Little Board™ P6d Reference Manual

P/N 5001451A Revision B

REVISION HISTORY

Revision	Reason for Change	Date
1	Pre-Production Release	08/00
A	Production Release	11/00
B	Updates/Revisions	02/02

AUDIENCE ASSUMPTIONS

This reference manual is for the person who designs computer related equipment, including but not limited to hardware and software design and implementation of the same. Ampro Computers, Inc. assumes you are qualified in designing and implementing your hardware designs and its related software into your prototype computer equipment

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Preface

Introduction

This manual is for integrators and programmers of systems based on the Ampro Little Board™ P6d, a full-featured CPU module conforming to the EBX 1.1 technical specification. It contains technical information about hardware requirements, interconnection, and software configuration.

Technical Support

Ampro Computers, Inc. provides a number of methods for contacting Technical Support listed in the following *Table i*. Ampro provides a comprehensive listing of Frequently Asked Questions on our web site at the Virtual Technician. If you can not find the answers to your questions, please continue in the Virtual Technician and ask for Personal Assistance. Requests for support through the web site are given the highest priority, and usually will be addressed within one working day.

■ Internet – Provides the most information concerning Ampro products, including reference material and white papers.

   – Ampro Virtual Technician – This service is free and available 24 hours a day through the Ampro Computers World Wide Web site at http://www.ampro.com. However, you must sign in to access this service.

     The Ampro Virtual Technician is a searchable database of Frequently Asked Questions, which will help you with the common questions asked by most customers. This is good source of information to look at first for your technical solutions. .

   – Embedded Design Resource Center – This service is also free and available 24 hours-a-day at the Ampro web site at http://www.ampro.com. However, you must sign in to access this service .

     The Embedded Design Resource Center was created as a resource for embedded system developers to share Ampro's knowledge, insight, and expertise gained from years of experience. This page contains links to White Papers, Specifications, and additional technical information.

■ Personal Assistance – This is the quickest way to obtain a response to your support questions. Please go to the following location on Ampro's web site to submit your request 24 hours a day, 7 days a week.

http://www.ampro.com/scripts/virtual_technician.exe/people

Table i. USA Technical Support Contact Information

Email	techsupport@ampro.com
Website	http://www.ampro.com
FTP	ftp://ftp.ampro.com
Surface Mail	Ampro Computers, Incorporated 5215 Hellyer Avenue San Jose, CA 95138-1007, USA

Chapter 1

Introduction

General Description

The Little Board™ P6d system is a high integration, high-performance Pentium-II based PC/AT-compatible system that conforms to the EBX V1.1 specification. This rugged and high quality single-board system contains all the component subsystems of a PC/AT PCI motherboard plus the equivalent of up to six expansion boards. The Little Board P6d system meets the size, power consumption, temperature range, quality, and reliability demands of embedded system applications.

Key functions on the Little Board P6d module include:

- High-speed Pentium-II CPU
- 64-bit wide 3.3V SDRAM - up to 256MB
- 256KB Internal secondary cache
- Embedded-PC BIOS in Flash EPROM
- Four buffered serial ports (with RS232, RS485, TTL options)
- Two universal serial bus (USB) ports
- Infrared (IrDA) port
- Multi-mode IEEE-1284 parallel port
- Floppy controller

- Dual PCI-bus EIDE/UltraDMA drive controllers
- Flat panel/CRT display controller
- Sound Blaster™ Audio
- Ethernet 100BaseT LAN interface,
- CompactFlash solid-state IDE drive support
- Standard PS/2 Keyboard/Mouse and speaker interfaces

In addition, Ampro has made many improvements to the architecture and firmware of the traditional desktop PC to optimize it for embedded applications. Among the many embedded-PC enhancements that ensure fail-safe embedded system operation and application versatility are a watchdog timer, a powerfail NMI generator, serial console support, serial boot loader, non-battery boot, failsafe boot, accelerated boot, on-board high-density CompactFlash disk, and BIOS extensions for OEM boot customization.

System operation requires a single +5 Volt power source (and 3.3 Volts for low-voltage PCI expansion cards, if required) and offers "green PC" power-saving modes under support of Advanced Power Management (APM) BIOS functions.

Product Feature Summary

CPU/Motherboard

The Little Board P6d module has a fully compatible PC architecture, with a Pentium-II low-voltage CPU.

For improved reliability in harsh thermal environments, the board implements a CPU thermal sensor and configurable thermal-management control logic in the BIOS.

The board uses a single 3.3V DIMM memory module for main DRAM memory, and supports from 32MB to 256MB in a 64-bit or 72-bit (ECC) configuration.

The module has a full complement of standard PCI PC/AT architectural features, including DMA channels, interrupt controllers, real-time clock, and timer counters.

Enhanced Embedded-PC BIOS

One of the most valuable features of the Little Board P6d module is its enhanced embedded-PC BIOS, which includes an extensive set of functions that meet the unique requirements of embedded-system applications. These enhancements include:

- CompactFlash support. You can use a solid-state CompactFlash memory module in place of a rotating media drive (see CompactFlash Disk, below).
- Watchdog timer. The WDT monitors the boot process and can be integrated into application programs using function calls provided in the BIOS.
- Fast boot operation. Normal or accelerated POST.
- Fail-safe boot support. Intelligently retries boot devices (configured in the BIOS) until a successful boot.
- Battery-free boot support. Saves system Setup information in non-volatile EEPROM. The board can use this information should the RTC battery fail.
- Serial console option. Let's you use a serial device, such as an ASCII serial terminal, as console.
- Serial loader option. Supports loading boot code from an external serial source.
- EEPROM access function. 256 bits of serial EEPROM storage are available to the user, useful for serialization, copy protection, security, etc.
- OEM customization hooks. The module can execute custom code prior to system boot via ROM extensions; allows sophisticated system customization without BIOS modification.

Modular PC/104-Plus Expansion Bus

The Little Board P6d module provides a PC/104-Plus expansion bus for additional system functions. This bus offers compact, self-stacking, modular expandability. It is an embedded system version of the signal set provided on a desktop PC's ISA bus. The PC/104-Plus bus includes this signal set, and in addition, signals implementing a PCI bus, available on an additional 120-pin PCI bus connector.

The Little Board P6d module's on-board EIDE, Ethernet, and Audio interface are internally connected to its PCI bus. In addition, you can attach PCI peripherals to the board's stackable PCI bus expansion connector in much the same way PC/104 modules are stacked on the PC/104 connectors. The PCI expansion connector consists of 4 rows of 30 pins (120-pin header), and carries all of the appropriate PCI signals to accommodate up to 4 PCI add-on modules. The bus operates at clock speeds up to 33MHz.

CompactFlash Disk

The CompactFlash interface allows you to substitute solid-state Flash memory for a conventional Hard drive. Any DOS-based application, including the operating system, utilities, drivers, and application programs, can easily be run from the CompactFlash device without modification.

The CompactFlash disk is a solid-state or rotating media disk system that emulates an IDE drive. It uses standard CompactFlash disk media, similar to a PCMCIA memory card, but smaller. Insert the CompactFlash disk media in the on-board CompactFlash socket, and use it in much the same way you would use a removable-media hard drive. The CompactFlash drive is architecturally equivalent to an IDE drive in your system. When installed, it becomes one of the two IDE drives supported by the primary EIDE disk controller. It can be configured as either an IDE master or slave drive.

Serial Ports

The Little Board P6d module provides four RS232C serial ports, implemented using 16C550-type UARTs. These UARTs are equipped with 16-byte FIFO buffers to improve throughput.

Serial ports 1 & 2 have full modem support. There are RS232 level shifters on all signals. The RX and TX data signals can also be configured as RS485/RS422. The TTL versions of the TX and RX signals for port 1, 3, and 4 are also brought out to the utility connector. Port 2 TTL TX and RX are brought out to the Utility connector via the IrDA interface.

Parallel Port

An enhanced bidirectional parallel port interface conforms to the IEEE-1284 standard. It provides features attractive to embedded system designers, including increased speed, an internal FIFO buffer, and DMA transfer capability.

Floppy Interface

An on-board floppy disk interface provides access to standard floppy drives. The interface supports two floppy drives, 5-1/4 inch or 3-1/2 inch. All standard floppy drive types, from 360K at 5-1/4 inch to 1.44M at 3-1/2 inch are supported.

PCI-Bus EIDE Interfaces

On-board PCI EIDE/Ultra DMA/33 interfaces provide high-speed hard disk, IDE CD-ROM drive, and other IDE device access. The interfaces support up to four IDE devices (via primary and secondary drive interfaces). The interfaces are fully compliant with the AS/NSIS ATA Rev. 3.0 specification and the ATAPI Specification.

The CompactFlash interface is implemented as an IDE drive. If it is installed, it takes the position of one of the drives of the primary IDE interface (settable as a master or slave drive).

PCI Audio Interface

The SoundBlaster™ compatible audio interface is implemented using a combination of the Trident 4DWAVE-NX PCI DirectSound Accelerator, the National LM4549 AD97 CODEC and a National LM4863 Audio Amplifier.

Flat Panel/CRT Display Controller

A 69030 video display controller supports both flat panels and CRTs, and offers full software compatibility with all popular PC video standards (VGA, Super VGA, and VESA). All standard resolutions up to 1600x1200 pixels at 64K colors for CRTs and up to 1280x1024 pixels at 16.7M colors for flat panels are supported. 4MB of SDRAM are provided as standard video memory. The display controller features are:

- Enhanced AGP Bus Interface – The video controller provides a 66MHz AGP-bus path between the CPU and the controller.
- Full IBM VGA compatibility – VESA DPMS and DCC standards supported.
- Color Flat Panel Support – Up to 16.7 million colors can be displayed on color TFT LCD flat panels and color STN LCD panels.
- Dual Independent Displays – The controller provides three different modes, which include two completely separate and independent video displays (CRT and flat panel) with resolutions up to 1280x1024 at 256 colors at 60Hz.
  - Dual-Pipe Simultaneous Mode – This mode provides the same image on both displays and each display (CRT or flat panel) can operate at its optimum timing.
  - Dual-Pipe Mosaic Mode – This mode provides two displays with completely different images on each display and each display can be configured at its optimum resolution/timing.
  - Virtual Desktop Mode – This mode provides a single image or desktop spanned across the two displays.
- Automatic Power Sequencing Controls. The video controller provides the signals to safely sequence the power and data signals to LCD flat panels.
- Low-Power Modes. The Advanced Power Management (APM) and Advanced Configuration and Power Management Interface (ACPI) compliant features are implemented in the power control logic.
- ZV Port Support. The standard ZV input port for PCMCIA is supported.

100 MBps Ethernet LAN Interface

The Ethernet subsystem is based on the Intel 82559ER 10/100BaseT PCI Ethernet Controller. It fully supports IEEE 802.3 Ethernet standards - 10BaseT and 100BaseT. Features of this Ethernet controller include:

- Chained memory structure
- Full Duplex support at 10 and 100Mbps
- IEEE 802.3u Auto-negotiable support

Enhanced Reliability

Reliability is especially important in embedded computer systems. Ampro, specializing in embedded system computers and peripherals, knows that embedded systems must be able to run reliably in rugged, hostile, and mission-critical environments without operator intervention. Over the years, Ampro has evolved system designs and a comprehensive testing program to ensure a reliable and stable system for harsh and demanding applications. These include:

ISO 9001 Manufacturing. Ampro is a certified ISO 9001 vendor. Knowing that many embedded systems must qualify under EMC emissions and susceptibility testing, Ampro designs boards with careful attention to EMI issues.

Wide-range temperature testing. Ampro Engineering qualifies all of its designs by extensive thermal and voltage margin testing.

Shock and Vibration Testing. Ampro products are intended for use in harsh environments and are designed for shock and vibration durability to MIL-STD 202F, Method 213-I, Condition A (three 50G shocks in each axis) and MIL-STD 202F, Method 214A, Table 214-I, Condition D (11.95B random vibration, 100 Hz to 1000 Hz).

Software

The vast array of commercial and public-domain software for the IBM PC and PC/AT is usable in LB/P6d-based systems. You can use the most popular software development tools (editors, compilers, debuggers, etc.) for developing code for your application. With this software and the standard Ampro-supplied utilities and drivers, you can quickly tailor a system to your needs.

Use the board's Setup function for all system configurations. Setup information is stored in both the battery-backed CMOS RAM-portion of the real-time clock, and in a configuration EEPROM. Setup information is retained in the EEPROM even if the real-time clock battery loses power, ensuring reliable start-up.

Setup can be invoked by pressing the DEL key during the Power-On Self Test (POST). The contents of the EEPROM can be written and read from the DOS command line using a utility program, SETCMOS.EXE, available on the Little Board P6d Utilities diskette.

