBLE CONTROLLERS

- Standard DMA/Interrupt/Timer support
 - 7 interrupt channels
 - 3 DMA channels
 - 3 programmable counter/timers
- Two RS232C ports with software controlled baud rates
 - PC-compatible COM port with full handshaking
 - OEM serial port with two active handshake lines
 - Onboard +/- 9VDC generation
- Parallel printer port
- Standard PC keyboard port
- Speaker port with 0.1 watt drive

- Optional battery-backed time-of-day clock with 10 year internal lithium battery
- PC-compatible mini (5-1/4") and micro (3-1/2") floppy controller
 - 2 drive selects, 1-2 sided, 250/500K bps data rates
 - BIOS supports all standard formats (360K/720K/1.2M/1.4M)
 - Reliable all-digital phase-locked loop and write precompensation
 - Disk change sense line supported

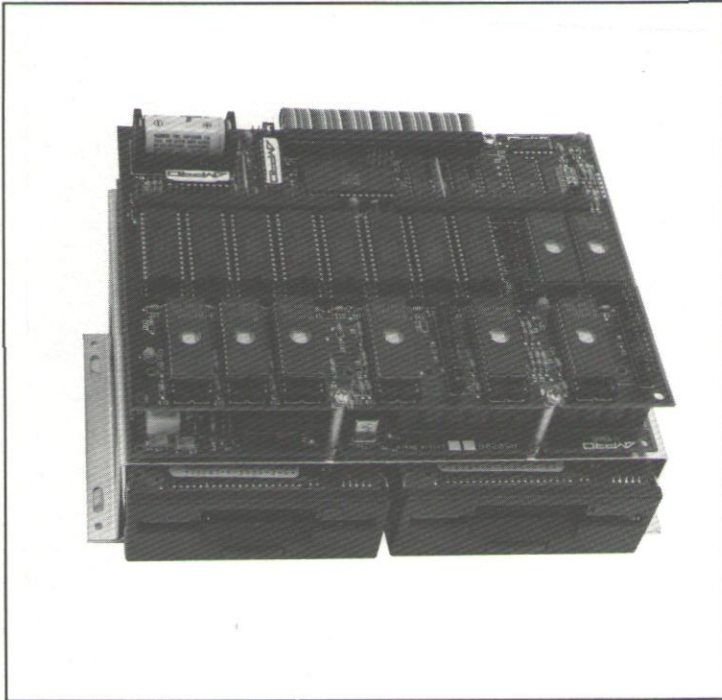
SCSI INTERFACE

- ANSI X3.131 (SCSI) compatible
- Based on popular 53C80 SCSI bus controller
- Usable as 16 (9 bidirectional, 7 input only) general purpose programmed digital I/O lines (48 mA sink)
- Up to 800K byte/sec data throughput

PHYSICAL

- Size: 8.0" x 5.75" x 1.1" (5-1/4" disk drive form factor)
- Provision for one onboard Ampro MiniModule
- Power req: +5V +/- 5% at 800 mA (typ.)
- 4-layer PCB, with full ground & power planes for low noise
- Operating environment:
 - 0-70° C
 - 5-95% relative humidity (non-condensing)
- Storage temperature: -55° to +85° C

Trademarks and Registered Trademarks — IBM, PC/XT: International Business Machines Corp.; Little Board, Ampro Computers, Inc.



FEATURES

- Large memory capacity: up to 2 megabytes NOVRAM or 4 megabytes EPROM
- Wide variety of EPROM's and static RAM's supported
- Onboard battery converts SRAM to NOVRAM
- Can be configured as one or more drives, each up to 1.44 megabytes in size
- System can boot from SSD Expansion Board
- Can be used as RAM or ROM memory for non-SSD applications
- System power-fail detect circuit
- Solid state media and +5 volt only operation is ideal for embedded applications
- Onboard expansion headers for two Ampro MiniModules™

DESCRIPTION

The Ampro SSD Expansion Board provides a convenient means to extend the solid state disk (SSD) capacity of systems based on the Little Board™/PC, Little Board/286, and Little Board/386 single board systems.

The SSD Expansion Board adds sixteen 32-pin byte-wide memory sockets to the system. The sockets can be populated with a variety of 28 or 32-pin EPROM and static RAM devices. Onboard logic and a 2/3A size lithium battery convert static RAM's into nonvolatile RAM (NOVRAM). Configuration options, along with Ampro's SSD Support Software, allow a single SSD Expansion Board to function as both a read-only EPROM SSD drive and a read/write NOVRAM SSD drive.

The board's sixteen byte-wide memory sockets are organized in three groups (4, 4, and 8) each of which can be configured for a different memory device

pin out, allowing many possible memory configurations.

All of the most popular 16K to 256K byte EPROM's and 32K to 128K byte static RAM's are supported, in both 28- and 32-pin packages (see Table 1).

Some typical SSD Expansion Board configurations are:

- 256K byte EPROM's (e.g. 27020) in all sixteen sockets, resulting in a 4M byte EPROM SSD.
- 128K byte static RAM's (e.g. 62204) in all sixteen sockets, resulting in a 2M byte NOVRAM SSD.
- 128K byte EPROM's in one block of four sockets, and 32K byte static RAM's in the remaining twelve sockets, resulting in a 512K byte EPROM SSD along with a 384K NOVRAM SSD.

Ampro's optional SSD Support software allows substitution of semiconduc-

tor memory devices for the disk drives normally used with a system. The resulting SSD drives act like normal DOS floppy disk drives. Under control of the Ampro SSD Support Software, the SSD Expansion Board can be used as the system boot device or as a data drive. One or more drives of up to 1.44M bytes (the maximum floppy capacity under DOS) can be programmed. In addition, the SSD Support Software can combine any number of sockets on one or more SSD Expansion Boards with one or both of the Little Board's onboard byte-wide sockets, into one or more DOS disk drives.

With custom software, the SSD Expansion Board can be used as data memory, bank-switched within a jumper selectable 64K byte window, for non-SSD applications. It can also be used as system ROM or RAM instead of onboard SIMM DRAM on a Little Board/PC (up to 512K bytes) by a sim-

ple jumper option. Other possibilities for non-SSD applications are discussed in Ampro Application Note AAN-9001.

The SSD Expansion Board is identical in size, mounting, and cabling to the Ampro StackPlane™/MM and StackPlane/PC, allowing each type of board to be stacked together with a Little Board. Like the StackPlane boards, the SSD Expansion Board conforms to the Little Board form factor (5.75" X 8" X 1.1"), and is designed to be installed above or below the Little Board using four 1-11/8" spacers. A short PC bus jumper cable connects the PC bus header on the Little Board to the SSD Expansion Board.

Multiple SSD Expansion Boards and StackPlane/PC's can be used, in a stacked arrangement, by daisy chaining their PC bus interfaces. Cables for connecting a Little Board to one or two SSD Expansion Boards and Ampro StackPlane boards are available from Ampro as options.

A pair of 64-pin MiniModule expansion headers allows the addition of one or two Ampro MiniModules within the form factor of the SSD Expansion Board. Up to four MiniModules can be added using Ampro Stacker™/MiniModules

The board's battery backup control logic protects RAM data from being

ORDERING INFORMATION

When placing an order, refer to the following model number:

- 10A Solid State Disk Expansion Board

The above product includes a 3V lithium battery. Contact the factory for quantity purchase ordering information.

The following may also be ordered for use with the SSD Expansion Board:

- 10SSD Solid State Disk support software
- A91204 Pc bus cable for connecting one SSD Expansion Board to a Little Board
- A91205 PC bus cable for connecting two SSD Expansion Boards to a Little Board

corrupted during power up/down cycles. This is done by preventing writes to the devices from occurring when the system's +5V logic supply falls below a jumper selectable value (4.50 or 4.75 volts).

A system power fail signal, activated when the system's +5V logic power falls below 4.5V or 4.75V is also provided. The power fail signal can be jumpered to a normal system interrupt, or to the system's non-maskable interrupt (NMI). System software can use this interrupt to activate alarms, save critical parameters, or perform other appropriate powerfail procedures.

Table 1. SUPPORTED DEVICES

MFGR	PART NUMBER	SIZE (bytes)
EPROM's		
generic	27(C)128	16K
generic	27(C)256	32K
generic	27(C)512	64K
generic	27(C)513	64K
NEC	uPD27C1001A	128K
Hitachi	HN27C101	128K
Toshiba	TC571000D	128K
Intel	27010	128K
Intel	27020	256K
OKI	MSM271000AS	128K
NEC	uPD272001	256K
PAGE-ADDRESSED EPROM's		
Intel	27513	64K
Intel	27011	128K
STATIC RAM's		
NEC	uPD43256A	32K
OKI	MSM51257(L)RS	32K
Toshiba	TC55257AP(L)	32K
Hitachi	HM62256	32K
Samsung	KM62256	32K
Hitachi	HM66204(L)	128K
Hitachi	HM628128	128K

<p>SPECIFICATIONS</p> <p>DATA RETENTION</p> <ul style="list-style-type: none"> ● Greater than 8 years with appropriate battery and memory devices ● Onboard battery: 2/3A size, 3.0V lithium, rated at 1200 milliam pere-hours (Rayovac BR2/3A or equivalent) ● Connector allows use of one or two off-board batteries ● Backup current: 100 microamperes, maximum, required (note: RAM backup power requirements are highly temperature dependent; consult specific data sheets for the devices to be used) <p>POWER FAIL PROTECTION</p> <ul style="list-style-type: none"> ● Monitors system (not battery) power ● Trip points of 4.75V or 4.5V jumper selectable ● Low power detection logic prevents memory write ● Generates non-maskable or maskable system interrupt: IOCHK (NMI), IRQ3,IRQ4, IRQ5, IRQ6, or IRQ7; jumper selectable 	<p>PHYSICAL</p> <ul style="list-style-type: none"> ● Size: 5.75" x 8" x .75" (1.2" with MiniModules) ● Two MiniModule headers for up to four onboard Ampro MiniModules (using two Stacker/MiniModules) ● Power required: <ul style="list-style-type: none"> — +5V +/-5% at 150 mA without memory (total power consumption depends on installed memory) — Power can be sourced through the PC bus cable or by means of an auxiliary onboard power connector ● Operating environment: <ul style="list-style-type: none"> — 0-70° C, or rating of added memory or battery, whichever is more restrictive — 5-95% relative humidity (non-condensing), depending on installed memory or batteries ● Storage temperature: -55° to +85° C
--	--

Trademarks and Registered Trademarks - Little Board, MiniModule, StackPlane, Stacker: Ampro

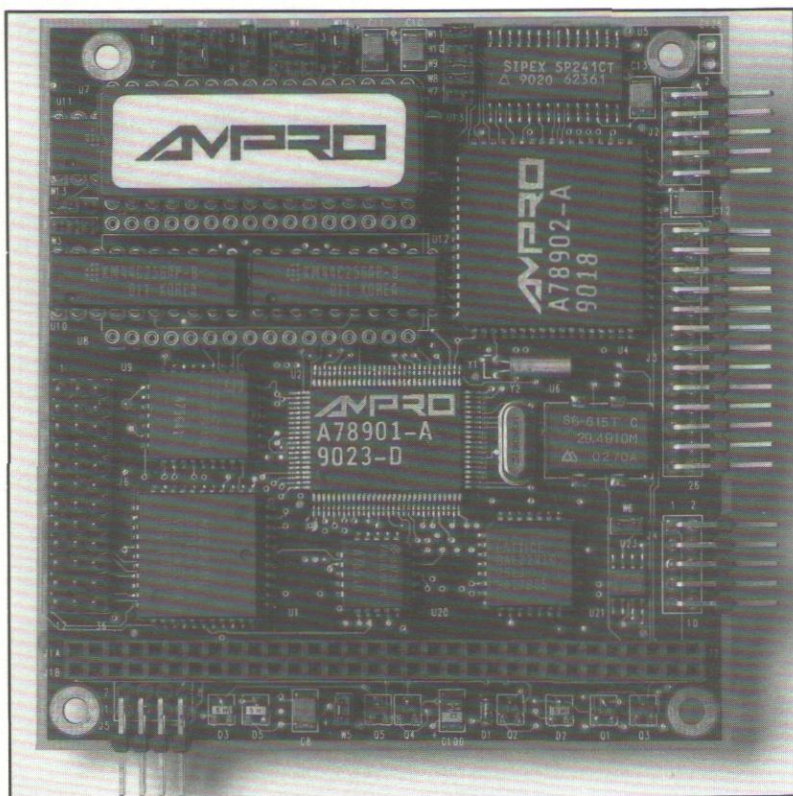


AMPRO COMPUTERS, INCORPORATED
 990 Almanor Avenue, Sunnyvale, California 94086
 TEL (408) 522-2100—FAX (408) 720-1305