Designing Little Board Systems

The board affords a great deal of flexibility in system design. You can build a system using only the Little Board, serial or parallel devices for input/output, and a solid-state disk drive.

On-board MiniModule Expansion

The simplest way to expand a Little Board system is with self-stacking Ampro MiniModules. MiniModules are available for a wide variety of functions. You can stack the MiniModules on the Little Board and avoid the need for bus cables, card cages, and backplanes. For detailed information, see page 2-43.

Little Board Development Platform And QuickStart Kit

To help developers quickly assemble an embedded system, Ampro offers the Little Board Development Platform. It includes a power supply, 3-1/2 inch 1.44M floppy disk drive, IDE hard drive, CD ROM drive, speaker, I/O connectors, a backplane for ISA and PCI expansion cards, an I/O development board (described below), and mounting studs for the Little Board.

The Development Platform provides a "known good" environment for your development work. You can install the Little Board P6d module, MiniModules, or conventional expansion boards, keyboard, monitor, and I/O devices to quickly create a platform for your hardware and software engineering needs.

The QuickStart Kit includes cables, documentation, and software needed to develop an application with the Little Board. Unlike the Development Platform, you must supply the disk drives and power supply. Technical drawings for the cables provided in the QuickStart Kit are included in Appendix B.

There are other kits available from Ampro to aid in the development of your application. A Cable Kit that includes only the Little Board P6d cable set is available.

To facilitate connections to the Little Board P6d utility connectors, Ampro provides the Little Board P6d Utility I/O Development Board. Figure 1-1 is an illustration of the I/O Development board showing the connectors and switches that are provided. It is included in the Development Platform Kit and the QuickStart Kit.
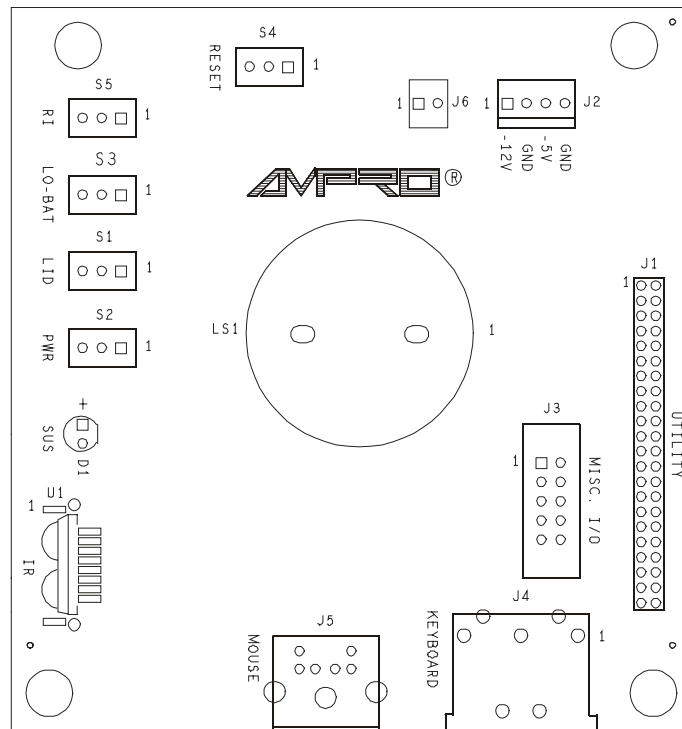
Figure 1-1. I/O Development Board

The Little Board P6d Utility I/O Development Board provides connections for the speaker, keyboard, mouse, IrDA, TTL serial, front panel switches, misc. power management signals, external power supply connections, and so forth.

Table 1-1 summarizes the connectors available on the I/O Development Board.

Table 1-1. I/O Development Board Connector Summary

Connector	Name	Description
J1	Utility	Connect to Little Board P6d Utility
J2	Power	Provides connections for -12V and -5V
J3	Misc.	Misc. Power Management and TTL Serial
J4	Keyboard	Plug in a standard PS/2 Keyboard
J5	Mouse	Plug in PS/2 Mouse

Connector Descriptions

The following sections describe the use of each connector on the I/O Development Board.

J1 — Utility

The Utility connector connects to the Little Board P6d Utility connector. It provides connections to an on-board speaker, keyboard connector, Mouse connector, reset switch, IrDA Transceiver, TTL RS232 signals, misc. power management I/O, and a connector for external -5V and -12V power supplies, and a power LED.

If you have the Ampro QuickStart Kit, connect a ribbon cable between J1 on the I/O Development Board and J19 on the Little Board.

J2 — Power

You can use J2 to connect -5V and -12V power supplies to the Little Board.

Table 1-2. –5V and –12V Power Wiring

Pin #	Signal
1	-12 Volts
3	-5 Volts
2, 4	Ground

J3 — Misc.

This connector contains miscellaneous Power Management signals and the TTL serial.

Table 1-3. Miscellaneous Power Management and TTL Wiring

Pin #	Signal	Pin #	Signal
1	TTL_TX3	2	TTL_RX1
3	TTL_RX3	4	TTL_TX1
5	TTL_GND	6	SMBALRT
7	TTL_TX4	8	SMBDATA
9	TTL_RX4	10	SMBCLK

J4 — Keyboard

You can use J4 to connect a PS/2 keyboard. J4 is a standard 5-pin DIN connector.

J5 — Mouse

You can use J5 to connect a PS/2 mouse. J5 is a standard 6-pin mini-DIN connector.

Switch Descriptions (S1 – S5)

There are five switches on the I/O Development Board. They're described in Table 1-4.

Table 1-4. I/O Development Board Switches

Switch	Name	Description
S1	LID	Power management input: causes an SMI to simulate a laptop lid closure.
S2	PWR	Power management input (push-button switch): when pushed for 6 seconds, it powers down the board. When pressed again, the board powers up.
S3	LO BAT	Power management input: causes an SMI to simulate a low-battery condition.
S4	RESET	Standard Reset signal to the Little Board
S5	RI	Ring Indicator: causes an SMI to simulate a laptop modem ring.

Figure 1-2 is a block diagram of the Little Board P6d architecture.
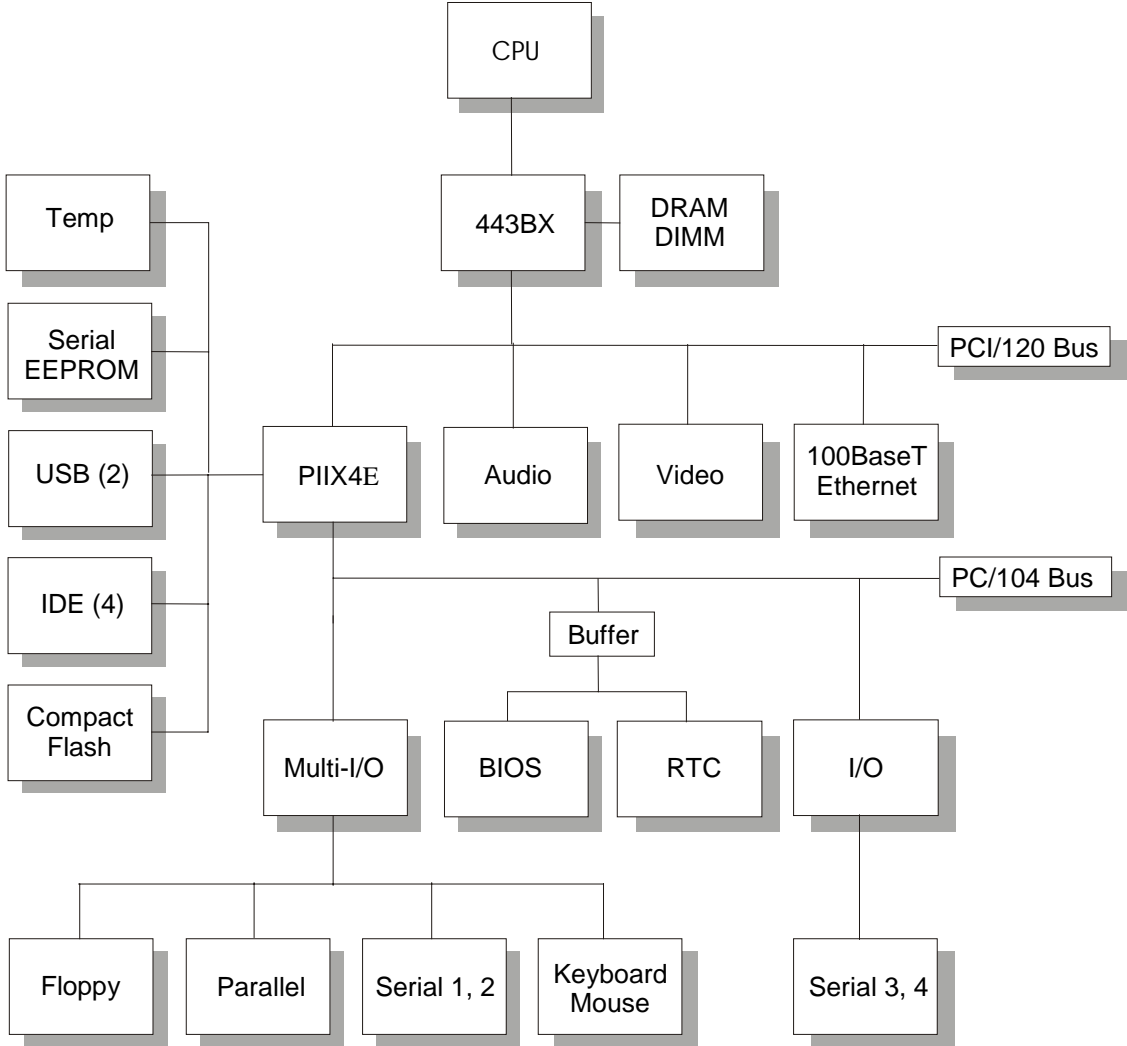
Figure 1-2. System Block Diagram

Chapter 2

Product Reference

Overview

This chapter contains the technical information you will need to install and configure the Little Board P6d system. The information is presented in the following order:

Mounting Dimensions

Figure 2-1 shows the Little Board P6d module's mounting dimensions.
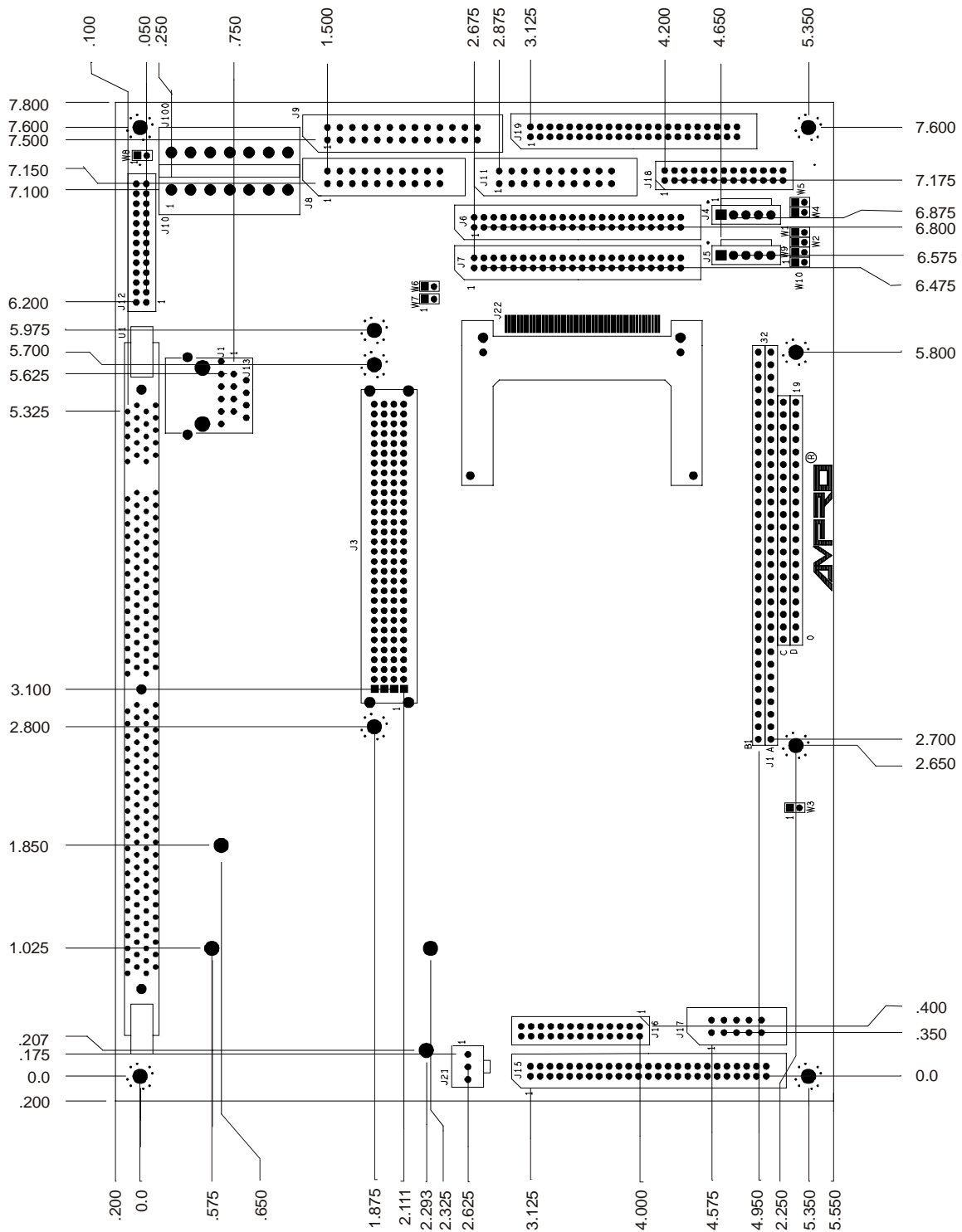
Figure 2-1. Little Board P6d Module with Mounting Dimensions

Connector Summary

Refer to Figure 2-2. Little Board P6d Connector and Jumper Locations for the locations of the connectors (J1 – J21) and configuration jumpers (W1 – W9). Table 2-1 summarizes the use of the I/O connectors.