CoreModule™/XT

Ultra compact PC compatible module for embedded applications



Actual Size

FEATURES

- Ultra compact form factor (3.6 × 3.8 × 0.6 inches)
- Low power consumption: 1.5W (typical)
- High performance NEC V20 CMOS processor operating at 9.8 MHz
- Up to 2Mbytes of onboard RAM with integral EMS support
- Two 32-pin byte-wide sockets for Solid State Disk support
- Industry standard BIOS with Ampro extensions
- DMA and interrupt controllers and timers
- Bidirectional parallel port
- RS-232C serial port
- Keyboard and speaker interfaces
- Battery backable real time clock
- Configuration EEPROM eliminates jumpers
- PC bus compatible header
- Easy system expansion with Ampro's line of peripheral MiniModules™

DESCRIPTION

The CoreModule/XT is an ultra compact PC compatible computer module combining all the functionality of a PC motherboard on a 3.6"×3.8" circuit board. It offers very low power consumption, +5V only operation, and a wide operating temperature range. Either as a component like PC engine, or combined into a system with Ampro's line of peripheral MiniModules, the CoreModule/XT is an ideal solution for a variety of embedded and portable applications.

The CoreModule/XT (CM/XT), allows system designers to include full PC functionality in their product while utilizing a minimum of space and power. It is equipped with a CMOS NEC V20 enhanced 8088-compatible microprocessor and a full complement of PC compatible DMA controllers, interrupt controllers and timers. On-board sockets support 256 kilobytes, 512 kilobytes, 1 megabyte, or

2 megabytes of DRAM. Support for EMS 4.0 allows access to full memory capacity.

All the features required of a PC compatible embedded controller are included in the CoreModule/XT. It is equipped with a PC compatible bidirectional parallel port and an 8250 compatible RS-232C serial port. The former can be configured as a printer interface or as an 8-bit general purpose I/O port. A real time clock with a connector for external battery backup is included.

Disk drives are undesirable for loading system software in many embedded applications. Further, the harsh operating environments often found in embedded applications make the use of floppy or hard disk drives unreliable. Sockets on the CM/XT allow onboard EPROM or battery-backed RAM to function as a bootable, DOS compati-

ble Solid State Disk (SSD). Using Ampro's optional Solid State Software Utilities, any disk-based PC software, including DOS or other operating systems, can be converted to SSD operation. Ampro's SSD support encompasses a wide variety of memory devices. Each byte-wide socket can be used for either EPROM, Flash EPROM, static RAM, or removable NOVDRAM cartridges — up to 512 bytes may be supported. In addition, Flash EPROMs can be programmed directly on the module.

When floppy or hard disk drives are required, an Ampro MiniModule/FSS may be mated directly to the CM/XT. The MiniModule/FSS provides a floppy controller, SCSI interface and an additional serial port in the same compact form factor.

The Award ROM-BIOS used in the CoreModule/XT contains Ampro ex-

tensions to support the Solid State Disk capability and the optional SCSI interface. Ampro has also added OEM hooks to the BIOS to ease the task of system customization, including extending the BIOS by using the byte-wide sockets, or building a ROM based controller.

The CoreModule/XT has been designed to offer superior configuration flexibility while maintaining very small overall system dimensions. Its onboard header provides all the signals found on the PC bus. Both the CoreModule/XT and Ampro's MiniModule expansion boards are offered with stack-through headers, allowing them to be stacked directly on top of each other, thus avoiding the need for backplanes or card cages. Standoffs are used to rigidly mount the edge of the boards opposite to the headers. In this manner, a complete

system consisting of the CoreModule/XT, a MiniModule video board, and a MiniModule/FSS (floppy drive, SCSI, and serial port controllers) can be assembled into a three-high stack measuring only 3.6 x 3.8 x 1.8 inches.

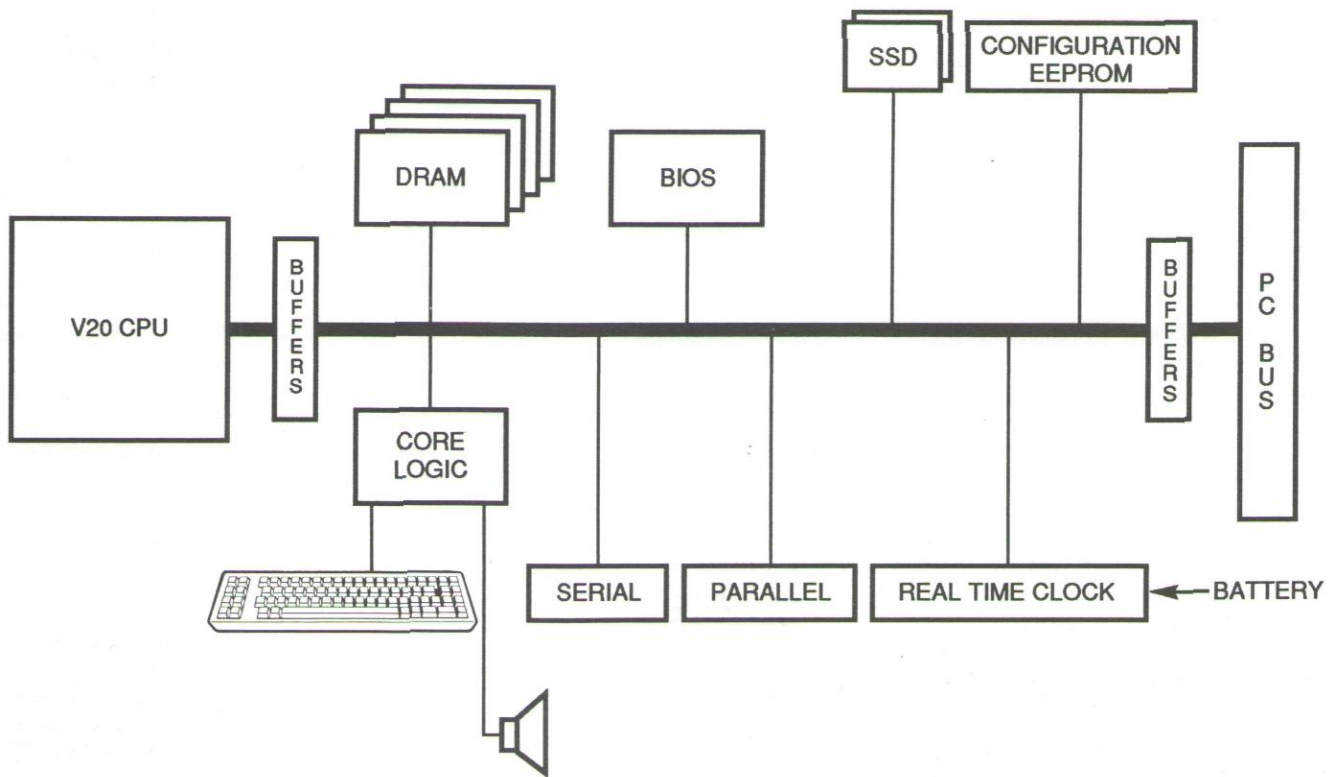
An optional version of the CM/XT allows it to be mounted component side down on a printed circuit board, which may contain other logic or connectors. Power and signals which enter or leave the module are presented on female headers using 0.10" pin spacing. By inserting the CM/XT onto pins on a PCB, it can serve as an ultra-compact PC engine module for almost any application — eliminating the need to design the CPU and the standardized I/O portion of the application.

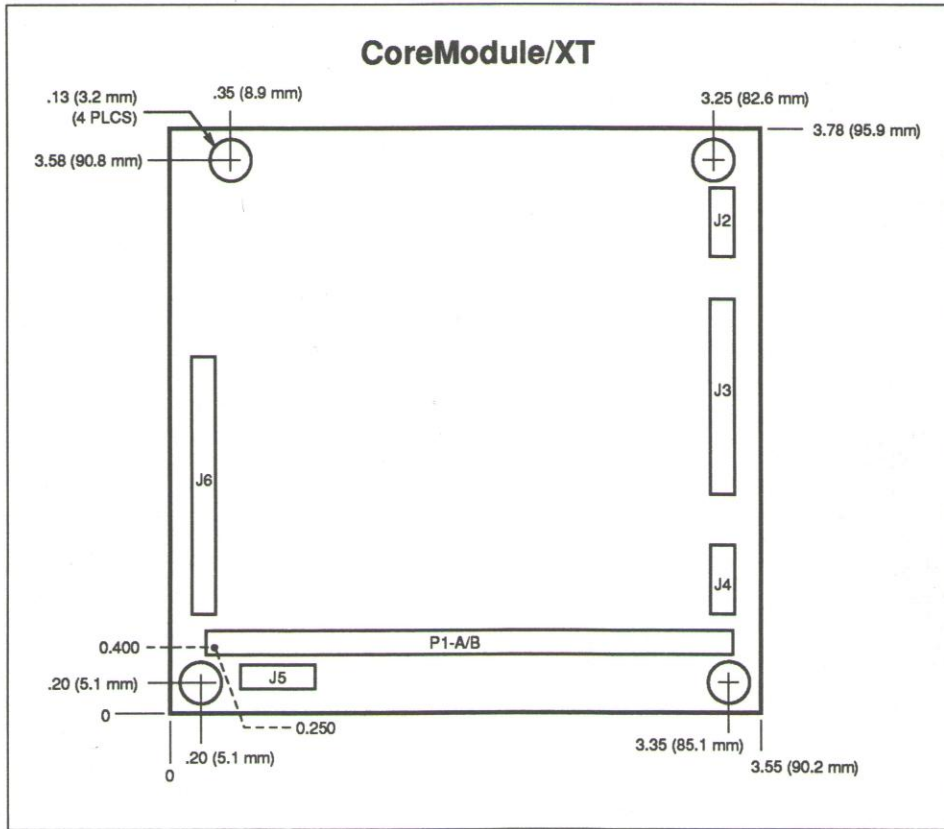
A key advantage of the PC compatibility of the CoreModule/XT is that it runs

standard IBM PC software, including disk operating systems (DOS, QNX, VRTX, etc), languages, and thousands of other software applications and utility packages. In addition, there is a large and growing selection of DOS programs targeted at industrial and commercial applications such as communications, data acquisition and control, terminal emulation, protocol conversion, etc.

The CoreModule/XT introduces Ampro's new line of Embedded System Modules, which provide a set of building blocks for configuring ultra-compact, PC and AT compatible solutions for embedded applications. These products offer a broad range of features in a modular, space efficient format tailored to the needs of OEM system designers.

CoreModule/XT Block Diagram





INTERCONNECTIONS

Pin No.	Pin Function						
	P1A-PC BUS A	P1B-PC BUS B	J2-RS-232C	J3-PAR Port	J4-Utility	J5-Power *	J6-Math Coprocessor
1	IOCHCK	GND	DCD	- STB	SPKR +		IA9
2	SD7	RESET DRV	DSR	- AFD	SPKR -		IA8
3	SD6	+ 5V DC	- RXD	PD0	RESET SW		AD7
4	SD5	IRQ2	RTS	- ERR	NOT USED		AD6
5	SD4	- 5V DC	- TXD	PD1	KBD DATA		AD5
6	SD3	DRQ2	CTS	- INIT	KBD CLK		AD4
7	SD2	- 12V DC	DTR	PD2	KBD GND		AD3
8	SD1	NOT USED	R1	- SLIN	KBD PWR		AD2
9	SD0	+ 12V DC	GND	PD3	BATV		AD1
10	IOCHRDY	GND	GND	GND	NOT USED		AD0
11	AEN	- SMEMW		PD4			SLPCK
12	SA19	- SMEMR		GND			GND
13	SA18	- IOW		PD5			IA14
14	SA17	- IOR		GND			IA13
15	SA16	- DACK3		PD6			IA12
16	SA15	DRQ3		GND			IA11
17	SA14	- DACK1		PD7			IA10
18	SA13	DRQ1		GND			S1
19	SA12	- REFRESH		- ACK			S0
20	SA11	CLK		GND			QS0
21	SA10	IRQ7		BSY			QS1
22	SA9	IRQ6		GND			BUSY
23	SA8	IRQ5		PE			RDY
24	SA7	IRQ4		GND			RST
25	SA6	IRQ3		SLCT			V _{CC}
26	SA5	- DACK2		PQE			IA15
27	SA4	TC					IA16
28	SA3	BALE					IA17
29	SA2	+ 5V DC					IA18
30	SA1	OSC					IA19
31	SA0	GND					RQGT1
32	GND	GND					NPUNM1
33							RQGT10
34							S2
35							(N/C)
36							GND

*See Technical Manual

SPECIFICATIONS

CPU and Onboard Memory

- NEC V20 CPU (8088 superset), 9.83 MHz
- 256K or 512K bytes of RAM using 256K x 4 DRAMS, or 1M or 2M bytes using 1M x 4 DRAMS (120ns or faster)
- Award ROM-BIOS with Ampro extensions
- Two spare 32-pin byte-wide memory sockets, located at D0000h to DFFFFh, and E0000h to EFFFFh.
- Provision for 8087 math coprocessor
- 1K bit configuration EEPROM, with 512 bits for OEM use
- Real-time clock (National Semiconductor 58167 compatible). Requires external backup battery (2.2V-3.6V).

PC-Compatible Controllers

- Standard DMA/interrupt/timer support
 - 6 interrupt channels (8259 compatible)
 - 3 DMA channels (8237 compatible)
 - 3 programmable counter/timers (8253 compatible)

- 8250 compatible RS-232C port with software controlled baud rate
 - PC-compatible COM port with full handshaking
 - Onboard ± 9 VDC generation
- Bidirectional parallel port
- Keyboard port (requires PC or XT keyboard)
- Speaker port with 0.1 watt drive

Physical

- Size: 3.6 x 3.8 x 0.6 inches (90.2 x 95.9 x 15.2mm)
- Power requirement: +5V $\pm 5\%$ at 280mA (typical)
- Eight layer PCB, with ground and power planes for low noise
- Operating environment:
 - 0 to 70°C
 - 5 to 95% relative humidity (non-condensing)
- Storage temperature: -55° to +85°C
- Weight: 3.4 oz. (97 gm)

ORDERING INFORMATION

To order, refer to the following model number:
D21A CoreModule/XT

The above development package includes:

- CoreModule/XT with 256K byte RAM
- MiniModule/VGA
- MiniModule/FSS (floppy, SCSI, and serial controllers)
- BIOS
- DR-DOS
- Interface cable set (power, utility, floppy, serial, parallel, video)
- Mounting hardware
- Technical manuals

Contact Ampro headquarters for quantity purchase ordering information.

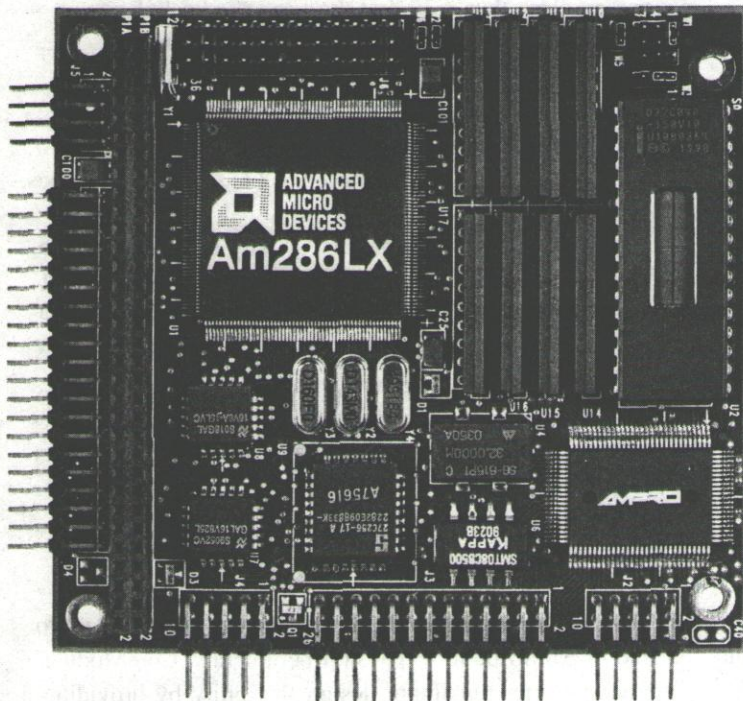


AMPRO COMPUTERS, INC.

990 Almanor Avenue, Sunnyvale, CA 94086 (408) 522-2100 FAX (408) 720-1305

CoreModule™/286

Ultra compact PC/AT-compatible module for embedded applications



Actual size 3.6 x 3.8 inches

- Ultra compact form factor (3.6 x 3.8 x 0.6 inches)
- Very low power consumption
- AMD Am286LX CMOS processor operating at 16 MHz
- Up to 4 Mbytes of onboard RAM with integral EMS support
- 32-pin, byte-wide socket for Solid State Disk support
- Industry standard BIOS with Ampro™ extensions
- DMA and interrupt controllers, and timers
- Bidirectional parallel port
- RS-232C serial port
- Keyboard and speaker interface
- Battery backable real-time clock
- Configuration EEPROM eliminates jumpers
- AT bus-compatible headers
- Easy system expansion with Ampro MiniModule™ peripherals

The CoreModule/286 product is ideally suited for adapting the PC/AT architecture to embedded control applications. It is the newest member of the Ampro family of *embedded system modules*. Like its predecessor, the CoreModule/XT, the CoreModule/286 unit offers all the functionality of a PC/AT motherboard in just 3.6 x 3.8 inches. It can be used either as a component-like AT engine, or combined into a system with Ampro MiniModule peripherals. And, like all CoreModule products, it is designed to meet the rigorous demands of OEM systems through low power consumption, +5 volt-only operation, and a 0°–70°C temperature range. The CoreModule/286 *embedded system module* allows system designers to include full AT functionality in their product while utilizing a minimum of space and power.

The 286 module is equipped with a CMOS AMD Am286LX microprocessor and a full complement of AT-compatible DMA controllers, interrupt controllers, and timers. Onboard sockets support 512 Kbytes, 1 Mbyte, 2 Mbytes, or 4 Mbytes of DRAM. Support for EMS 4.0 is available, or the memory can be accessed as "extended memory" in the normal manner.

All the features required of an AT-compatible embedded controller are included in the CoreModule/286 unit. It comes with an 8250-compatible RS-232C serial port, and an AT-compatible bidirectional parallel port that can be configured as a printer interface or as an 8-bit general purpose I/O port. A real-time clock with a connector for external battery backup is included.

Solid State Disk A socket on the CoreModule/286 unit allows onboard EPROM, Flash EPROM, or NOVRAM devices to function as a bootable, DOS Solid State Disk (SSD).

AMPRO®

Pioneering Solutions for Embedded Control

Using Ampro optional Solid State Disk support software, any DOS-based PC software, including DOS, drivers, and application programs, can be used unmodified. Ampro SSD support encompasses a wide variety of memory devices. The SSD byte-wide socket can be used for either EPROM, Flash EPROM, static RAM, or removable NOVRAM cartridges – up to 1 Mbyte may be supported. In addition, Flash EPROMs can be programmed directly on the module.

Floppy or Hard Disk Drives When floppy or hard disk drives are required, an Ampro MiniModule/FSS or MiniModule/FSI peripheral may be mated directly to the CoreModule/286 unit. Both of these modules transfer data through a 16-bit, high performance data bus and provide a floppy controller, an additional serial port controller, and an interface for hard disk drives. While the MiniModule/FSS peripheral includes a SCSI port, the MiniModule/FSI peripheral is fitted with an IDE drive interface.

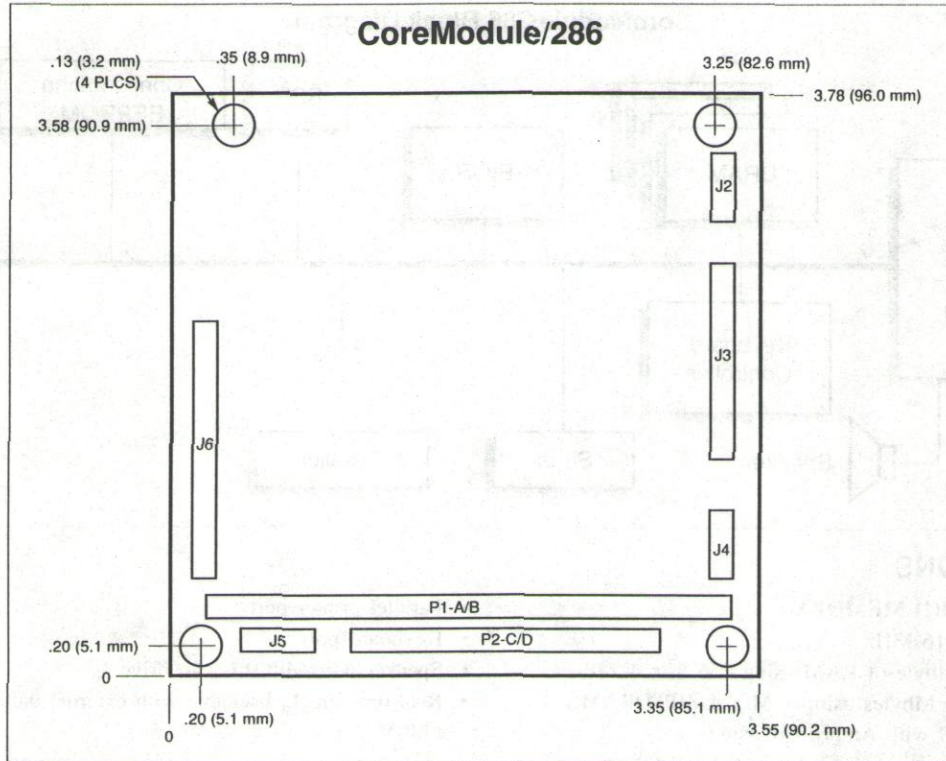
Industry Standard BIOS The Award ROM-BIOS, used in the CoreModule/286 product, contains Ampro extensions to support the Solid State Disk capability and the optional SCSI interface. A unique "serial console" option allows an external RS-232C-connected device to substitute for a standard AT keyboard and display. Ampro has also added "OEM hooks" to the BIOS to ease the task of system customization, including extending the BIOS by using the byte-wide socket, or executing OEM-supplied code prior to system booting.