Each interface is described in its own section, showing connector pinouts, signal definitions, required mating connectors, and configuration jumper options.

Many of the connectors have a key pin removed. This allows you to block the corresponding cable connector socket to help prevent improper assembly. Table 2-1 indicates which pins are key pins.

Table 2-1. Connector Summary

Connector	Function	Size	Key Pin
J1 A/B	PC/104 Expansion Bus	64-Pin	B10
J2 C/D	PC/104 Expansion Bus	40-pin	C19
J3	PCI Bus	120-pin	A1/D30*
J4	USB 1	5-PIN	Mechanical Key**
J5	USB 2	5-PIN	Mechanical Key**
J6	IDE1 Interface	44-pin 2mm	20
J7	IDE2 Interface	44-pin 2mm	20
J8	Serial 1 and Serial 2	20-pin	None
J9	Parallel Port	26-pin	26
J10 (J100)	Power, +5V, +12V, +3.3V (J100 Alternate Connector)	7-pin Molex	Mechanical Key**
J11	Serial 3 and Serial 4	20-pin	None
J12	Audio Interface	26-pin 2mm	25
J13	Ethernet Twisted Pair	RJ45	Mechanical Key**
J14	Ethernet Option	6-pin	None
J15	Flat Panel Video	50-pin 2mm	None
J16	Video ZOOM	26-pin 2mm	None
J17	CRT Video	10-pin	None
J18	Floppy Interface	26-pin 2mm	1
J19	Utility	44-pin 2mm	31
J21	Fan Power	3-pin	None
J22	CompactFlash	50-pin	Mechanical Key**
Notes: *A1 and D30 keys are used to key the PCI connector for 5V or 3.3V respectively.			
**Connector provides keying mechanism.			

Most I/O connectors are shrouded dual-row male headers for use with flat ribbon (IDC) female connectors and ribbon cable.

Note

Ampro recommends using "center-bump polarized" connectors to prevent accidentally installing cables backwards.

You can also design a PC board assembly, made with female connectors in the same relative positions as the Little Board's connectors, to eliminate cables, meet packaging requirements, add EMI filtering, or customize your installation in other ways. Precise dimensions for locating connectors are provided in Figure 2-1.

The ISA portion of the PC/104-Plus bus appears on connector J1A, J1B, J2C, and J2D. You can expand the system with on-board MiniModule products or other PC/104-compliant expansion modules. These modules stack directly on the connectors, or use conventional or custom expansion hardware, including solutions available from Ampro.

The PCI portion of the PC/104-Plus expansion bus appears on connector J3. It uses a 2 mm 4-row connector called out in the PC/104-Plus draft specification. Like the J1, J2 connector, J3 has both male and female connections, allowing for "stackthrough" assembly.
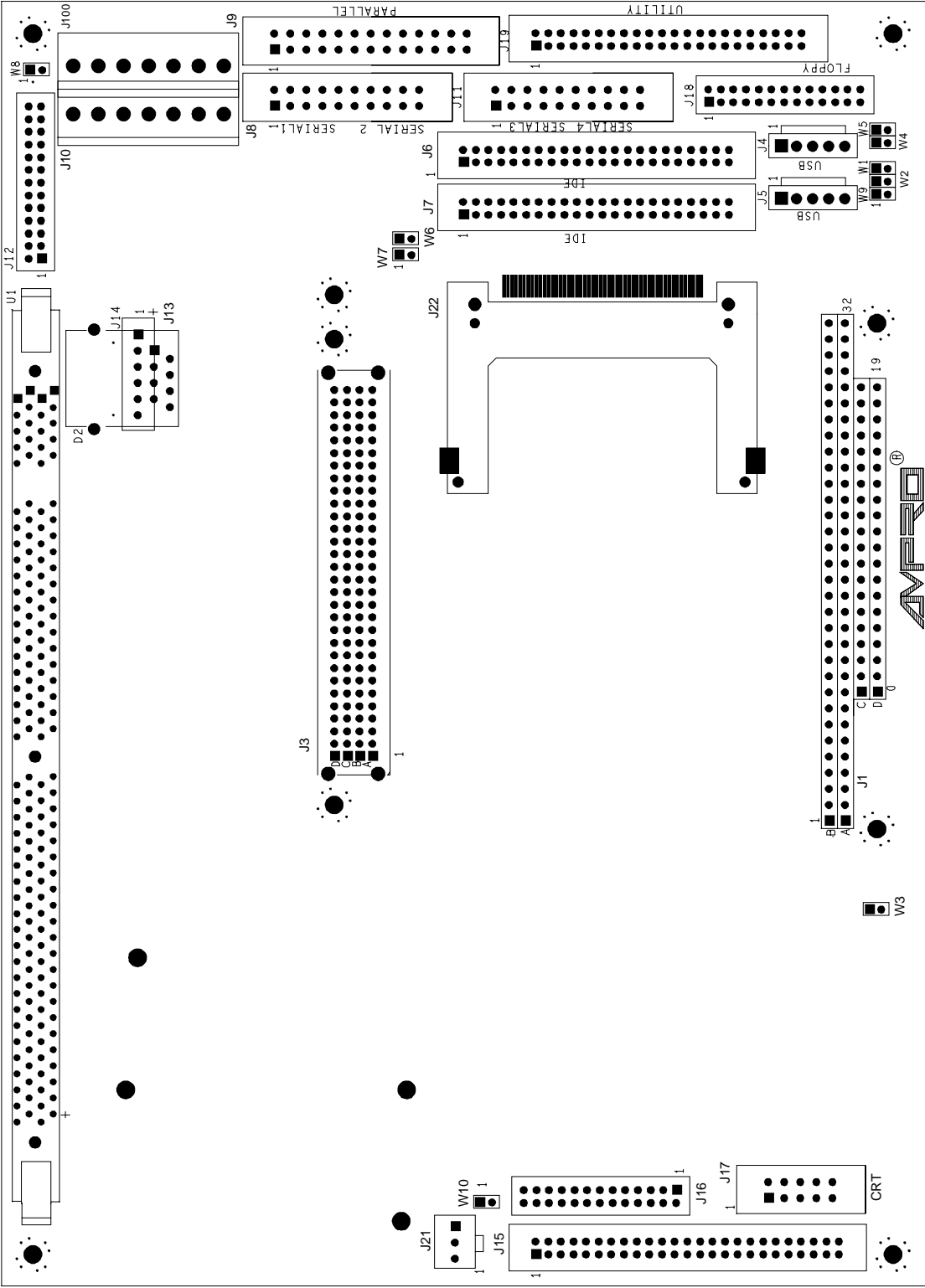
Figure 2-2. Little Board P6d Connector and Jumper Locations

Jumper Summary

Ampro installs option jumpers in default positions so that in most cases the Little Board P6d module requires no special jumpering for standard AT operation. You can connect the power and peripherals and operate it immediately.

Jumper-pin arrays are designated W1, W2, and so forth. Jumper pins are spaced 2 mm apart. A square solder pad identifies pin 1 of each jumper array. Table 2-2 is a summary of jumper use. Factory settings are shown in the Default column. Some jumpers are set at the factory to configure options that are not user-settable. These are indicated in the table. Do not change these settings.

Table 2-2. Configuration Jumper Summary

Jumper Group	Function	Default
W1	CompactFlash IDE Master/Slave ON=Master, OFF=Slave	ON
W2	BIOS Flash EPROM Programming Power ON=Programming enabled OFF= Programming disabled	ON
W3	External BIOS Board Enable/Cable Connection ON=Normal, OFF=External Cable	ON
W4	Serial 1 RS485 100 Ohm Termination ON=Terminated, OFF=Unterminated	OFF
W5	Serial 2 RS485 100 Ohm Termination ON=Terminated, OFF=Unterminated	OFF
W6	Serial 3 RS485 100 Ohm Termination ON=Terminated, OFF=Unterminated	OFF
W7	Serial 4 RS485 100 Ohm Termination ON=Terminated, OFF=Unterminated	OFF
W8	Local Head Phone Enable ON = Enable Local HP, OFF = Disable HP	OFF
W9	Watchdog timer reset enable ON=Enabled, OFF=Disabled	OFF

DC Power

The power connector J10 is a 7-pin polarized connector. Refer to Table 2-3 for power connections and Table 2-4 for mating connector information.

Caution

To prevent damage to the Little Board P6d or its power connector, ensure the power plug is wired correctly before applying power to the module!! See Table 2-3.

Table 2-3. Power Connector (J10)

Pin #	Signal Name	Function
1, 7	+5VDC	+5VDC ±5% input
2, 3, 6	Ground	Ground return
4	+12VDC	+12VDC ±5% input
5	+3.3VDC	+3.3V ±5% input (Only required for some PCI expansion boards)

Table 2-4. J10 Mating Connector

Connector Type	Mating Connector
DISCRETE WIRE	MOLEX HOUSING 09-50-8073 Pins 08-52-0071

Power Requirements

The Little Board P6d module requires only +5VDC (±5%) for operation. The voltage required for the RS232 ports is generated on-board from the +5VDC supply. An on-board low-voltage power supply circuit provides power to low-voltage CPUs and certain other on-board components.

The exact power requirement of the Little Board P6d system depends on several factors, including the CPU speed, the peripheral connections, and which, if any, MiniModule products or other expansion boards are attached. For example, the keyboard draws its power from the board, and there can be some loading from the serial, parallel, and other peripheral ports. Consult the specifications in Chapter 3 for the basic power requirements of your model.

Other Voltages

There may be a requirement for an external +12 volt supply, depending on what peripherals you connect to the Little Board system. For instance, +12V is required for most flat panel backlight power supplies. You can connect a +12V supply to the Little Board module through the power connector, J10. This will supply +12V to the ISA and PCI portions of the PC/104 expansion busses. Similarly, you can connect -12V and -5V to the Utility Connector, to supply those voltages to both expansion busses. Pinouts for the Utility Connector are provided in Table 2-4.

If a PCI expansion card requiring 3.3V is installed, that voltage can be connected to J10-5 to supply power to J3, the PCI bus interface connector.

Switching Power Supplies

If you use a switching power supply, be sure it regulates properly with the load your system draws. Some switching power supplies do not regulate properly unless they are loaded to some minimum value. If this is the case with your supply, consult the manufacturer about additional loading, or use another supply or another type of power source (such as a linear supply, batteries, etc.). The minimum power for the Little Board P6d system appears in the power specifications in Chapter 1.

Powerfail NMI

The Little Board P6d module includes a circuit that can sense a power failure. If the +5V power supply falls below ~4.7V, the powerfail logic produces a non-maskable interrupt (NMI).

When a NMI occurs, the BIOS detects the NMI and displays the message "Power Fail NMI" on the console. At this point you have two options via the keyboard. You can mask the NMI and continue (the PC architecture provides a mask bit for the non-maskable interrupt), or reboot the system.

If you want your system to respond to the NMI, you can provide a NMI handler in your application, and patch the NMI interrupt vector address to point to your routine.

Backup Battery

The Real-Time Clock Battery on the Little Board P6d module should last 10 years under normal usage.

Cooling Requirements

The Pentium-II CPU, DRAM module, video controller, and core logic chips draw most of the power and generate most of the heat. The board is designed to support various speed versions of the Pentium-II from 333MHz to 366MHz with a 66MHz clock speed.

A heat sink and fan are provided for the CPU and a thermal sensor is used to monitor the CPU temperature, as described below.