Configuration Flexibility The CoreModule/286 embedded control unit has been designed to offer superior configuration flexibility while maintaining very small overall system dimensions. Its onboard expansion

bus headers provide all the signals found on the AT bus. Both the CoreModule/286 product and Ampro MiniModule expansion units are offered with stack-through headers, allowing them to be stacked directly on one another, thus avoiding the need for backplanes or card cages. In this manner, a complete system consisting of the CoreModule/286 unit, a MiniModule video unit, and a MiniModule/FSS unit (floppy drive, serial port, and SCSI controllers) can be assembled into a three-high stack measuring only 3.6 x 3.8 x 1.8 inches.

Industry Standard Software A key advantage of the PC/AT compatibility of the CoreModule/286 embedded control unit is that it runs standard IBM PC and PC/AT software, including disk operating systems (DOS, UNIX, QNX, VRTX, etc.), languages, and thousands of other software applications and utility packages. In addition, there is a large and growing selection of DOS programs targeted at embedded applications such as communications, data acquisition and control, terminal emulation, and protocol conversion.

Optimal Feature Partitioning Along with the Ampro line of MiniModule expansion peripherals, CoreModule products offer maximum design flexibility by providing a set of building blocks for configuring ultra compact, PC, and PC/AT-compatible solutions for embedded applications. This modular architecture allows the system designer to include only those features required by the application, thus reducing cost and saving space. In addition, every Ampro product is backed by the highest levels of support services and the company's dedication to providing OEMs with the most rugged, reliable, and cost effective embedded control products available.

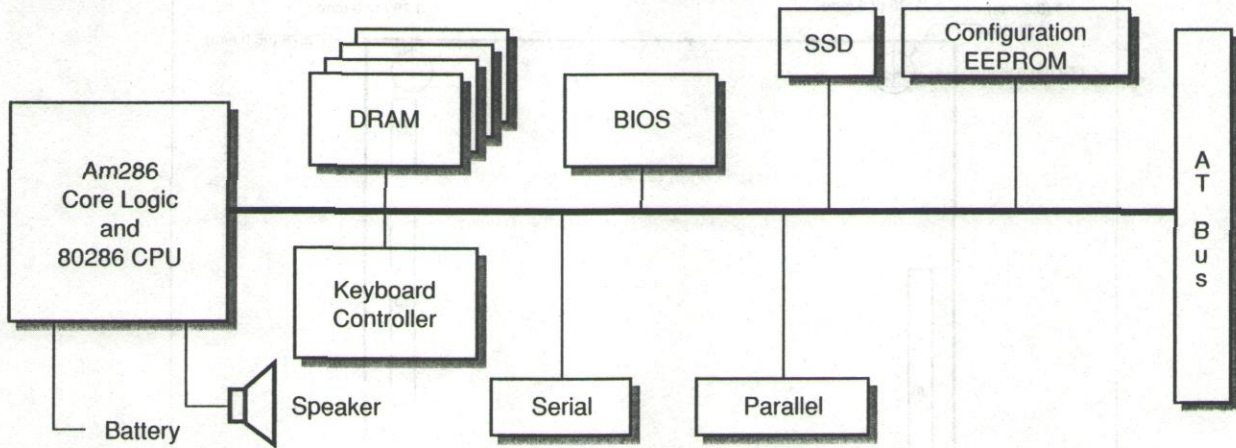


Note: The above drawing is a general guide only. Contact Ampro for exact product dimensions.

INTERCONNECTIONS

Pin NO.	Pin Function								
	P1A- PC BUS A	P1B- PC BUS B	P2C- PC BUS C	P2D- PC BUS D	J2- RS-232C	J3- PAR Port	J4- Utility	J5- Power	J6-Math Coprocesor
0			GND	GND					
1	-IOCHCHK	GND	-SBHE	-MEMCS16	DCD	-STB	SPKR+	GND	+5 VDC
2	SD7	RESETDRV	LA23	-IOCS16	DSR	-AFD	BATV-	+5 VDC	MD12
3	SD6	+5 VDC	LA22	IRQ10	-RXD	PD0	RESET SW	GND	MD11
4	SD5	IRQ9	LA21	IRQ11	RTS	-ERR	KBD SW	+12 VDC	MD10
5	SD4	-5 VDC	LA20	IRQ12	-TXD	PD1	KBD DATA	-5 VDC	MD9
6	SD3	DRQ2	LA19	IRQ15	CTS	-INIT	KBD CLK	-12 VDC	MD8
7	SD2	-12 VDC	LA18	IRQ14	DTR	PD2	GND	GND	MD7
8	SD1	-ENDXFR	LA17	-DACK0	R1	-SLIN	KBD PWR	+5 VDC	MD6
9	SD0	+12 VDC	-MEMR	DRQ0	GND	PD3	BATV+		MD5
10	IOCHRDRY	GND	-MEMW	-DACK5	GND	GND	DIO RGD		MD4
11	AEN	-SMEMW	SD8	DRQ5		PD4			MD3
12	SA19	-SMEMR	SD9	-DACK6		GND			GND
13	SA18	-IOW	SD10	DRQ6		PD5			MD15
14	SA17	-IOR	SD11	-DACK7		GND			MD14
15	SA16	-DACK3	SD12	DRQ7		PD6			MD13
16	SA15	DRQ3	SD13	+5 VDC		GND			(N/C)
17	SA14	-DACK1	SD14	-MASTER		PD7			NPWR
18	SA13	DRQ1	SD15	GND		GND			NPRD
19	SA12	-REFRESH	GND	GND		-ACK			ERROR
20	SA11	SYSCLK				GND			CMD0
21	SA10	IRQ7				BSY			PEREQ
22	SA9	IRQ6				GND			MD0
23	SA8	IRQ5				PE			MD1
24	SA7	IRQ4				GND			MD2
25	SA6	IRQ3				SLCT			+5 VDC
26	SA5	-DACK2							(N/C)
27	SA4	TC				N.C.			PEACK
28	SA3	BALE							RESET
29	SA2	+5 VDC							(N/C)
30	SA1	OSC							NPS2
31	SA0	GND							CLOCK
32	GND	GND							CMD1
33									NPS1
34									BUSY
35									(RESERVED)
36									GND

CoreModule/286 Block Diagram



SPECIFICATIONS

CPU AND ONBOARD MEMORY

- AMD Am286LX, 16 MHz
- 512 Kbytes or 1 Mbyte of RAM using 256 K x 4 ZIP DRAMs, or 2 or 4 Mbytes using 1 M x 4 ZIP DRAMs
- Award ROM-BIOS with Ampro extensions
- 32-pin, byte-wide memory socket, located at D0000h to DFFFFh, or E0000h to EFFFFh
- Provision for 80287 math coprocessor
- 2 Kbit serial EEPROM, with 512 bits for OEM use

AT-COMPATIBLE CONTROLLERS

- Standard DMA/interrupt/timer support
 - 11 interrupt channels (8259 compatible)
 - 7 DMA channels (8237 compatible)
 - 3 programmable counter/timers (8253 compatible)
- PC-compatible RS-232C port with software controlled baud rate (8250 compatible)
 - PC-compatible COM port with full handshaking
 - Onboard ± 9 VDC generation

- Parallel printer port
- Keyboard port
- Speaker port with 0.1 watt drive
- Real-time clock, backable with external battery (3.0 V–3.6 V)

PHYSICAL

- Size: 3.6 x 3.8 x 0.6 inches (90 x 96 x 15mm)
- Power requirement: $+5$ V $\pm 5\%$ at 450 mA (typical)
- Eight-layer PCB, with ground and power planes for low noise
- Operating environment:
 - 0° – 70° C
 - 5–95% relative humidity (noncondensing)
- Storage temperature: -55° to $+85^{\circ}$ C
- Weight: 3.4 oz (97 gm)

ORDERING INFORMATION

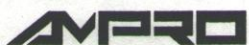
Ampro requires all first time buyers of any Ampro product to purchase a Development Kit version of the product. Kits are configured to provide an overview of how a particular product is assembled and works. They allow testing of products in advance of ordering quantity shipments.

When ordering, refer to the following model number

CMX-286-K-51 CoreModule/286 Kit

This Development Kit includes: CoreModule/286 unit with 1 Mbyte RAM, MiniModule/SupervGA video module, MiniModule/FSS unit (floppy, serial, and SCSI controllers), DR DOS, Ampro utilities diskette, interface cable set (power, utilities, floppy, serial, parallel, SCSI, and video), battery, mounting hardware, technical manuals, math coprocessor carrier, and math coprocessor 80C287.

Quantity shipments (minimum order 10 units) include the CoreModule/286 embedded system module only. Please contact your local Ampro representative or Ampro Sales Administration for ordering information.



990 Almanor Avenue
Sunnyvale, CA 94086
(408) 522-2100 FAX (408) 720-1305

©1991 Ampro Computers, Inc. All rights reserved.

The Ampro logo is a registered trademark of Ampro Computers, Inc. Ampro, CoreModule, and MiniModule are trademarks of Ampro Computers, Inc. All other names may be trademarks or registered trademarks of their respective companies. Information and specifications are subject to change without notice.

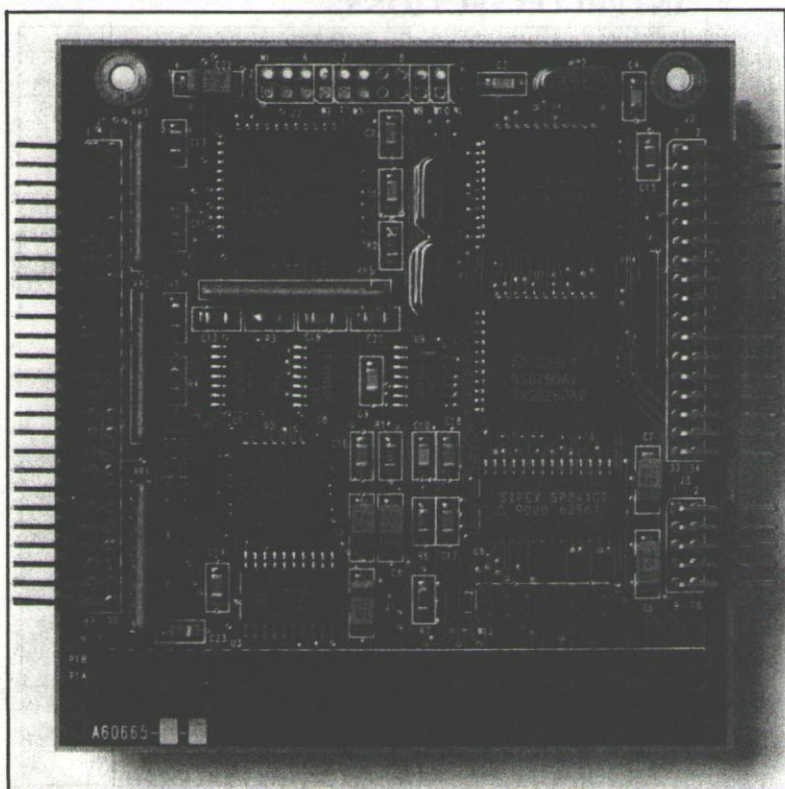
Note: The information provided herein is preliminary and subject to change. This document is being published to help you evaluate a product currently under development. Ampro reserves the right to change the product's specifications or discontinue it entirely if circumstances require it.

A77004



MiniModule™/FSS

Floppy drive, SCSI interface, and serial controller module



Actual Size

FEATURES

- Mini/Micro floppy drive controller (360K, 720K, 1.2M, and 1.44M byte formats)
- SCSI controller for hard disks, tape, other SCSI devices, or general purpose digital I/O
- RS-232C compatible serial port
- Software compatible with many popular PC and PC/AT multi-port cards
- Mounts directly on Ampro's CoreModules™
- Small size (3.6 × 3.8 inches), +5V only operation, and low power CMOS is ideal for embedded applications

DESCRIPTION

The MiniModule/FSS is a compact, low power, expansion module with floppy, SCSI interface, and serial port controllers. It is a part of Ampro's new line of Embedded System Modules, which provide a set of building blocks for configuring ultra compact, PC and AT compatible solutions for embedded applications. These products offer a broad range of features in a modular, space efficient format tailored to the needs of OEM system designers.

Designed to plug directly on to Ampro's CoreModules, the MiniModule/FSS is ideal for embedded applications which require an additional serial port, floppy or hard disk drive controllers. Like the CoreModule, the MiniModule/FSS conforms to the Ampro MiniModule standard (3.6 × 3.8 inches).

Thanks to extensive use of CMOS logic, only 1.0 watt of power is needed for operation of the MiniModule/FSS. In addition, since the ±9 volts

necessary for the RS232C interface are generated onboard, the module only requires a +5 volt power source.

The MiniModule/FSS is offered with pass-through bus headers, allowing it to be stacked on top of other MiniModules without the need of a Stacker/MM. A designer using this building block approach can easily customize a system by simply stacking the desired set of expansion MiniModules. In this manner, a complete system consisting of a CoreModule, a MiniModule video controller, and a MiniModule/FSS can be assembled into a three-high stack measuring only 3.6 × 3.8 × 1.8 inches.

Support for 360K, 720K, 1.2M, or 1.44M floppy disk drives is provided through the 37C65B-based standard drive interface.

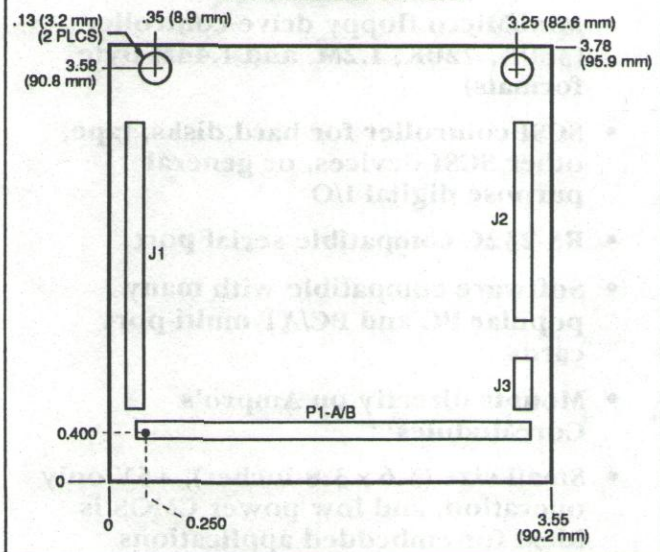
The SCSI interface supports a wide variety of hard disks. It is also usable as 17 general purpose programmable I/O lines.

The RS232C serial port interface can be enabled as COM2 or COM3, (COM1 already exists on the CoreModule/XT). Jumpers permit selection between interrupt request IRQ2 through IRQ7. The MiniModule/FSS serial port can be operated under any of the many programs written to work with standard PC and PC/AT serial ports. In addition, with Ampro's interrupt sharing circuitry, serial ports on some modules can share a single interrupt (requires customized software).

Custom Configurations

Although any of the three controllers (floppy, SCSI, serial) on the MiniModule/FSS can be disabled through jumpers, volume production orders may specify the exclusion of any one or two functions. Contact Ampro for further information on custom configurations.

MiniModule/FSS



SPECIFICATIONS

Floppy Controller

- Two drive selects, 1–2 sided, 250/500K bps data rates
- BIOS on Ampro CPUs supports all standard floppy formats: 360K, 720K, 1.2M or 1.44M bytes
- Reliable all digital phase-locked loop and write pre-compensation
- Disk change line support
- Based on popular 37C65B controller

SCSI Controller

- ANSI X3.131 (SCSI) compatible
- Usable as 17 general purpose programmed digital I/O lines (48 mA sink)
- Up to 1 megabyte/second data throughput
- Configurable with DMA channels 1 and 3 (default factory setting: 3)
- Interrupt request (IRQ2, IRQ3, IRQ5, IRQ7), TC signal and SCSI bus power termination are jumper selectable
- Based on the popular 53C80 SCSI bus controller

Serial Port

- RS232C compatible serial port with software controlled baud rates
- Full handshaking support
- Onboard $\pm 9V$ DC generation
- Choice of IRQ2–IRQ7 with interrupt sharing capability
- Based on industry standard 82C50

Physical

- Power: +5V at 200mA ($\pm 9V$ for RS232C generated on-board)
- Size: 3.6 x 3.8 x 0.6 inches (90.2 x 95.9 x 15.2mm)
- Temperature: 0 to +70°C operating, –55 to +85°C storage
- Humidity: 5 to 95% relative, non-condensing
- Weight: 3.0 oz. (85.2 gm)

INTERCONNECTIONS

Pin No.	Pin Function				
	P1A XT Bus Header	P1B XT Bus Header	J2– SCSI Port	J3– Floppy Port	J4– Serial Port
1	~IOCHCK	GND	GND	GND	DCD
2	SD7	RESETRV	DB0	RPM RWC	DSR
3	SD6	+5V DC	GND	GND	RXD
4	SD5	IRQ2	DB1	(NC)	RTS
5	SD4	–5V DC	GND	GND	TXD
6	SD3	DRQ2	DB2	(NC)	CTS
7	SD2	–12V DC	GND	GND	DTR
8	SD1	OWS	DB3	IDX	RI
9	SD0	+12V DC	GND	GND	GND
10	IOCHRDY	GND	DB4	MO1	(NC)
11	AEN	–SMEMW	GND	GND	
12	SA19	–SMEMR	DB5	DS2	
13	SA18	–IOW	GND	GND	
14	SA17	–IOR	DB6	DS1	
15	SA16	–DACK3	GND	GND	
16	SA15	DRQ3	DB7	MO2	
17	SA14	–DACK1	GND	GND	
18	SA13	DRQ1	DBP	DIRC	
19	SA12	–REFRESH	GND	GND	
20	SA11	CLK	GND	STEP	
21	SA10	IRQ7	GND	GND	
22	SA9	IRQ6	GND	WD	
23	SA8	IRQ5	GND	GND	
24	SA7	IRQ4	GND	WE	
25	SA6	IRQ3	(NC)	GND	
26	SA5	–DACK2	TERM PWR	TRK0	
27	SA4	TC	GND	GND	
28	SA3	BALE	GND	WP	
29	SA2	+5V DC	GND	GND	
30	SA1	OSC	GND	RDD	
31	SA0	GND	GND	GND	
32	GND	GND	ATN	HS	
33			GND	GND	
34			GND	DCH6	
35			GND		
36			BSY		
37			GND		
38			ACK		
39			GND		
40			RST		
41			GND		
42			MSG		
43			GND		
44			SEL		
45			GND		
46			C/D		
47			GND		
48			REQ		
49			GND		
50			IO		

ORDERING INFORMATION

To order, refer to the following model number:

22A MiniModule/FSS

Includes: • Floppy cable • Technical Manual
• Serial cable • Mounting Hardware

Contact Ampro headquarters for quantity purchase ordering information.

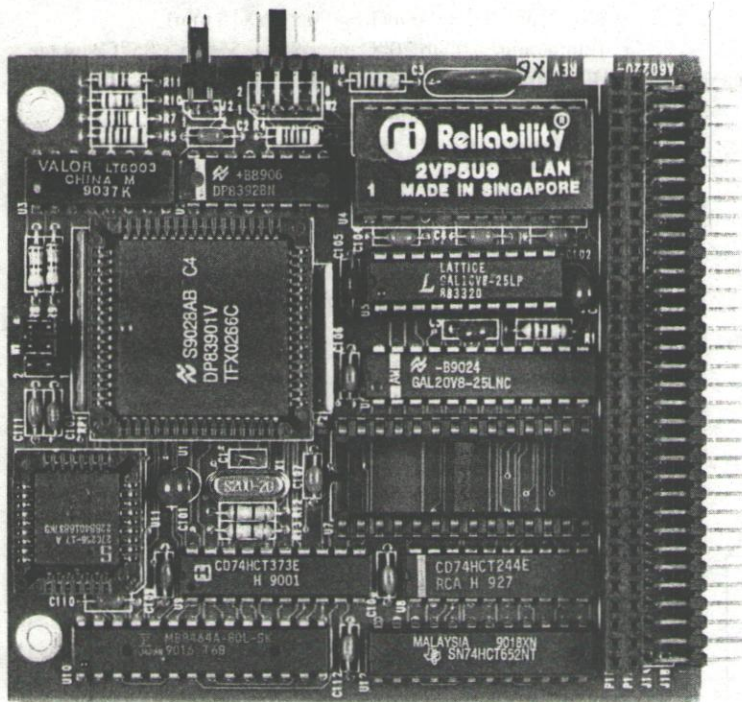


AMPRO COMPUTERS, INC.

990 Almanor Avenue, Sunnyvale, CA 94086 (408) 522-2100 FAX (408) 720-1305

MiniModule™/Ethernet

Ethernet LAN communications controller



Actual size 3.6 x 3.8 inches

- Compatible with Novell NE1000A controller
- Connects to thin Ethernet cable with optional transition cable
- High-speed 10 Mbits/second operation
- Socket for 8 Kbyte remote-boot PROM
- Onboard 8 Kbyte buffer
- User selectable interrupts, I/O, and boot address
- Runs most Novell-compatible LAN software
- Small size (3.6 x 3.8 inches), +5 volt-only operation, low power CMOS, rugged design; ideal for embedded applications

The MiniModule/Ethernet *embedded system module* is a special purpose communications adapter for interconnecting Ampro™ systems to other systems using an Ethernet local-area network (LAN). Ethernet is preferred in many applications due to its high data rate and broad level of compatibility. Because the MiniModule/Ethernet peripheral is hardware and software compatible with the popular Novell NE1000A Ethernet controller, a number of network operating systems, drivers, and utilities are readily available and can be used without modification.

The MiniModule/Ethernet unit is a complete network controller handling all communications at the board level, thus resulting in faster more efficient operation without processor overhead. It operates at 10 Mbits/second and contains the logic necessary to send and receive data packets and to control the CSMA/CD (Carrier Sense, Multiple Access/Collision Detect) network access technology.

The module has an 8 Kbyte RAM buffer for holding four data packets, two transmit and two receive, of up to 1500 bytes each. The RAM buffer address is jumper selectable on the board. In addition, autoboot software, required for installing a diskless node on the network, can be placed in an onboard 8 Kbyte PROM (socket provided). The PROM is scanned for the autoboot software during power-up. Its starting address is jumper selectable.

Designed to meet the "thin Ethernet" cabling standards, the MiniModule/Ethernet unit can address up to 30 nodes per trunk segment, with up to 607 feet per trunk (repeaters may be added to increase total trunk length to 3035 feet).

The MiniModule/Ethernet product can be installed directly on any Ampro Slot Board™, Little Board™, or CoreModule™ CPU unit or configured with other MiniModule peripherals using Ampro expansion products. With its small size (3.6 x 3.8 inches), +5 volt-only operation, and operating temperature range of 0° to 70°C, the MiniModule/Ethernet *embedded system module* is ideally suited for use in embedded applications.