Thermal Sensor

A thermal sensor monitors the internal temperature of the Pentium-II CPU. If the thermal sensor detects the CPU temperature has exceeded its upper temperature threshold (100°C/212°F), the thermal sensor's logic sends a signal to the BIOS to reduce the CPU clock speed. This speed reduction remains in effect until the processor has cooled to the lower sensor limit. Choosing to operate the CPU at a temperature higher than this upper limit should be avoided due to the possibility of CPU damage and its erratic operating speed.

Fan Connector

Figure 2-3 shows the connection between the fan and J21. The pinout of J21 is shown in Table 2-5.
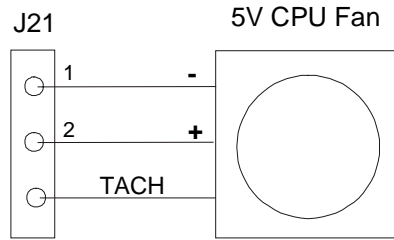
Figure 2-3. CPU Fan Connection (J21)

Table 2-5. Fan Power Connector (J21)

Pin #	Function
1	Switched Ground
2	+5V Power
3	TACH Output

System Memory

The module supports a single 168-pin DIMM socket. The system supports both 64-bit SDRAM and 72-bit SDRAM. The 72-bit SDRAM is used to support ECC (Error Detection And Correction). You can install from 32MB to 256MB, depending on your memory needs.

The ROM BIOS automatically detects the size of the installed memory module and configures the system accordingly at boot time (No jumpering or manual configuration is required.). The amount of memory the BIOS measures can be displayed by running Setup. Memory error correction (ECC) is supported by the chip set used on the Little Board P6d module. DRAM memory is allocated in the system as shown in Table 2-6.

Table 2-6. System Memory Map

Memory Address	Function
FE0000h - FFFFFFh	Duplicates BIOS at 0E0000-0FFFFFh.
100000h - FDFFFFh	Extended memory
0E0000h - 0FFFFFh	128K ROM BIOS
0D0000h - 0DFFFFh	BIOS extension option, if enabled. Otherwise, free.
0CB000h - 0CFFFFh	USB
0C0000h - 0CAFFFh	Video BIOS (44K)
0A0000h - 0BFFFFh	Normally contains video RAM, as follows: CGA Video: B8000-BFFFFh Monochrome: B0000-B7FFFh EGA and VGA video: A0000-AFFFFh
000000h - 09FFFFh	Lower 640K DRAM

ROM BIOS

The standard BIOS is installed in a 256KB Flash device at the factory. The top 128KB of the Flash device is reserved for the system BIOS, located at 000E0000h – 000FFFFFh and mirrored at the top of the memory address space. The remaining 128KB are mapped only to the top of memory.

A utility program, PGM6X.COM, can be used to program the on-board Flash device. It can be used to update the system BIOS, video BIOS, or user area. The utility is included on the utility diskette that accompanies the Ampro Development Platform. The diskette includes documentation about how to use the program.

Shadowing

 To improve system performance, the contents of the ROM BIOS and video BIOS are copied into DRAM for execution ("shadowed"), where they are accessed as 64-bit wide data. Shadowing a BIOS ROM substantially enhances system performance. Shadowing for both the ROM and video BIOS is built into the Ampro Extended BIOS. There is no user setting.

BIOS Recovery

If the BIOS Flash device somehow becomes corrupted, the Little Board P6d system may not boot. In this case, the BIOS will have to be reprogrammed. A disk with an image of the current BIOS along with the Utility PGM6X.COM may be used to restore the BIOS image. Before this can be done, the Little Board P6d system needs to be Booted and running DOS.

Interrupt and DMA Channel Usage

The PC architecture provides several interrupt and DMA control signals. When you expand the system through the ISA portion of the PC/104-Plus bus with MiniModule products or plug-in cards that require either interrupt or DMA support, you must select which interrupt or DMA channel to use. Typically this involves switches or jumpers on the expansion module. In most cases, these are not shared resources. It is important that you configure the new module to use an interrupt or

DMA channel not already in use. For your convenience, Table 2-7 and Table 2-8 provide a summary of the normal interrupt and DMA channel assignments on the Little Board P6d module.

The PCI bus uses four interrupts (INTA*, INTB*, INTC*, and INTD*). These interrupts are mapped to any of the available ISA interrupts by the BIOS. If an expansion card has multiple functions, then more interrupts may be required. You can set the priority in which interrupts are assigned on Setup 6 — PCI Configuration Setup.

Table 2-7. Interrupt Channel Assignments

Interrupt	Function
IRQ0	ROM BIOS clock tick function, from Timer 0
IRQ1	Keyboard interrupt
IRQ2	Cascade input for IRQ8-15
IRQ3	Serial 2, Serial 4
IRQ4	Serial 1, Serial 3
IRQ5	PCI
IRQ6	Floppy controller
IRQ7	Parallel port (option)
IRQ8	Reserved for battery-backed clock alarm
IRQ9	PCI
IRQ10	PCI, Serial 3, Serial 4
IRQ11	PCI
IRQ12	PS/2 Mouse, Serial 3, Serial 4
IRQ13	Reserved for coprocessor
IRQ14	Primary IDE hard disk controller
IRQ15	Secondary IDE hard disk controller

Note: IRQs for the Ethernet, Video, and Audio interfaces are automatically assigned by the BIOS plug and play logic.

PCI Interrupts assigned during initialization cannot be used by non-PCI devices.

Table 2-8. DMA Channel Assignments

Channel	Function
0	Available for 8-bit transfers
1	Available for 8-bit transfers
2	Floppy controller
3	Available for 8-bit transfers
4	Cascade for channels 0-3
5	Available for 16-bit transfers
6	Available for 16-bit transfers
7	Available for 16-bit transfers

Battery-Backed Clock

An AT-compatible battery-backed real-time clock (with CMOS RAM) is standard on the Little Board P6d module. A 3.0 volt Lithium battery soldered to the board powers the clock. Battery drain for the clock is less than 0.4 uA. This battery will support the clock for more than 10 years of normal usage.

The factory initializes the real-time clock and various parameters in the configuration memory for a standard configuration. The factory sets the date and time, but it may not be set for your time zone. Use Setup to change these values as needed.

The contents of the configuration memory are also stored in an on-board EEPROM. The ROM BIOS reads the EEPROM to get configuration information if the CMOS RAM data is lost. This means the board will function if the battery fails.

Note

The real-time clock date and time will not be correct without a battery, or after the battery fails.

Serial Ports

The Little Board P6d module provides four RS232C serial ports, Serial 1 and Serial 2 at J8, and Serial 3 and Serial 4 at J11.

Serial 1 and Serial 2 have full modem support. Serial 3 and Serial 4 support only RXD, TXD, RTS, CTS. All ports support software selectable standard baud rates up to 115.2Kbps, 5-8 data bits, and 1, 1.5, or 2 stop bits.

Note

The IEEE RS232C specification limits the serial port to 19.2Kbps on cables up to 50 feet in length.

I/O Addresses and Interrupt Assignments

The serial ports appear at the standard port addresses as shown in Table 2-9. Each serial port can be independently disabled using the Setup function, freeing its I/O addresses for use by other devices installed on the PC/104 and PCI expansion buses. When a serial port is disabled, its I/O addresses and IRQ are available to other peripherals installed on the PC/104 expansion bus. You can disable any of the serial ports using Setup.

Table 2-9 also shows the IRQs assigned to each serial port.

Note

Serial 3 and Serial 4 ports may use interrupts IRQ10 (PCI) and IRQ12 (PS/2 Mouse), but these IRQs can only be allotted to one device or port at a time. For example, if you are using IRQ10 for a Serial Port 3 and also have it assigned to the PCI bus, the serial interrupt will not occur. You may disable the PCI slot or PS/2 Mouse, to free the IRQ.

Table 2-9. Serial Port I/O Addresses and Interrupts

Port	I/O Address	Interrupt
Serial 1	3F8h - 3FFh	3, 4
Serial 2	2F8h - 2FFh	3, 4
Serial 3	3E8h - 3EFh	3, 4, 10, 12
Serial 4	2E8h - 2EFh	3, 4, 10, 12

ROM-BIOS Installation of the Serial Ports

Normally, the ROM BIOS supports Serial 1 as the DOS COM1 device, Serial 2 as the DOS COM2 device, and so on. If you desire a serial port, and there is no substitute serial port in the system, then the ROM-BIOS assigns the COMn designations in sequence as it finds the serial ports, starting from the primary serial port and searching to the last one, Serial 4. Thus, for example, if Serial 1 and Serial 3 are disabled, the ROM-BIOS assigns COM1 to Serial 2 and COM2 to Serial 4.

Serial Port Connectors (J8, J11)

Serial 1 and Serial 2 appear on connector J8; Serial 3 and Serial 4 appear on connector J11. Table 2-10 gives the connector pinout and signal definitions for J8 and J11. Table 2-11 gives the RS485/RS422 serial port connections.

The table also indicates the pins to which each signal is wired for compatibility with DB25 and DB9 connectors. The serial port pinout is arranged so that you can use a flat ribbon cable between the header and a standard DB9 connector. Split a 20-wire ribbon cable into two 10-wire sections, each one going to a DB9 connector. Normally PC serial ports use male DB connectors. Table 2-12 shows the manufacturer's part number for mating connectors.

The RS485/RS422 interface requires that the receiving end of the twisted-pair cable be terminated with 100 ohm resistors. You can terminate the RS485 interface with a resistor provided on the Little Board P6d module. To terminate the line, install a jumper on W4-W7, as shown in Table 2-13 .

Table 2-10. RS232 Serial Port Connection

Ports	Pin #	Signal Name	Function	In/Out	DB25 Pin	DB9 Pin
Serial 1 (J8) or Serial 3 (J11)	1	DCD[1]	Data Carrier Detect	IN	8	1
	2	DSR[1]	Data Set Ready	in	6	6
	3	RXD	Receive Data	in	3	2
	4	RTS	Request To Send	out	4	7
	5	TXD	Transmit Data	out	2	3
	6	CTS	Clear to Send	in	5	8
	7	DTR[1]	Data Terminal Ready	out	20	4
	8	RI[1]	Ring Indicator	in	22	9
	9	GND	Signal Ground	-	7	5
	10	N/A	No Connection	-	-	-
Serial 2 (J8) or Serial 4 (J11)	11	DCD[1]	Data Carrier Detect	IN	8	1
	12	DSR[1]	Data Set Ready	in	6	6
	13	RXD	Receive Data	in	3	2
	14	RTS	Request To Send	out	4	7
	15	TXD	Transmit Data	out	2	3
	16	CTS	Clear to Send	in	5	8
	17	DTR[1]	Data Terminal Ready	out	20	4
	18	RI[1]	Ring Indicator	in	22	9
	19	GND	Signal Ground	-	7	5
	20	TXT	TxD at TTL level	-	-	-

Note 1: Not supported on Serial 3 and Serial 4

Table 2-11. RS485/RS422 Serial Port Connection

Ports	Pin #	Signal Name	Function	DB25 Pin	DB9 Pin
Serial 1 (J8) or Serial 3 (J11)	3	RXD-	Receive Data -	3	2
	4	TXD+	Transmit Data +	4	7
	5	TXD-	Transmit Data -	2	3
	6	RXD+	Receive Data +	5	8
	9	GND	Signal Ground	7	5
Serial 2 (J8) or Serial 4 (J11)	13	RXD-	Receive Data -	3	2
	14	TXD+	Transmit Data +	4	7
	15	TXD-	Transmit Data -	2	3
	16	RXD+	Receive Data +	5	8
	19	GND	Signal Ground	7	5

Note: For RS485, externally connect TXD+ to RXD+ and TXD- to RXD-

Table 2-12. J8 and J11 Mating Connector

Connector Type	Mating Connector
RIBBON	3M 3421-7600 Latching Clip 3505-8020
DISCRETE WIRE	MOLEX HOUSING 22-55-2202 PIN 16-02-0103

Table 2-13. RS485 Termination

Jumper	Result
W4	On Serial 1 Terminated Off Serial 1 Unterminated
W5	On Serial 2 Terminated Off Serial 2 Unterminated
W6	On Serial 3 Terminated Off Serial 3 Unterminated
W7	On Serial 4 Terminated Off Serial 4 Unterminated

Serial TTL Option

The TTL version of each of the four serial ports is brought out to the Utility connector. Serial 2 TTL can be configured to be output via the IrDA signals. The remaining three TTL serial ports are connected directly through the utility connector. The serial port signals appear as shown in Table 2-38. Utility Connector (J19).

Ampro Custom Serial Features

The Ampro extended BIOS provides custom serial port features useful in embedded applications.

The serial console feature enables you to operate the Little Board P6d system from a standard ASCII terminal, replacing the standard keyboard and display devices. See Serial Console Features, below, for a description of the serial console capabilities.