AMPRO®

Pioneering Solutions for Embedded Control

SPECIFICATIONS

GENERAL

- Novell Ethernet specification compatible
- 10 Mbit/second data rate
- Ethernet bus topology, using CSMA/CD
- Uses RG/58A/U 50 ohm cable with BNC connector jacks/plugs
- 607 feet (185 meters) maximum distance for each LAN
 - 5 segments can be joined by repeaters
 - 30 nodes maximum per segment
 - 1.5 feet (0.5 meters) minimum distance between node connections
- Remote boot socket for 8 Kbyte PROM (27C64 or equivalent)
Base address at C8000h, CC000h, D0000h, D4000h (jumper selected)
- 8 Kbytes of RAM buffer
- Interrupts at IRQ2, IRQ3, IRQ4, IRQ5 (jumper selected)

PHYSICAL

- Power: +5 V \pm 5% at 225 mA (typical)
- Size: 3.6 x 3.8 x 0.6 inches (90 x 96 x 15 mm)
- Temperature: 0° to 70°C operating, -55° to + 85°C storage
- Humidity: 5-95% relative, noncondensing
- Weight: 3.2 oz (91 gm)

ORDERING INFORMATION

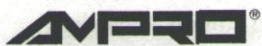
Ampro requires all first time buyers of any Ampro product to purchase a Development Kit version of the product. Kits are configured to provide an overview of how a particular product is assembled and works. They allow testing of products in advance of ordering quantity shipments.

When placing an order, refer to the following model number:

MMX-ETH-K-01 MiniModule/Ethernet, coax bus

This Development Kit includes: MiniModule/Ethernet unit, coax cable adapter with BNC connector, and technical manual.

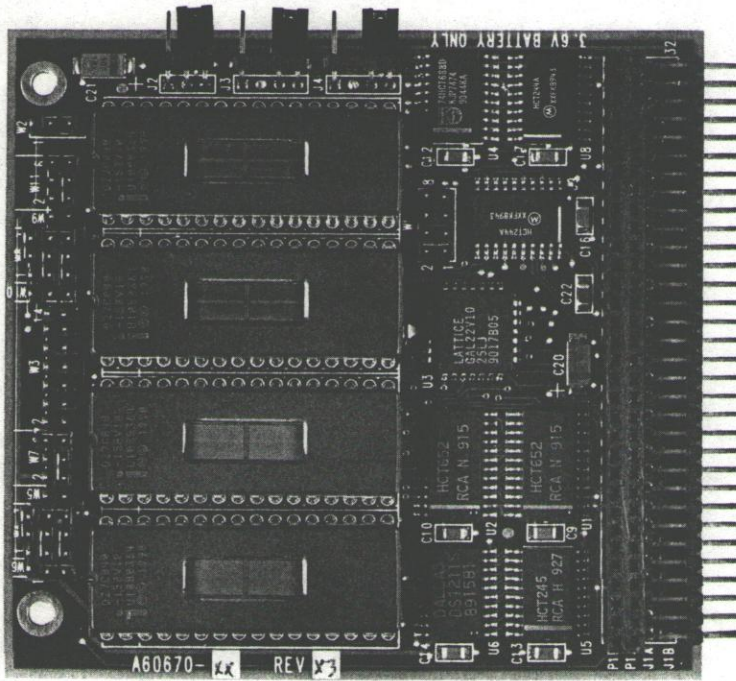
Quantity shipments include the MiniModule/Ethernet unit only. Please contact your local Ampro representative or Ampro Sales Administration for more ordering information.



990 Almanor Avenue
Sunnyvale, CA 94086
(408) 522-2100 FAX (408) 720-1305

MiniModule™/SSD

Solid State Disk expansion



Actual size 3.6 x 3.8 inches

- Provides four 32-pin byte-wide SSD memory device sockets
- Large memory capacity: up to 2 Mbyte SRAM or NOVRAM, or 4 Mbytes EPROM
- Configurable as one or more Solid State Disk (SSD) drives, each up to 1.44 Mbytes in size, using Ampro™ SSD Support Software
- Can be system boot device
- Wide variety of EPROM, Flash EPROM, and static RAM devices supported
- Converts static RAM into NOVRAM using onboard logic and external battery
- Includes onboard logic for programming Flash EPROMs
- System power-fail and low-battery detect circuit included
- Supports two batteries for maximum reliability
- Small size (3.6 x 3.8 x 0.6 inches), +5 volt-only operation, and low power consumption are ideal for embedded applications

The Ampro MiniModule/SSD embedded system module provides a convenient means to expand the Solid State Disk (SSD) capacity of any Ampro CoreModule™, Little Board™, or Slot Board™ based system. The MiniModule/SSD unit can be installed directly on any Ampro CoreModule, Little Board, or Slot Board CPU unit, or configured with other MiniModule peripherals using Ampro expansion products. With its small size (3.6 x 3.8 inches), +5 volt-only operation, and operating temperature range of 0° to 70°C, the MiniModule/SSD product is ideally suited for use in embedded applications.

The SSD module provides four 32-pin byte-wide memory sockets. The sockets can be populated with a variety of 28- or 32-pin static RAM, NOVRAM, EPROM, or Flash EPROM devices. The module's four byte-wide memory sockets are organized in two groups of two sockets each. Each group can be configured for a different type of memory device, allowing many possible memory configurations. All of the most popular 32 Kbyte to 1 Mbyte EPROMs and 32 to 512 Kbyte static RAMs, as well as many types of Flash EPROMs are supported.

Provisions are made for connecting backup batteries which can convert static RAM into nonvolatile RAM (NOVRAM). Configuration options allow a single MiniModule/SSD unit to function as both a read-only EPROM SSD drive and a read/write NOVRAM SSD drive.

Ampro SSD Support Software allows substitution of MiniModule/SSD-based memory devices for the disk drives normally used with a system. The resulting SSD drives act like normal DOS floppy disk drives. Under control of the Ampro SSD Support Software, SSD drives in the MiniModule/SSD unit can be used as the system boot device or as a data drive. One or more drives of up to 1.44 Mbytes each (the maximum floppy capacity under DOS) can be programmed. In addition, the SSD support software can combine sockets on the MiniModule/SSD product with sockets on Ampro computer boards and modules to make one or more DOS disk drives.



Some typical MiniModule/SSD configurations are:

- 64 Kbyte EPROMs (for example 27512) in all four sockets, resulting in a 256 Kbyte EPROM SSD.
- 32 Kbyte static RAMs (for example 62256) in all four sockets, resulting in a 128 Kbyte NOVRAM SSD.
- 128 Kbyte EPROMs in one group of two sockets, and 128 Kbyte static RAMs in the other two sockets, resulting in a 256 Kbyte EPROM SSD along with 256 Kbyte NOVRAM SSD.

Connectors for two offboard batteries are provided. When the system power is off, one of the two batteries provides the backup current for converting the static RAMs into NOVRAMs. The module's circuitry will select the battery with the highest voltage to supply the backup current. When either of the two batteries falls below 2.2 volts, a

SPECIFICATIONS

DATA RETENTION

- External Battery: connectors allow use of two 3.6 volt external backup batteries.
 - Battery life depends on devices used, but typical battery lasts more than 8 years.
 - Recommended battery: Tadiran TL-5242 or equivalent
Caution: Batteries must not exceed 4 volts or damage to the module may result.
- Low-Battery Signal: triggered when battery voltage falls below 2.2 volts. Software readable signal consists of one status bit for each battery.
- Backup Current: 1 mA (max.) continuous (Note: RAM power usage is highly temperature dependent; consult data sheets of devices to be used.)

POWER-FAIL DETECTION

- Monitors system (not battery) power
- Trip points of 4.75 volts or 4.5 volts (jumper selectable)
- Low power inhibits memory write, after current cycle is completed.

software readable low-battery status signal is triggered. Control logic protects RAM data from being corrupted during system power shutdown or power failure. This is done by switching to battery backup and preventing access to the devices when the system's +5 volt logic supply falls below a jumper selectable value (4.50 or 4.75 volts).

A system power-fail signal, activated when the system's +5 volt logic power falls below a jumper selectable value (4.5 volt or 4.75 volt), is also provided. The power-fail signal can be jumpered to a normal system interrupt or to the system's nonmaskable interrupt (NMI), or it can be read by software. System software can use this signal to activate alarms, save critical parameters, or perform other appropriate power-fail procedures.

- Generates nonmaskable or maskable system interrupt: IOCHCK (NMI), IRQ3, IRQ4, IRQ6, or IRQ7 (jumper selectable)

PHYSICAL

- Size: 3.6 x 3.8 x 0.6 inches (90 x 96 x 15 mm)
- Power:
 - +5 V \pm 5% at 150 mA without memory (Total power consumption depends on installed devices.)
 - +12 V optional for Flash EPROM programming, except Atmel-compatible devices
- Temperature: 0° to 70°C operating, -55 to 85°C storage
Note: Operating and storage temperatures depend on the ratings of added memory or batteries, whichever is more restrictive. The typical battery has an operating temperature range of: -40°C to 85°C.
- Humidity: 5-95% relative (noncondensing, also dependent on installed memory or batteries)
- Weight: 2.5 oz (71 gm)

ORDERING INFORMATION

Ampro requires all first time buyers of any Ampro product to purchase a Development Kit version of the product. Kits are configured to provide an overview of how a particular product is assembled and works. They allow testing of products in advance of ordering quantity shipments.

When placing an order, refer to the following model number:

MMX-SSD-K-51 MiniModule/SSD

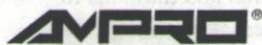
This Development Kit includes: MiniModule/SSD unit with stack-through header and a technical manual. Please consult your local Ampro representative

or Ampro Sales Administration for availability of the MiniModule/SSD unit without stack-through header.

Quantity shipments include the MiniModule/SSD unit only. Please contact the local Ampro representative or Ampro Sales Administration for more ordering information.

The following software may also be ordered for use with the MiniModule/SSD embedded system module:

SWR-SSD-K-01 Ampro Solid State Disk Support Software for DOS operating systems (includes technical manual)



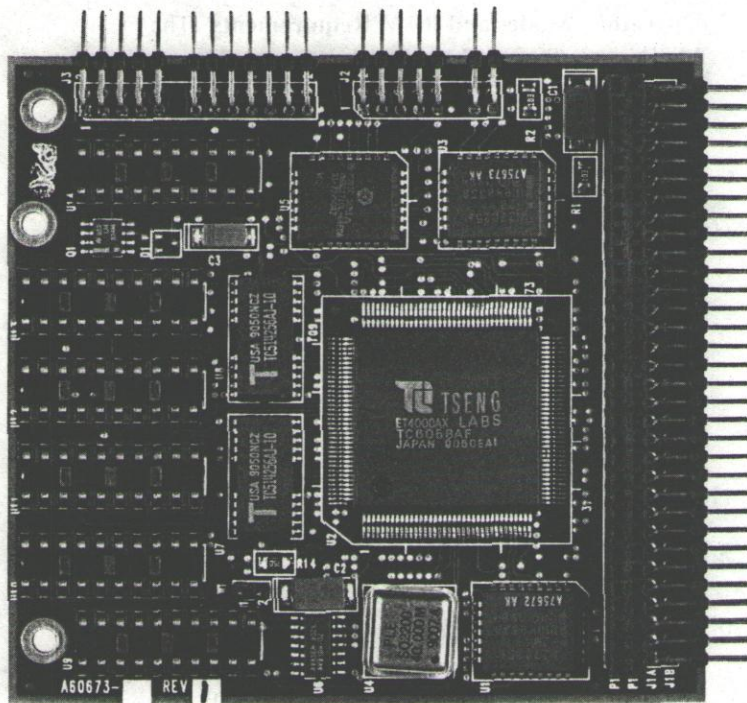
990 Almanor Avenue
Sunnyvale, CA 94086
(408) 522-2100 FAX (408) 720-1305

©1991 Ampro Computers, Inc. All rights reserved.

The Ampro logo is a registered trademark of Ampro Computers, Inc. Ampro, CoreModule, MiniModule, Little Board, Slot Board, SmartClock, Stacker, MiniBackplane, and StackPlane are trademarks of Ampro Computers, Inc. All other names may be trademarks or registered trademarks of their respective companies. Information and specifications are subject to change without notice.