The serial boot facility enables the Little Board P6d system to boot from code downloaded through a serial port in a manner similar to booting from a local hard disk or from a network.

The serial download feature permits updating the OEM Flash memory device over a serial port.

Refer to Ampro Application Note AAN-9403 for a complete description of these features. Refer to the Ampro Common Utilities manual for descriptions of SERLOAD and SERPROG, utility programs used to support serial booting and serial downloading.

Serial Console Features

You can connect a device, such as an ASCII video terminal or PC running a video terminal emulation program, to either serial port to act as your system console. To use the serial console features, connect a serial console device to Serial 1 or Serial 2. Use Setup to enable the serial console feature. When enabled, the serial console is set up for:

- 9600 baud
- No parity
- 8 bits
- One stop bit

To use an ASCII terminal as the console device for your system, set the serial baud rate, parity, data length, and stop bits of the terminal to match the serial console settings. For proper display of Setup and POST messages from the BIOS, you must use an IEEE-compatible terminal or terminal emulation program that implements the standard ASCII cursor commands. The required commands and their hexadecimal codes are listed in Table 2-14.

Some Programs that emulate an ASCII terminal do not properly support the basic ASCII command functions shown in Table 2-14. Ampro provides a suitable PC terminal emulator program, TVTERM, on the Common Utilities diskette.

After booting this system, the keyboard and screen of the serial terminal become the system console.

Note

The programs you execute via the serial terminal must use ROM BIOS video functions (rather than direct screen addressing) for the display I/O. Some programs that emulate an ASCII terminal do not properly support the basic ASCII command functions shown in Table 2-14. Ampro provides a suitable PC terminal emulator program, TVTERM, on the Common Utilities diskette.

After booting this system, the keyboard and screen of the serial terminal become the system console. The programs you execute via the serial terminal must use ROM BIOS video functions (rather than direct screen addressing) for the display I/O.

Note

DOS programs that write directly to video RAM will not display properly on a serial console device.

Table 2-14. Required Cursor Commands

Hex	Command
08	Backspace
0A	Line Feed
0B	Vertical Tab
0C	Non-destructive Space
0D	Carriage Return

Using a Standard PC Keyboard

If you have both a serial terminal and a standard keyboard attached to your system at the same time, both keyboards will function.

Using Arrow Keys During Setup

During Setup, the serial console arrow keys and function keys must be simulated. To simulate the function keys, enter two keystrokes, an "F" followed by the function key number. Thus, function key F3 is simulated with the literal "F3" typed on the keyboard. (Don't type the quotes). F10 is simulated with "F0".

Note

The keystroke simulations are only valid during Setup, not during normal operation. The arrow keys are simulated with the substitute keystrokes shown in Table 2-15.

Table 2-15. Arrow Key Substitutions

Function	Substitute Keys
Up	^ or Ctrl e
Down	v or Ctrl x
Right	> or Ctrl d
Left	< or Ctrl s
PgUp	Ctrl r
PgDn	Ctrl c

COM Port Table

When the system boots under DOS, the serial ports are initialized to 9600 baud (typical). To preserve the selected console port parameters stored in Setup, the Ampro ROM BIOS deletes the selected console port from the internal COM port table, normally used by DOS to locate the serial ports. With the port deleted from the COM port table, DOS cannot change its parameters. Because it is not listed in the BIOS COM port table, it is not assigned a COMn designation (COM1, COM2, etc.).

Universal Serial Bus (USB) Ports

The Universal Serial Bus connects USB devices with a USB host, in this case, the Little Board P6d module. The USB physical interconnect is a tiered star topology, or tree, consisting of hubs and USB devices. Each USB segment is a point-to-point connection between hubs or between hubs and USB devices. The entire tree can support up to 127 USB devices. The USB interface standard is for keyboards, mice, modems, digitizer pads, and other low- to medium-speed peripherals. The bus can run at 12Mbps or 1.5Mbps, depending on the pull-up resistor on the peripheral device. A 1.5k ohm pull-up on the +data line sets the speed to 12Mbps. A 1.5k ohm pull-up on the -data line sets the speed to 1.5Mbps. The power to the peripheral device is current limited with self-resetting fuses. Each USB interface is implemented as a two-wire differential pair for data, a power wire, a ground wire, and a shield wire. The USB port signals appear on the two USB connectors (J4 and J5), as shown in Table 2-16 and Table 2-17.

Table 2-16. USB Port 1 Pinout

J4 Pin #	Signal Name	Function
1	USBPWR1	USB1 +5 Volt Power
2	USBP-1	USB1 Data-
3	USBP+1	USB1 Data+
4	USBGND1	Ground
5	SHIELD1	Cable Shield for USB1

Table 2-17. USB Port 2 Pinout

J5 Pin #	Signal Name	Function
1	USBPWR2	USB2 +5 Volt Power
2	USBP-2	USB2 Data-
3	USBP+2	USB2 Data+
4	USBGND2	Ground
5	SHIELD2	Cable Shield for USB2

Infrared (IrDA) Interface

The Little Board P6d infrared interface provides for a two-way wireless communications port using infrared as a transmission medium. The Little Board P6d IrDA interface supports both SIR (Serial Infrared) and FIR (Fast Infrared) standards . The SIR standard allows serial communication at baud rates up to
115K Baud. The FIR standard allows data rates up to 4Mbps.

Requirements for an IrDA Interface

On the Little Board P6d module, the IrDA physical link hardware consists of an IR transmit encoder and IR receiver decoder. To implement an IrDA port, the OEM must supply an IR transducer, which consists of the output driver and IR emitter for transmitting, and the receiver IR detector. Particular IR transducers may require additional external components.

The IrDA port uses the second serial port to drive its internal encoder/decoder. When using the IrDA interface, you cannot use serial 2 as an RS232, RS485, or RS422 port.

IrDA Connector (Part of Utility J19)

There are two popular implementations of Fast IR. One uses a separate receive line capable of receiving at the higher data rate (up to 4 Mbytes/second). The other is implemented with a mode control line. When the IR port is set for high speed, the mode select line (IRMODE) is high. This switches the external transceiver to high speed mode. The IrDA port pinout is listed in Table 2-18.

Table 2-18. IrDA Interface Pinout

J19 Pin #	Signal Name	Function
18	IRMODE /IRRXB	Fast IR Receive/Mode Input
19	IRTX	IR Transmit
20	IRRXA	IR Receive (SIR)

Multi-Mode Parallel Port

The Little Board P6d system incorporates a multi-mode parallel port. This port supports four modes of operation:

- Standard PC/AT printer port (output only)
- PS/2-compatible bidirectional parallel port (SPP)
- Enhanced Parallel Port (EPP)
- Extended Capabilities Port (ECP)

This section lists the pinout of the parallel port connector and describes how to configure it for its I/O port and interrupt assignments, how to assign a DMA channel to the port when operating in ECP mode. And programming information, including how to use the port for bidirectional I/O.

I/O Addresses and Interrupts

The parallel port functions are controlled by eight I/O ports and their associated register and control functionality. The Little Board P6d parallel port is assigned to the primary parallel port address normally assigned to LPT1 and cannot be changed. You may disable the port in Setup to free the hardware resources for other peripherals.

The parallel port can be configured to generate an interrupt request upon a variety of conditions, depending on the mode the port is in. Assignment of an interrupt to the parallel port is optional, and its use depends on software requirements and which mode of operation you are using. IRQ 7 is the default parallel port IRQ assignment. Table 2-19 lists the parallel port addresses and IRQs.

Table 2-19. Parallel Printer I/O Addresses and Interrupt

Selection	I/O Address	Interrupt
Primary	378h - 37Fh	7
Secondary	278h - 27Fh	5
Secondary	3BCh - 3BFh	7
Disable	None	None

ROM-BIOS Installation of Parallel Ports

Normally, the BIOS assigns the name LPT1 to the primary parallel port, and LPT2 to the secondary parallel port (if present), and so on. However, the BIOS scans the standard addresses for parallel ports and if it only finds a secondary port, it assigns LPT1 to that one. Therefore, if the Little Board's parallel port is enabled, it will be assigned LPT1 by the BIOS. If it is disabled and there is another parallel port in your system, that port will be assigned LPT1 by the BIOS.

The ROM-BIOS scans I/O addresses for parallel ports in the following order: 3BCh, 378h, 278h.

DMA Channels

In ECP enhancement mode, the parallel port can send and receive data under control of an on-board DMA controller. On the Little Board P6d module, select a DMA channel in Setup. You can configure the parallel port to use either DMA channel 1 or DMA channel 3. If you will not be using DMA with the parallel port, leave it disabled. This makes the DMA channel available to other peripherals installed on the expansion buses.

Parallel Port Connector (J9)

The parallel port appears on J9. Its pinout is arranged so that a 26-pin ribbon cable can be directly connected to a 25-pin DB-25 connector to match the PC standard pinout.

Table 2-20 gives the connector pinout and signal definitions for the parallel port. In addition, the table indicates the pins to which each signal must be wired for compatibility with a standard DB25 connector. Normally the PC parallel port uses a female "DB" connector.

Table 2-20. Parallel Port Connections (J9)

Pin #	Signal Name	Function	In/Out	DB25 Pin
1	STB*	Output Data Strobe	Out	1
3	PD 0	LSB Of Printer Data	I/O	2
5	PD 1	Printer Data 1	I/O	3
7	PD 2	Printer Data 2	I/O	4
9	PD 3	Printer Data 3	I/O	5
11	PD 4	Printer Data 4	I/O	6
13	PD 5	Printer Data 5	I/O	7
15	PD 6	Printer Data 6	I/O	8
17	PD 7	MSB Of Printer Data	I/O	9
19	ACK*	Character Accepted	In	10
21	BUSY	Cannot Receive Data	In	11
23	PE	Out of Paper	In	12
25	SLCT	Printer Selected	In	13
2	AUTOFD*	Autofeed	Out	14
4	ERROR	Printer Error	In	15
6	INIT*	Initialize Printer	Out	16
8	SELIN*	Selects Printer	Out	17
26	KEY	Key Pin	N/A	

Note

For maximum reliability, keep the cable between the board and the device it drives to 10 feet or less in length.

IEEE-1284-compliant Cables

Using the parallel port for high-speed data transfer in ECP/EPP modes requires special cabling for maximum reliability.

Some of the parameters for a compliant IEEE-1284 cable assembly include:

All signals are twisted pair with a signal and ground return

Each signal and ground return should have a characteristic unbalanced impedance of 62 +/- 6 ohms within a frequency band of 4 to 16MHz

The wire-to-wire crosstalk should be no greater than 10%

Please refer to the IEEE-1284 standard for the complete list of requirements for a compliant cable assembly, including recommended connectors

Latch-Up Protection

The parallel port incorporates chip protection circuitry on some inputs, designed to minimize the possibility of CMOS "latch up" due to a printer or other peripheral being powered up while the Little Board P6d system is turned off.

Parallel Port Registers

The low-level software interface to the parallel port consists of eight addressable registers. The address map of these registers is shown in Table 2-21.

Table 2-21. Parallel Port Register Map

Register Name	Address
Data Port	Base address
Status Port	Base address + 1
Control Port	Base address + 2
EPP Address Port	Base address + 3
EPP Data Port 0	Base address + 4
EPP Data Port 1	Base address + 5
EPP Data Port 2	Base address + 6
EPP Data Port 3	Base address + 7
Note: EPP registers are only accessible when in EPP mode	

Standard and Bidirectional Operation

You can use the parallel port as a standard output-only printer port or as a PS/2-compatible bidirectional data port with up to 12 output lines and 17 input lines. All data and interface control signals are TTL-compatible. Set the parallel port's default mode using Setup.

Using the Parallel Port in Bidirectional Mode

To use the port as a bidirectional data or digital control port you must set the default mode to bidirectional in Setup or put it in bidirectional mode with a BIOS call. The following code example shows how to set the parallel port mode to bidirectional.

```
;----------------------------------------------------------
; Code to set the parallel port mode to bidirectional
;----------------------------------------------------------
MOV   AH,0CDh            ; AMPRO command
MOV   AL,0Ch             ; AMPRO function
MOV   BX,01h             ; Extended mode (use 00 to set output-only mode)
INT   13h
```

Within bidirectional mode, the port can be in its input state or output state. The code shown above leaves the port in its input state. An IN instruction of I/O address 378h reads the current state of the data lines.