MiniModule™/SuperVGA

Multimode display controller module



Actual size 3.6 x 3.8 inches

- Resolution up to 1024 x 768 with 256 colors, interlaced or noninterlaced
- Text density up to 132 columns x 44 rows
- Hardware and software compatible with five popular video standards: VGA, EGA, CGA, MDA, and Hercules-compatible monochrome graphics
- Software switching between modes
- Supports onboard memory upgrades up to 1 Mbyte
- Compatible with analog or TTL fixed frequency and multifrequency monitors
- Provides a feature connector for external video sources
- Standard Ampro™ MiniModule form factor (3.6 x 3.8 inches)
- +5 volt—only operation and low power consumption (2 watts)

**MONTINE LELKO
LELKO SALES**
13773 NO. CENTRAL, SUITE 1201
DALLAS, TEXAS 75243
(214) 680-9588 • FAX (214) 680-9589

The MiniModule™/SuperVGA *embedded system module* is a compact, high-resolution graphics display controller, offering software selectable, multimode operation. It is implemented in low power CMOS logic, and requires less than 2 watts of power. The SuperVGA module conforms to the Ampro MiniModule standard (3.6 x 3.8 inches), and attaches directly to any of the following: a CoreModule™ CPU module, a Little Board™ single board system, a Slot Board™ single board system, or any Ampro expansion module. A PC expansion bus *passthrough* connector allows additional external expansion. These features make the MiniModule/SuperVGA controller ideal for embedded applications.

Software Compatibility The MiniModule/SuperVGA display controller is compatible with most video standards and video monitors. Using the onboard ET4000 video controller from Tseng Labs, the MiniModule/SuperVGA controller is register and BIOS-level compatible with all popular PC video standards.

The MiniModule/SuperVGA display controller supports the five most popular video formats, but also provides even higher *super* resolutions for special applications. The controller provides PC-compatible color and monochrome graphics or character display capability for CRT video monitors. Video modes are software selectable between VGA, EGA, CGA, MDA, and Hercules-compatible monochrome graphics.

In addition, the following extended-resolution SuperVGA modes are available:

- 640 x 480 with up to 256 colors
- 800 x 600 with up to 256 colors
- 1024 x 768 with up to 256 colors, interlaced or noninterlaced
- Up to 132 column x 44 row text density

Software support for these SuperVGA modes, available from a variety of sources, includes C and other high-level language graphics libraries.

AMPRO®

Pioneering Solutions for Embedded Control

Output Flexibility The MiniModule/SuperVGA display controller easily interfaces to standard VGA monitors. It supports various analog multifrequency monitors such as Sony Multiscan, NEC MultiSync, and Mitsubishi Diamond Scan, and supports fixed frequency analog monitors such as the IBM 85XX family. The display controller also supports TTL monitors for cost-effective backwards compatibility with EGA installations.

The MiniModule/SuperVGA controller provides two display interface headers; one for analog and one for TTL monitors. Ampro provides a transition cable (DB15) with the MiniModule/SuperVGA Development Kit to transfer

SPECIFICATIONS

MEMORY REQUIREMENTS

- Onboard RAM: 256 Kbytes to 1 Mbyte (Two 256 K x 4 DRAMs provided)
- Optional RAM allowed: 512 Kbytes (1 set of two DRAMs), 1 Mbyte (3 sets of two DRAMs)
- Access time: 100 ns, or faster
- Display space: A0000h to BFFFFh
- ROM-BIOS: C0000h to C7FFFh

I/O ADDRESS SPACE

- 03B4h to 03DAh

signals to analog monitors. You can obtain a similar cable for TTL monitors as an option.

Operating Modes and RAM Requirements The MiniModule/SuperVGA controller supports many operating modes offering various resolution choices.

The higher the resolution, the more RAM required. The MiniModule/SuperVGA controller comes with two DRAM devices installed (256 K x 4 DRAM), for a total of 256 Kbytes. Sockets for additional memory allow a total of either 512 Kbytes or 1 Mbyte of onboard memory. For 512 Kbytes, two additional DRAM devices must be added. For 1 Mbyte, six DRAM devices must be added.

VIDEO CHARACTERISTICS

- Bandwidth: 25 MHz to 65 MHz
- Horizontal scan rate: 30 KHz to 49 KHz
- Vertical scan rate: 44 Hz to 70 Hz

PHYSICAL

- Power consumption: 1.8 watt to 2 watt, typical
 - Voltage: +5 V \pm 5%
 - Size: 3.6 x 3.8 x 0.6 inches (90 x 96 x 15 mm)
- Operating environment:
 - Temperature: 0°–70°C
 - Humidity: 5–95% (noncondensing)
- Storage temperature: –55° to +85°C
- Weight: 2.9 oz (81 gms)

ORDERING INFORMATION

Ampro requires all first time buyers of any Ampro product to purchase a Development Kit version of the product. Kits are configured to provide an overview of how a particular product is assembled and works. They allow testing of products in advance of ordering quantity shipments.

When placing an order, refer to the following model number:

MMX-SVG-K-01 MiniModule/SuperVGA Development Kit

This Development Kit contains: MiniModule/SuperVGA unit, DB15 video transition cable, mounting hardware, the MiniModule/SuperVGA support software, and technical manual.

Quantity shipments include the MiniModule/SuperVGA unit only. Please contact your local Ampro representative or Ampro Sales Administration for more ordering information.

You may also order the following accessories or options for use with the MiniModule/SuperVGA controller:

RAM-SVG-Q-01 256 K DRAM (two 256 K x 4) for the MiniModule/SuperVGA controller

CBL-XGA-Q-01 Video transition cable with DB9 connector for multisync monitors

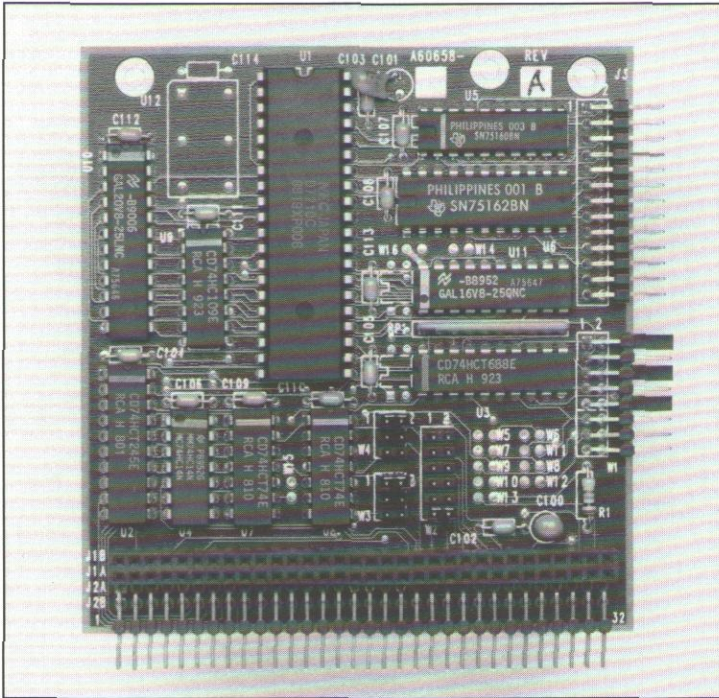


990 Almanor Avenue
Sunnyvale, CA 94086
(408) 522-2100 FAX (408) 720-1305

©1991 Ampro Computers, Inc. All rights reserved.

The Ampro logo is a registered trademark of Ampro Computers, Inc. Ampro, CoreModule, MiniModule, Little Board, Slot Board, SmartClock, Stacker, MiniBackplane, and StackPlane are trademarks of Ampro Computers, Inc. All other names may be trademarks or registered trademarks of their respective companies. Information and specifications are subject to change without notice.

A77008



FEATURES

- IEEE-488 (GPIB) compatibility
- Based on popular NEC 7210 controller
- Compatible with National Instruments PCII
- Complete talker/listener/controller
- Mounts directly on the Ampro Little Board™, Slot Board™, StackPlane™/SSD, or StackPlane/MM, within the board's dimensions
- Small size (3.6" x 3.8"), +5V only operation, and low power CMOS; ideal for embedded applications

DESCRIPTION

The MiniModule/488 is a special purpose digital interface for interconnecting Ampro single board systems with test, data acquisition, control, and recording instrumentation. It is a full function IEEE-488 bus controller, making possible the transfer of data between thousands of compatible devices and the Ampro single board systems. It can be used to monitor, control, and communicate with engineering, scientific, or medical instruments.

The module conforms to the Ampro MiniModule standard (3.6" x 3.8") and can be installed directly on Ampro's Little Board and Slot Board single board systems. It can also be installed on Ampro's StackPlane/SSD or configured with other MiniModules using the Stacker/MM or the StackPlane/MM. When installed on an Ampro Little Board, the MiniModule/488 fits entirely

within the board's space envelope (1.1" thickness required).

The MiniModule/488 can be a controller, talker, or listener as defined by the IEEE-488 standard. In simple systems, only a talker and listener may be present. Complex systems may have multiple controllers, only one of which may be active at any one time.

Data transfers of 300K bytes per second are possible with the MiniModule/488. The bus will operate at the rate of the slowest device, however.

An optional transition cable is available for bringing the signals off the 26-pin square post header on the board to a female 24-pin IEEE-488 connector.

SOFTWARE COMPATIBILITY

Because the MiniModule/488 is compatible with the most popular IEEE-488 controller, the National Instru-

ments PCII, readily available, standard IEEE-488 software can be used without modification.

Ampro has made arrangements for special driver software for the MiniModule/488 to be provided by IOtech. Driver488 is an installable driver that simplifies the process of developing application software. It provides the ability to control up to 14 IEEE-488 devices from popular languages including GW-BASIC, Turbo Pascal, Fortran, C, and assembler.

For information on Driver488, contact: IOtech, Inc., 25971 Cannon Road, Cleveland, OH 44146, Tel. (216)439-4091, FAX (216)439-4093

ORDERING INFORMATION

When ordering, refer to the following model number:

- D19A MiniModule/488 Bus Controller

The above development package includes a cable adapter with a female 24-pin IEEE-488 connector. Contact the factory for quantity purchase ordering information.

SPECIFICATIONS

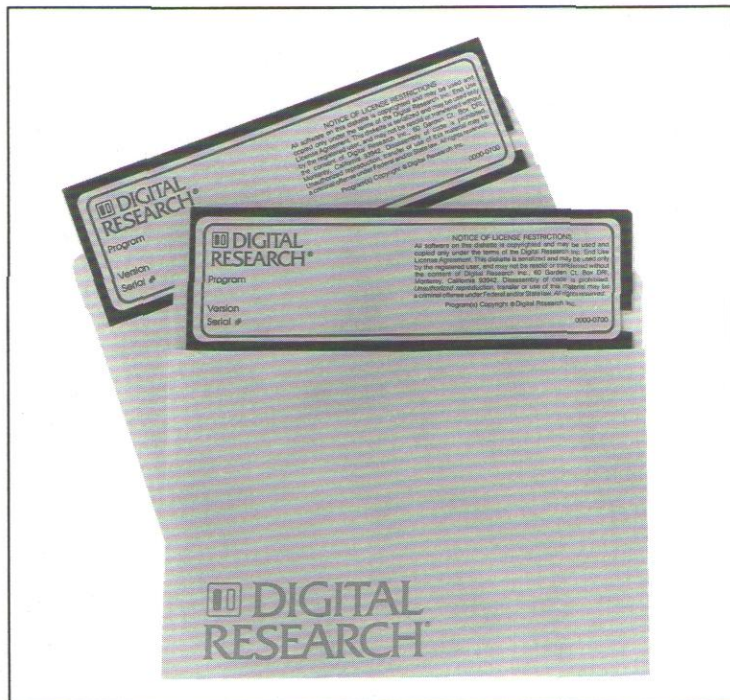
GENERAL

- IEEE-488 specification compatible
- Controller IC: NEC 7210
- Data rate: 300K bytes/sec
- Block length: up to 64K bytes
- I/O space: 8 bytes
- Addressing: any 8-byte boundary in the PC bus I/O address space (jumper selected)
- DMA Channel: 1, 2, or 3 (jumper selected)
- Interrupts: IRQ2, IRQ3, IRQ4, IRQ5, IRQ6, or IRQ7 (jumper selected)

PHYSICAL

- Size: 3.6" x 3.8" x 0.5"
- Power: +5V +/-5% at 300 mA (typ)
- Operating environment:
 - Temperature: 0-70° C
 - Humidity: 5-95% relative (non-condensing)
- Storage temperature: -30 to +85° C

©1990, Ampro Computers, Inc. Little Board, Slot Board, MiniModule, StackPlane, Stacker: Ampro Computers, Inc.; All other product names may be trademarks or registered trademarks of their respective companies.