To change the port between input and output states, write a 1 to bit five of the control register to set the port to its input state; or a 0 to set it to its output state. Here is a code sample for dynamically changing the port direction (after it is in Extended Mode).

```
;----------------------------------------------------------
; Code to change the parallel port direction to input
;----------------------------------------------------------
MOV   DX,37A
IN AL,DX
OR AL,20h                         ;set bit 5 (input)
OUT   DX,AL
;
;----------------------------------------------------------
; Code to change the parallel port direction to output
;----------------------------------------------------------
MOV   DX,37Ah
IN AL,DX
AND   AL,0DFh                     ;clear bit 5
OUT   DX,AL
```

Using the Control Lines for Additional I/O

Besides the eight data lines, you can use the four control lines (STB*, AUTOFD*, INIT*, and SELIN*) as general purpose output lines. Similarly, you can use the five status lines (ERROR*, SLCT, PE, ACK*, and BUSY) as general purpose input lines.

You can read the four control lines and use them as input lines. These lines have open collector drivers with 4.7k ohm pull-ups. To use a control line as an input line, you must first write to its corresponding bit in the control register. If the line is inverting (*), write a 0, otherwise write a 1. This will cause the line to float (pulled up by the 4.7k ohm resistors). When a line floats, you can use it as an input.

Enabling the Parallel Port Interrupt

Bit 4 in the Control Register enables the parallel port interrupt. If this bit is high 1, then a rising edge on the ACK* (IRQ) line will produce an interrupt on the parallel port interrupt, IRQ7. Table 2-22 lists the parallel port register bits. Parallel port register bit definitions are described in Table 2-23.

Table 2-22. Parallel Port Register Bits

Register	Bit	Signal Name or Function	In/Out	Active High/Low	J5 Pin	DB25F Pin
DATA (378h)	0	PD 0	I/O	High	6	2
	1	PD 1	I/O	High	10	3
	2	PD 2	I/O	High	14	4
	3	PD 3	I/O	High	18	5
	4	PD 4	I/O	High	22	6
	5	PD 5	I/O	High	26	7
	6	PD 6	I/O	High	30	8
	7	PD 7	I/O	High	34	9
STATUS (379h)	0	TMOUT	In	---	---	---
	1	0	---	---	---	---
	2	0	---	---	---	---
	3	ERROR*	In	Low	8	15
	4	SLCT	In	High	50	13
	5	PE	In	High	46	12
	6	ACK* (IRQ)	In	Low	38	10
	7	BUSY	In	High	42	11
CONTROL (37Ah)	0	STB*	Out*	Low	2	1
	1	AUTOFD*	Out*	Low	4	14
	2	INIT*	Out*	High	12	16
	3	SELIN*	Out*	High	16	17
	4	IRQE	---	High	---	---
	5	PCD	---	High	---	---
	6	1	---	---	---	---
	7	1	---	---	---	---
Note: * Can also be used as input (see text).						

Table 2-23. Standard and PS/2 Mode Register Bit Definitions

Signal Name	Full Name	Description
TMOUT	Time-out	Valid only in EPP mode , this signal goes true after a 10 μS time-out has occurred on the EPP bus. This bit is cleared by reset.
ERR*	Error	Reflects the status of the -ERROR input. 0 means an error has occurred.
SLCT	Printer selected status	Reflects the status of the SLCT input. 1 means a printer is on-line.
PE	Paper end	Reflects the status of the PE input. 1 indicates paper end.
ACK*	Acknowledge	Reflects the status of the ACK input. 0 indicates a printer received a character..
BUSY*	Busy	Reflects the complement of the BUSY input. 0 indicates a printer is busy.
STB*	Strobe	This bit is inverted and output to the -STROBE pin.
AUTOFD	Auto feed	This bit is inverted and output to the -AUTOFD pin.
INIT*	Initiate output	This bit is output to the -INIT pin.

SELIN*	Printer select input	This bit is inverted and output to the pin. It selects a printer.
IRQE	Interrupt request enable	When set to 1, interrupts are enabled. An interrupt is generated by the positive-going -ACK input.
PCD	Parallel control direction	When set to 1, port is in input mode. In printer mode, the printer is always in output mode regardless of the state of this bit.
PD0-PD7	Parallel Data Bits	

Floppy Disk Interface

The on-board floppy disk controller and ROM BIOS support one or two floppy disk drives in any of the standard DOS formats shown in Table 2-24.

Table 2-24. Supported Floppy Formats

Capacity	Drive Size	Tracks	Data Rate
360K	5-1/4 inch	40	250KHz
1.2M	5-1/4 inch	80	500KHz
720K	3-1/2 inch	80	250KHz
1.44M	3-1/2 inch	80	500KHz

Floppy Drive Considerations

Nearly any type of soft-sectored, single or double-sided, 40 or 80 track, 5-1/4 inch or 3-1/2 inch floppy disk drive is usable with this interface. Using higher quality drives improves system reliability. Here are some considerations about the selection, configuration, and connection of floppy drives to the Little Board P6d module.

Drive Interface—The drives must be compatible with the board's floppy disk signal interface, as described below. Ampro recommends any standard PC-or AT-compatible 5-1/4 inch or 3-1/2 inch floppy drive.

Drive Quality—Use high quality, DC servo, direct drive motor floppy disk drives.

Drive Select Jumpering—Both drives must be jumpered to the second drive select.

Floppy Cable—For systems with two drives, use a floppy cable with conductors 10-16 twisted between the two drives. This is standard practice for PC-compatible systems.

Head Load Jumpering—When using drives with a Head Load option, jumper the drive for head load with motor on rather than head load with drive select. This is the default for PC-compatible drives.

Drive Mounting—If you mount a floppy drive very close to the Little Board or another source of EMI, you may need to place a thin metal shield between the disk drive and the device to reduce the possibility of electromagnetic interference.

Floppy Interface Configuration

The floppy interface is configured using Setup to set the number and type of floppy drives connected to the system. Refer to the Setup section starting on page 2–48 for details.

If you don't use the floppy interface, disable it in Setup. This frees the floppy's I/O addresses, IRQ6, and DMA channel 2 for use by other peripherals installed on the PC/104 bus.

Floppy Interface Connector (J14)

Table 2-25 shows the pinout and signal definitions of the floppy disk interface connector, J14. This pinout does not meet the AT standard for floppy drive cables. An adapter board can be purchased from Ampro that will interface the 26-pin 2mm connector to a standard 3.5" floppy disk connector.

Table 2-25. Floppy Disk Interface Connector (J14)

Pin #	Signal Name	Function	In/Out
1	KEY	Cable Key Pin	N/A
2	DEN	Speed/Precomp	OUT
4	IDX*	Index Pulse	IN
6	MO1*	Motor On 1	OUT
8	DS2*	Drive Select 2	OUT
10	DS1*	Drive Select 1	OUT
11	MO2*	Motor On 2	OUT
12	DIRC*	Direction Select	OUT
14	STEP*	Step	OUT
15	WD*	Write Data	OUT
16	WE*	Write Enable	OUT
18	TRKO*	Track 0	IN
20	WP*	Write Protect	IN
22	RDD*	Read Data	IN
24	HS*	Head Select	OUT
26	DCHG*	Disk Change	IN
-	Other Odd Pins	Signal grounds	N/A

EIDE Hard Disk Interface

The Little Board P6d system provides an interface for up to four Integrated Device Electronics (IDE) peripheral devices, such as hard disk drives and CD-ROM drives.

The primary IDE interface appears at connector J6, a 44-pin 2mm, dual-row connector.

The secondary IDE interface appears at connector J7, also a 44-pin 2mm, dual-row connector.

Table 2-26 shows the interface signals and pin outs for the IDE interface connectors. Both pinouts are identical.

Note

For maximum reliability, keep IDE drive cables less than 18 inches long.

Table 2-26. IDE Interface Connectors (J6, J7)

Pin #	Signal Name	Function	Pin #	Signal Name	Function
1	RESET*	Reset signal	2	GND	Ground
3	D7	Data bit 7	4	D8	Data bit 8
5	D6	Data bit 6	6	D9	Data bit 9
7	D5	Data bit 5	8	D10	Data bit 10
9	D4	Data bit 4	10	D11	Data bit 11
11	D3	Data bit 3	12	D12	Data bit 12
13	D2	Data bit 2	14	D13	Data bit 13
15	D1	Data bit 1	16	D14	Data bit 14
17	D0	Data bit 0	18	D15	Data bit 15
19	GND	Ground	20	KEY	Keyed pin
21	DRQ0	DMA Request 0	22	GND	Ground
23	IOW*	Write strobe	24	GND	Ground
25	IOR*	Read strobe	26	GND	Ground
27	IDERDY	I/O Channel Ready	28	RSVD	Reserved
29	DACK0*	DMA Acknowledge 0	30	GND	Ground
31	IRQ14/IRQ15	Interrupt request	32	IDE16	IOCS16
33	A1	Drive address 1	34	RSVD	Reserved
35	A0	Drive address 0	36	A2	Drive address 2
37	CS0*	Chip select	38	CS1*	Chip select
39	RSVD	Reserved	40	GND	Ground
41	+5V	Drive VCC	42	+5V	Drive VCC
43	GND	Ground	44	RSVD	Reserved

IDE Interface Configuration

Use Setup to specify your IDE hard disk drive types. See the Setup section beginning on page 2-48 for details.

If you do not find a drive type whose displayed parameters match the drive you are using, use drive type USER. It allows you to manually enter the drive's parameters. The drive manufacturer provides the drive parameters—check the drive's documentation for the proper values to enter.

If you are using a newer IDE drive, use drive type AUTO. It automatically configures the drive type parameters from information provided by the drive itself.

CompactFlash Solid-State Disk

The Little Board P6d system supports a CompactFlash device, a solid-state IDE hard-disk emulator. It acts as a removable hard-disk drive. You can format, read, and write the CompactFlash device much as you would any standard IDE drive.

Enabling the Drive

The CompactFlash interface emulates an IDE drive to the operating system. However, the CompactFlash interface takes up one of the positions of the primary IDE drive controller.

Note

If you use the CompactFlash interface, you can only add one additional hard drive to the primary IDE controller.

Master/Slave Setting

The CompactFlash interface can be configured to emulate a master or slave IDE device in the system.

To configure the drive as master, install a jumper on W1.

To configure the drive as slave, remove the jumper on W1.

Note

The IDE drive attached to the primary IDE controller must have the opposite setting.

Solid-State Disk Preparation

To prepare CompactFlash device for use in the system, insert the device. Boot the system and prepare the drive just as you would a new IDE drive. That is, use the DOS FDISK utility to set up one or more partitions, and then use the DOS FORMAT utility to format the drive.

A CompactFlash device, properly formatted and programmed, can be used as a boot drive. To do so, you must configure the drive to be master by installing a jumper on W1. First FDISK the device as a primary DOS partition, then format the drive using the /S option to include the DOS operating system.

Audio Interface

The audio interface will be provided by a combination of the 4DWAVE-NX PCI DirectSound Accelerator, a Rev 2.1 compliant AC97 CODEC and a National LM4863 Audio Amplifier. It provides an advanced wavetable synthesizer, full legacy compatibility, multiple stereo capture channels, and is fully plug and play PCI compatible.

Audio Amplifier

The Amplifier is a dual bridge-connected audio power amplifier which will deliver 2.2W to a 4Ω load and 1.1W to an 8Ω load.
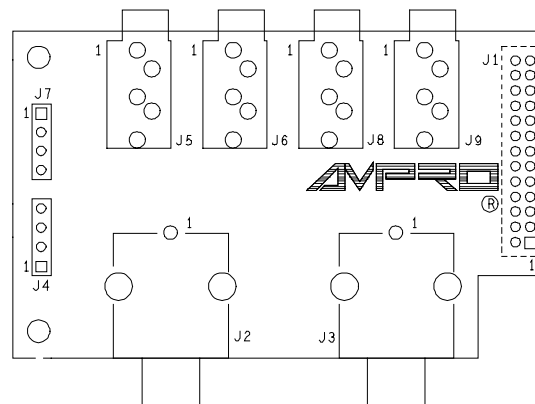
Figure 2-4. Little Board P6d Audio Interface Adapter

Audio Interface Connector

The Audio interface is through a 26-pin 2mm connector. Standard input and output devices can be connected by using the interface shown in Figure 2-4. Little Board P6d Audio Interface Adapter and Figure 2-5. Audio Interface Adapter Schematic. Table 2-27. Audio Interface Connectors shows the connector pinout for the Audio Interface Adapter. Table 2-28. Audio Interface Input Connector (J12) shows the pinout of the Audio interface input connector. Table 2-29 shows manufacturer's part numbers for mating connectors.

Table 2-27. Audio Interface Connectors

Connector	Function	Type	Signals
J1	Audio Interface	26 Pin, Female, 2mm	All Audio Signals from CPU
J2	Video Sound In	RCA Jack	1 – Ground 2 – Video Sound In Left
J3	Video Sound In	RCA Jack	1 – Ground 2 – Video Sound In Right
J4	CD Input	4 Pin, Single Row, .1"	1 – CD In Left 2, 3 – CD In GND 4 – CD In Right
J5	Line Input	Stereo Mini Jack	1 – Line In GND 2 – Line In Right 3 – Line In Left
J6	Mic Input	Stereo Mini Jack	1 – Mic In GND 2 – Mic In Voltage Ref. 3 – Mic Input
J7	Phone Input & Mono Output	4 Pin, Single Row, .1"	1 – Phone In 2 – Phone GND 3 – Mono Out 4 – Mono GND
J8	Speaker Out	Stereo Mini Jack	1 – Speaker R+L – 2 – Speaker R+ 3 – Speaker L+
J9	Headphone	Stereo Mini Jack	1 – Headphone GND 2 – Headphone Right 3 – Headphone Left
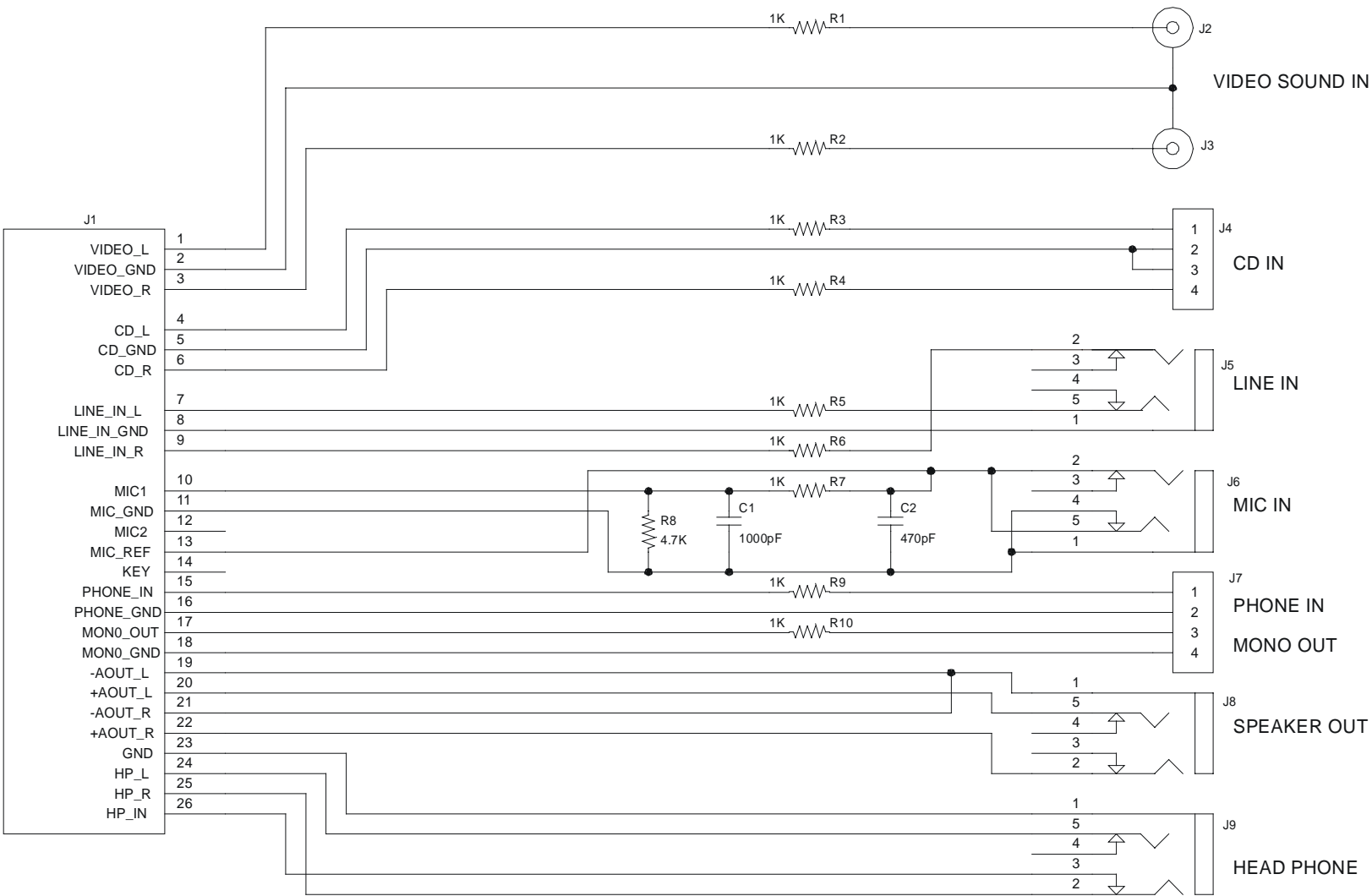
Figure 2-5. Audio Interface Adapter Schematic

Table 2-28. Audio Interface Input Connector (J12)

Pin #	Signal	Function	Pin #	Signal	Function
1	VIDEO_L	Audio in Left from Video Source	2	VIDEO_GND	Video Ground
3	VIDEO_R	Audio in Right from Video Source	4	CD_L	CD Audio Left
5	CD_GND	CD Audio Ground	6	CD_R	CD Audio Right
7	LINE_IN_L	Line Audio In Left	8	LINE_IN_GND	Line Audio Ground
9	LINE_IN_R	Line Audio In Right	10	MIC1	Microphone in 1
11	MIC_GND	Microphone Ground	12	MIC2	Microphone in 2
13	MIC_REF	Mic Ref Voltage	14	KEY	Key Pin
15	PHONE_IN	Phone Input	16	PHONE_GND	Phone Ground
17	MONO_OUT	Mono Output	18	MONO_GND	Mono Ground
19	-AOUT_L	Amplified Out Left -	20	+AOUT_L	Amplified Out Left +
21	-AOUT_R	Amplified Out Right -	22	+AOUT_R	Amplified Out Right +
23	GND	Ground	24	HP_L	Head Phone Left
25	HP_R	Head Phone Right	26	HP_DETECT	Head Phone Detect

Table 2-29. J12 Mating Connectors

Mating Connector	
Discrete Wire:	
Molex Housing	51110-2650
Molex Pin	50394-8051

Flat Panel/CRT Video Controller

The Little Board P6d system provides an integrated high-performance super-VGA video controller. The standard video controller supports both CRT and flat panel displays, but only supports 3.3V video panels.

Note

If you are using 5V panels, an Application Note can be downloaded, which describes how to build a 3.3V-to-5V converter, or you can order a voltage converter through a recommended third party. All this information is provided on Ampro's web site through the Virtual Technician, by searching for "translator card" and viewing the problem/solution text.

There are three connectors associated with the video display and complete hardware details about each connector and its supported features are provided in the following sections. These connectors are summarized in Table 2-30.

Table 2-30. Video Connector Summary

Name	Connector	Pins/Type	Description
Flat Panel	J15	50-pin Shrouded 2mm Header	Provides connections for a broad array of standard flat panel displays.
CRT	J17	10-pin Shrouded .100 Header	Provides connections for a CRT display. To connect to a standard CRT cable, use a short "transition cable" to a DB-15 connector. The pinout for a transition cable is provided below.
ZV Port	J16	26-pin 2mm Header	Provides connections for external video overlay signals.

Connecting a Flat Panel (J15)

Signals for a wide range of flat panel displays, both color and gray-scale, appear on the Flat Panel connector. Although flat panels of a similar type use similar sets of signals from the video controller, these do not share a standardized interface connector pin configuration. The names of panel control signals vary from manufacturer to manufacturer. Read the description of each signal carefully to determine how each signal is to be used for your chosen display. Refer to the panel manufacturer's technical literature to determine how to wire a cable for your chosen panel and application.

In many applications, the power management functions control the LCD display; for example, in portable equipment. Furthermore, power and signals must be sequenced at the proper time when the system is energized to prevent damage to the display. The Little Board P6d video controller provides power and signal conditioning to meet these requirements. Table 2-31 lists the signals available on the Flat Panel connector.

Table 2-31. Flat Panel Video Connector (J15)

Pin #	Signal Name	Description
1	SHFCLK	Shift Clock. Pixel clock for flat panel data.
2	M DE	M signal for panel AC drive control. Sometimes called ACDCLK or AC Drive. May also be configured to be -BLANK or as Display Enable (DE) for TFT panels.
3	LP	Latch Pulse. Sometimes called Load Clock, Line Load, or Input Data Latch. It's the flat panel equivalent of HSYNC.
4	FLM	First Line Marker. Also called Frame Sync or Scan Start-up. Flat panel equivalent to VSYNC.
5,6	GND	Ground
7-30	FP0-FP23	Flat panel video data 0 through 23 (in order).
31	ENAVDD	Enable Vdd. Power sequencing control for panel driver electronics Vdd. Active high.
32	ENAVEE	Enable Vee, active high. Power sequencing control for panel bias voltage. This signal is sent to the optional Vee supply board to control Vee output.
33	+3.3V	Panel power
34	+12V	+12 Volt supply (from J10)
35,36	GND	Ground
37	ENABLK	Enable backlight. Power control for panel backlight. Active high.
38	+5.0V	From Little Board P6d module.
39-50	FP24-FP35	Flat panel video data 24 through 35 (in order).

Power Sequencing

Some LCD flat panel displays can be damaged if the voltage and data signals are applied at power up. This can result in damage to the panel or reduction of its operational life. The LB P6d module provides the control signals for switching the power supply lines to protect the flat panel. Power to the panel must be enabled using the special enable signals provided on the flat panel connector, ENAVEE, ENAVDD, and ENABKL.

Advanced Power Management

The same signals that support power sequencing are also used to provide the power management feature. In "panel off mode" both the CRT and flat panel interfaces are turned off, but the VGA subsystem (registers and display memory) remain powered. In "standby mode", the CRT and flat panel interfaces are turned off, and in addition, the VGA subsystem is turned off. The screen DRAM is placed in a low-power mode in which only the DRAM is refreshed.

BIOS Support of Standard Flat Panels

The Little Board P6d system can support flat panel BIOS settings for up to 16 popular LCD panels, but only 8 have been configured in the BIOS. You select which flat panel BIOS settings to use in Setup. For details about configuring the video controller, refer to the description of the Integrated Peripherals Setup on page 2–48. For the current list of supported panels types, refer to Table 2-48.

If you plan to use an unsupported panel, you must modify the standard BIOS to support the panel. Ampro can provide a BIOS modification kit to you for this purpose. The new video BIOS is then loaded into the on-board Flash device.

To install the new video BIOS code in the on-board OEM Flash memory device:

1. Install jumper W2 to write-enable the Flash device.

2. Install your new video BIOS code in the on-board Flash device using a utility called PGM6X.COM, supplied by Ampro on the utility disk that comes with the Little Board P6d Development Platform.

3. Remove W2 to write-protect the on-board Flash device.

PGM6X is a DOS utility designed to write to the on-board Flash device (The on-board Flash device contains the system's BIOS and the video BIOS). Instructions for this utility are provided on the utility diskette. Contact your Ampro sales representative or Ampro Technical Support for information about the Little Board P6d Flat Panel BIOS Modification Kit.

Connecting a CRT (J17)

Analog video signals from the video controller appear on a 10-pin dual-row header. These signals are compatible with the standard video monitors commonly used with desktop PCs. Specifications for compatible monitors are provided in Chapter 3, Technical Specifications.

Normally, the signals are connected to a standard DB-15 video connector by a "transition cable," made from a ribbon cable connectors and a short length of 10-wire ribbon cable. A transition cable can connect the video signals to a bulkhead-mounted DB-15 connector, allowing any standard CRT to be easily connected using a standard monitor video cable.

+5V power, protected by a fuse, can supply power to an external device, such as an NTSC Video adapter module. Table 2-32 gives the signal pinout of J17 and pin connections for a DB-15 connector. Table 2-33 shows mating connectors.

Table 2-32. CRT Interface Connector (J17)

Pin #	Signal Name	DB-15
1	Red	1
2	Ground	6
3	Green	2
4	Ground	7
5	Blue	3
6	Ground	8
7	Horizontal Sync.	13
8	Ground	10
9	Vertical Sync.	14
10	+5V Power	-

Table 2-33. J17 Mating Connectors

Connector Type	Mating Connector
RIBBON	3M 3473-7600 Latching Clip 3505-8010
DISCRETE WIRE	MOLEX HOUSING 22-55-2102 PIN 16-02-0103

ZV Port Interface (J16)

This section describes the ZV port interface. The ZV port is a PCMCIA standard for video input. The ZV port can be used to receive video data in either RGB or YUV format. The input data can be scaled, positioned, and can overlay the Little Board P6d system's VGA data stream. It can use color keying for non-rectangular windowing, or X-Y window keying. The ZV connector is a high density connector with 2mm pitch pins. Table 2-34 lists the signals and pin numbers for J6 and Table 2-35 lists a compatible mating connector.