FEATURES

- Single-user, single-tasking PC-DOS & MS-DOS® 3.x compatible operating system
- Allows use of virtually all DOS 1.x, 2.x, and 3.x application programs, drivers, utilities, languages, and software development tools
- Drives of up to 512 megabytes supported as a single oversize partition
- Complete utility set with built-in help screens to describe options
- Password protection of files and subdirectories
- File-level and byte-level record locking
- Compatible with Ampro SCSI and Solid State Disk (SSD) support

DESCRIPTION

DR DOS is a powerful single-user, single-tasking PC-DOS/MS-DOS 3.x compatible operating system which allows virtually all DOS applications to operate on the Ampro Little Board™ (except Little Board/186) and Slot Board™ single board systems.

DR DOS can be booted from floppy diskette (all standard DOS formats), EPROM or nonvolatile RAM memory devices on the Little Board, Slot Board and SSD Expansion Board, or any SCSI "direct access device" such as hard disk, bubble drive, etc.

DR DOS is designed to be compatible with DOS (PC-DOS or MS-DOS) versions 1.x, 2.x, and 3.x. Virtually all application programs written to use DOS run under the DR DOS operating system without modification. DR DOS supports the full DOS 3.x hierarchical file system structure, and includes a complete set of utilities for directory

and file manipulation. Like DOS 3.x, DR DOS allows an applications program or the user to redirect console input/output to or from other devices such as a printer or disk file. DR DOS also offers the DOS 3.x compatible file-level and byte-level record locking.

In addition to the standard DOS 3.x features, DR DOS provides several key enhancements.

- Command Line Editing – A comprehensive set of command line editing functions, allows the user to correct errors when entering commands and to recall and edit a previously entered command.
- Password Protection – Files can be protected against unauthorized access by use of password protection. Passwords may be assigned to each file or subdirectory, and are stored by DR DOS in encrypted form. Password protection may be set to permit a

variety of access rights to individual files.

- Large Drive Support – Disk drives up to 512 megabytes in size can be supported as a single oversized partition.
- Utility Help Screens – Many of the DOS 3.x compatible utilities provide convenient help screens, accessed by running the utility with a "/H" parameter (e.g. "XCOPY/H").

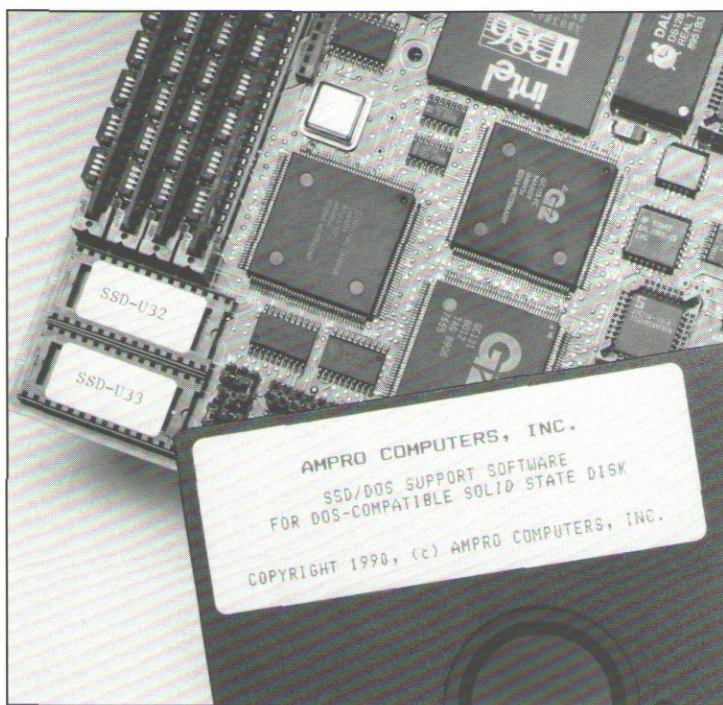
ORDERING INFORMATION

When placing an order, refer to the following model number:

- DR DOS DR DOS Operating System

The D4B, D7B, S7B, and D16A development packages include a DR DOS operating system. Contact the factory for quantity purchase ordering information.

Trademarks and Registered Trademarks: DR DOS: Digital Research, Inc.; MS-DOS: Microsoft, Inc.; Little Board and Slot Board: Ampro Computers, Inc.



FEATURES

- Creates Solid State Disks using sockets on Ampro Little Board™ and Slot Board™ single board systems, and on Ampro SSD expansion boards
- Can use EPROM, NOVRAM, and static RAM devices
- DOS and any DOS compatible file or application software can be stored in SSD
- Each SSD emulates a floppy disk drive operating under DOS
- Supports multiple logical drives, each with read-only or read/write capability
- Supports removable media using cartridge and "credit-card" solid state memories
- Allows system to boot from solid state disk
- Utility software prepares output for EPROM programmer

DESCRIPTION

Ampro's Solid State Disk (SSD) support allows substitution of semiconductor memory devices such as EPROM and static RAM for the disk drives normally required to boot and run a DOS-based system.

Ampro Little Board and Slot Board single board systems make ideal dedicated controllers, "embedded" within a product or device. In many such applications it is unacceptable to use floppy or hard disk drives to hold the operating system, application programs, and data.

The Little Board, or the Slot Board, onboard byte-wide memory sockets can be used as independent SSD drives, or they can be combined into a single larger drive. For greater SSD capacity, Ampro StackPlane™/SSD or Slot Board/SSD expansion boards, with their 16 byte-wide sockets and onboard

backup battery and logic can be added to the Little Board or Slot Board based systems respectively.

The resulting SSD drives act like normal DOS disk drives – nearly all applications can be converted to SSD based operation immediately! In effect, the Ampro SSD utilities automatically turn your software into firmware without modifying DOS, your software, or requiring special programming techniques.

ADVANTAGES OF SSD DRIVES

Solid state disk drives offer a number of important advantages over magnetic media drives:

- **Low power consumption** -- SSD drives consume almost zero power as compared with magnetic media drives. In addition, SSD drives do

not exhibit the startup surge currents characteristic of rotating magnetic media.

- **Resistance to environmental factors** SSD drives are unaffected by shock and vibration, operate over a wide temperature range, and are not degraded by contaminants or electro-magnetic interference.
- **High reliability** -- Because SSD has no moving parts, dissipates very little heat, and is completely digital, it exhibits extremely low failure rates. SSD does not wear out, and is not subject to either the "hard" or "soft" errors experienced with magnetic media drives.
- **Diskless, unattended operation** -- SSD is an ideal program load device. By booting from an SSD, a DOS-based system can act as though it is running dedicated ROM-based software. For example, a DOS

Autoexec.bat file may be placed in SSD to automatically load and execute an application program.

- **Compactness** -- SSD requires far less space than floppy or hard disk drives. For example, a 256K byte EPROM SSD drive can be installed directly on the Little Board, requiring no extra space.
- **Speed** -- Since there is no track-to-track seeking, SSD drives offer very fast data access. Data transfers occur at memory access speeds, resulting in a substantial speed advantage over floppy disk drives.
- **Cost savings** -- Substituting an EPROM SSD for a floppy drive as a program load device results in reduced system costs, when all related system components are considered -- including disk drive, power supply, and packaging.

SSD SUPPORT FEATURES

Ampro's SSD support encompasses a wide variety of memory devices. Each byte-wide socket can be used for EPROM, static RAM, or NOVRAM devices. Flash EPROM devices may also be used on Ampro's SSD expansion boards.

- **EPROM** -- EPROM are supported transparently through the SSD software. Many popular device sizes are supported.
- **NOVRAM on Little Board and Slot Board sockets** -- When a Little Board or Slot Board byte-wide socket is used as an SSD, the devices installed in the sockets should be special NOVRAM modules that contain their own internal battery backup. This type of device is available as a 28-pin NOVRAM module that plugs directly into the socket. Little Board or Slot Board sockets do not have provision for battery backup.
- **NOVRAM on SSD expansion boards** -- The Ampro SSD expansion boards have onboard battery backup logic, which means that you can use ordinary static RAM devices to build a NOVRAM SSD.
- **Removable NOVRAM** -- A NOVRAM cartridge can be connected to a byte-wide socket by means of a short cable, which provides removable NOVRAM. An advantage of removable NOVRAM cartridges is that they are rugged and reliable SSD media, allowing data import/export to systems in applications where floppy disks are not practical. They are small and

ORDERING INFORMATION

When placing an order, refer to the following model number:

- 10SSD SSD/DOS Support Software
- The following may also be ordered for use with the SSD/DOS Support Software and either Ampro single board systems or the SSD expansion boards:
- A91215 27011 EPROM

take up virtually no system space for drives or interfaces, and they offer high density of up to 512K bytes per cartridge. NOVRAM support is provided for Dallas cartridges and the Databook Thin Card product.

The SSD devices used on the Little Board, Slot Board, and SSD expansion boards can be programmed as one or more DOS drives. Each SSD drive has a maximum capacity of 1.44M bytes, which is the maximum floppy drive capacity allowed under DOS. As with a floppy drive based system, SSD drives can be used in a system along with other floppy drives or hard disk drives and such systems can boot from floppy, hard, or SSD drives.

UTILITY PROGRAMS

The Ampro SSD Utilities provide a number of tools to aid in the creation of SSDs. These include:

NOVRAMFMT.COM -- This program formats NOVRAM devices, including ordinary static RAMs and non-volatile RAM cartridges. Its function is similar to the DOS utility FORMAT.COM, in that it prepares the target NOVRAM for use as a disk device. It does not transfer the operating system to the SSD.

SSD-DRVR.SYS -- SSDs which are either unformatted, absent, or non-linkable at boot time, are not installed by the ROM-BIOS during the system boot process. Access to SSD drives not installed by the ROM-BIOS at boot time is provided by the SSD-DRVR.SYS device driver.

EPROMFMT.COM -- This program prepares a floppy diskette to become a master diskette that contains information necessary to create the EPROM SSD image. EPROMFMT initializes the diskette so that it matches the size of target SSD EPROM(s). It does not transfer the operating system to the SSD.

EPROMGEN.COM -- This utility uses the diskette prepared by the EPROMFMT.COM utility to create one or more EPROM image files required by an EPROM programmer. The files produced by EPROMGEN.COM are binary, hexadecimal, or Intel Hexadecimal images of the contents of the target EPROM(s).

SSDMODE.COM -- This utility can modify an SSD's boot record to prevent the Ampro ROM-BIOS from attempting to boot from that device or from linking it into the list of BIOS-installed drives at boot time. This utility is useful when creating data-only EPROM SSDs, and can force the system to boot from a hard disk or floppy drive instead of from the SSD.

RESTRICTIONS

Please note the following restrictions which apply to the use of the Ampro SSD Utilities:

- The Ampro SSD Utilities are for use only with Ampro CPU boards.
- Use of this product with the Little Board/PC is restricted to Model 4B (or later) and requires ROM-BIOS version 3.0 (or later).