Table 2-34. ZV Port Connector (J16)

J6 Pin #	Name	Function
1 - 16	VP0 - VP15	Video Data Inputs
18	VREF	Vertical Reference Input
20	HREF	Horizontal Reference Input
22	RSVD	Reserved
24	RSVD	Reserved
26	PCLK	Video Clock Output (DCLK or DCLK/2)
17, 19, 21,23, 25	Ground	-

Table 2-35. J6 Mating Connector

Mating Connector	
Discrete Wire:	
Molex Housing	51110-2650
Molex Pin	50394-8051

Disabling the Video Controller

The video controller can be disabled in Setup. There are no jumpers to change.

Ethernet Network Interface

This section describes the hardware of the Ethernet interface and discusses relevant software considerations.

Hardware Description

The Ethernet subsystem is based on the Intel 82559ER 10/100BasetT PCI Ethernet Controller. The Ethernet controller fully supports IEEE 802.3 Ethernet standards, and supports standard 10BaseT and 100BaseT via a standard RJ45 connector.

The Ethernet controller interfaces to the PCI portion of the bus. Features of this controller include:

- Speed auto-negotiation (complies with IEEE802.3 standard)
- Full-duplex operation at 10 Mb/s and 100 Mb/s
- Low-power energy modes

Ethernet RJ45 Interface Connector (J13)

The Ethernet connector is a standard RJ45 jack for connecting directly to an Ethernet network using category 5 UTP/STP cabling.

Table 2-36 lists the signals and pin numbers of the Ethernet connector:

Table 2-36. Ethernet RJ45 Connector (J13)

Pin #	Function
1	TX +
2	TX -
3	RX +
6	RX -
4, 5, 7, 8	Signal Common

Ethernet Interface Software

Manufacturer's Ethernet ID

Each manufacturer of Ethernet network adapters and interfaces is assigned a unique manufacturer's ID by the IEEE Standards Office. A network address consists of 48 bits. The upper 24 bits are the manufacturer's ID and the lower 24 bits are the board's unique ID.

For developers who are creating network applications, knowing the manufacturer's ID for network adapters attached to the network may or may not be important.

Ampro's 24-bit manufacturer's ID for Ethernet controllers is displayed in hex as follows:

```
00 40 53
```

Network Operating Systems

The Ethernet interface is typically connected in a network controlled by a network operating system. The network operating system may be part of the computer's operating system or be provided separately. For example, Windows® NT provides the network operating system as part of a computer's operating system. Novell's NetWare™ provides a separate, add-on network operating system for DOS and Windows. The network operating system provides file server and network services to the distributed systems connected to the network. Each node on the network must have a compatible network operating system installed as well.

Modern network architectures are based on the OSI model, which defines layers of software between the network hardware, the network operating system, and the applications that use the network services. The actual Ethernet cable and the Little Board P6d hardware interface are at the bottom level. A driver program at the next level handles communication between the hardware and the operating system, masking any unique differences in the hardware from the layers above it, including the network operating systems.

Network OS Drivers

The Little Board P6d Ethernet subsystem uses Intel drivers available from Intel. The driver is the only unique software you need to use the Little Board P6d system. The supported network operating systems provide the other software layers normally provided in the OSI model. These include:

AHSM ODI Drivers (DOS, OS/2, Server)

CHSM ODI Driver for NetWare 5.0

NDIS 2.0.1 Drivers (DOS version 6.x, OS/2 version 3.x and 4.x)

NDIS 3.x MAC Drivers (for WFW 3.11; NT versions 3.5, 3.51, 4.0; Win95)

NDIS 3.x Miniport Drivers (for Windows 95 and Windows NT 3.51)

NDIS 4.x Driver (for Windows NT 4.0 and Windows 95 OSR 2)

Novell UnixWare Drivers (for v1.1 and 2.0)

There are also drivers for various flavors of UNIX and for other operating systems. Intel also supplies diagnostic software for testing your Ethernet setup.

For the most up-to-date drivers and utility software, please refer to the Intel web page:

http://developer.intel.com/design/network/drivers/index.htm#82559ER

Note

Intel updates its web site frequently and this location could move in the future.

Ethernet Setup

This section describes how to configure and connect the Ethernet LAN interface.

There are no jumpers to set on the Ethernet interface, and no hardware configuration, other than connecting the network cable to an appropriate connector.

Software configuration of the Ethernet interface includes the following steps:

1. In Setup, enable the Ethernet interface.

2. Install the proper driver for the network operating system you will be running. Follow Intel's instructions for installing your driver.

Ethernet Indicator LEDs

Two LED indicator lamps are provided on the board to indicate the status of the Ethernet interface. You can use these LEDs as simple trouble-shooting aids when connecting to an Ethernet segment. Table 2-37 shows the meaning of each LED.

Table 2-37. Ethernet Diagnostic LEDs

Color	Designation	Function
Green	D3	Link Status
Red	D4	TX or RX Activity

Watchdog Timer

The watchdog timer function restarts the system if a mishap occurs. Possible problems include: failure to boot properly; application software losing control; temporary power supply problems; failure of an interface device; unexpected conditions on the bus; or other hardware or software malfunctions. The watchdog timer helps assure proper start-up after an interruption. The Little Board P6d ROM-BIOS supports the board's watchdog timer function in two ways:

There is an initial watchdog timer setting, specified using SETUP, which determines whether the watchdog timer monitors the system boot, and if so, how long the time-out is (30, 60, or 90 seconds). Set the initial time-out (using SETUP) long enough to guarantee that the system can boot and pass control to the application. Then, the application must periodically retrigger the timer by reading I/O Port 201h so the time-out does not occur. If the time-out does occur, the system will respond as determined by how the watchdog timer jumper, W8, is set (see Chapter 2).

There is a standard ROM-BIOS function which may be used by application software to start and stop the watchdog timer function. Ampro provides the WATCHDOG program that you can use from the command line or in a batch program to manage the watchdog timer. It is described in the

Ampro Common Utilities manual. The following simple assembly language routine illustrates how to control the watchdog timer using the Ampro ROM-BIOS function provided for this purpose:

```
;-------------------------------------------------------------
; Watchdog timer control program
;-------------------------------------------------------------
MOV   AH,0C3h                  ; Watchdog Timer BIOS function
MOV   AL,nn                    ; Use "00" to disable, "01" to enable
                               ; timer.
MOV   BX,mm                    ; Selects time, in seconds
                               ;(00-FFh; 1-255 seconds)
INT   15h
```

Utility Connectors (J19)

The Utility connector is 44-pin dual row 2mm. Several functions appear on the Utility connector. Table 2-38 shows the pinout and signal definitions. Since there are connections for diverse features on this single connector, a discrete-wire connector is recommended. Table 2-39 shows manufacturer's part numbers for both types of mating connectors.

Table 2-38. Utility Connector (J19)

Pin #	Signal Name	Function	Pin #	Signal Name	Function
1	-12	External -12V input for expansion cards	2	GND	Ground return
3	-5	External -5V input for expansion cards	4	GND	Ground return
5	LED	LED current source (+5V through 330 ohms)	6	RSVD	No connection
7	SPKR+	PC audio signal output	8	GND	Ground
9	RSTSW*	To one side of manual reset button.	10	KBDATA	Keyboard serial data
11	KBCLK	Keyboard clock	12	GND	Keyboard ground
13	+5	Keyboard +5V power	14	MDATA	Mouse serial data
15	MCLK	Mouse clock	16	GND	Mouse ground
17	+5	Mouse +5V power	18	IR_MODE	IrDA Mode/IrDA RXB
19	IRTX	IrDA Transmit /TTL TX2	20	IRRX	IrDA Receive/TTL RX2
21	GND	Ground	22	TTL_TX1	TTL Transmit 1
23	TTL_RX1	TTL Receive 1	24	GND	Ground
25	TTL_TX3	TTL Transmit 3	26	TTL_RX3	TTL Receive 3
27	GND	Ground	28	TTL_TX4	TTL Transmit 4
29	TTL_RX1	TTL Receive 4	30	GND	Ground
31	KEY	Key Pin	32	LID	Lid Switch Input
33	PWRBTN*	Power Button Input	34	BATLOW*	Battery Low Input
35	RI*	Ring Indicator Serial 2	36	GND	Ground
37	SUSV	Voltage for Power Down	38	GND	Ground
39	SUSC*	Suspend Status C	40	SMBCLK	SMBus clock
41	SMBDATA	SMBus Data	42	SMBALRT*	SMBus Alert
43	BATV	+ Battery (Not Required)	44	Ground	- Battery (Not Required)

Table 2-39. Utility Mating Connector

Connector Type	Mating Connector
Cable, Ribbon, 1mm, 44 pins	3M3625/44 or equivalent
Connector, IDC, 2mm, 44 pins	3M87044-1000 or equivalent

LED Connection

To connect an external LED power-on indication lamp, connect the LED anode to pin-5 and the cathode to ground. Pin 5 provides +5V through a 300 ohm resistor.

Speaker Connections

The board supplies about 100 mW for a speaker on pin-7. Connect the other side of the speaker to ground (pin-8). A transistor amplifier buffers the speaker signal. Use a permanent magnet speaker with an 8 ohm voice coil.

Push-button Reset Connection

Pin-9 provides a connection for an external normally-open momentary switch to manually reset the system. Connect the other side of the switch to ground. The reset signal is "de-bounced" on the board.

Keyboard Connection

You can connect an AT keyboard to the keyboard port. Normally, AT keyboards include a cable that terminates in a male 5-pin DIN plug for connection to an AT (or a 6-pin miniature DIN plug for PS/2). Table 2-40 gives the keyboard connector pinout and signal definitions, and includes corresponding pin numbers for DIN keyboard connectors.

Table 2-40. Keyboard Connector (J19)

Pin #	Signal Name	DIN-5 Pins	DIN-6 Pins
10	Keyboard Data	2	1
11	Keyboard Clock	1	5
12	Ground	4	3
13	Keyboard power	5	4

PS/2 Mouse Connection

You can connect aPS/2 Mouse to the mouse port. Normally, the PS/2 Mouse includes a cable that terminates in a 6-pin miniature DIN. Table 2-41 gives the keyboard connector pinout and signal definitions, and includes corresponding pin numbers for DIN keyboard connectors.

Table 2-41. Keyboard Connector (J16)

Pin #	Signal Name	DIN-6 Pins
14	Mouse Data	1
15	Mouse Clock	5
16	Ground	3
17	Mouse power	4

IrDA Interface

The IrDA interface is described earlier in this chapter.

TTL Serial Ports

The TTL version of the serial ports 1,3, and 4 are brought out to the Utility connector. The TTL version of serial port 2 can be rerouted to the IrDA TX and RX lines.

Miscellaneous Power Management Signals

Table 2-42 describes miscellaneous Power Management signals.

Table 2-42. Miscellaneous Power Management Signals

Signal	Description
LIDSW	Simulates the lid switch of a laptop
PWRBTN	Turns off all but minimum power or restores power
BATLOW	Simulates a low battery condition
RI	Ring indicator I/O: Input to wake up from power off; output from serial port 2 RI
SUSV	Low current input voltage to support power off.
SUSC	Indicates Suspend To Disk (Power Off)
SMBCLK	System Management Bus Clock
SMBDATA	System Management Bus Data I/O
SMBALRT	System Management Bus Alert
BATV	External Battery Input (Only used for special options)

PC/104-Plus Expansion Bus

The PC/104-Plus expansion bus appears on three header connectors, J1, J2, and J3. J1 is a 64-pin female dual-row header. J2 is a 40-pin female dual-row header, and J3 is a 120-pin 2mm female quad-row header (4 x 30). The PC bus subset of the PC/104-Plus expansion bus connects to J1. The AT expansion bus signals connect to J2. The layout of signals on J1 and J2 is compliant with the PC/104 bus specification, and make up the ISA bus portion of the PC/104-Plus bus. An implementation of the PCI bus appears on J3.

PC/104-compatible expansion modules can be installed on the Little Board P6d expansion bus. The buffered output signals to the expansion bus are standard TTL level signals. All inputs to the Little Board P6d system operate at TTL levels and present a typical CMOS load to the expansion bus.

On-board MiniModule Expansion Details

When installed on the PC/104 expansion bus headers, expansion modules fit within the Little Board P6d module's outline dimensions. You can install one or more Ampro MiniModule products or other PC/104 modules on the Little Board P6d expansion connectors. When installed on J1 and J2, the expansion modules fit within the Little Board P6d module's outline dimensions.

Most Ampro MiniModule products have stackthrough connectors compatible with the PC/104 specification. You can stack several modules on the Little Board P6d headers. Each additional module increases the thickness of the package by 0.66 inches (15 mm). Thus, a 3-module system fits within the outline of the Little Board and within a 2.4-inch vertical space.

Figure 2-6 shows an example of how PC/104 modules stack on the Little Board P6d module.
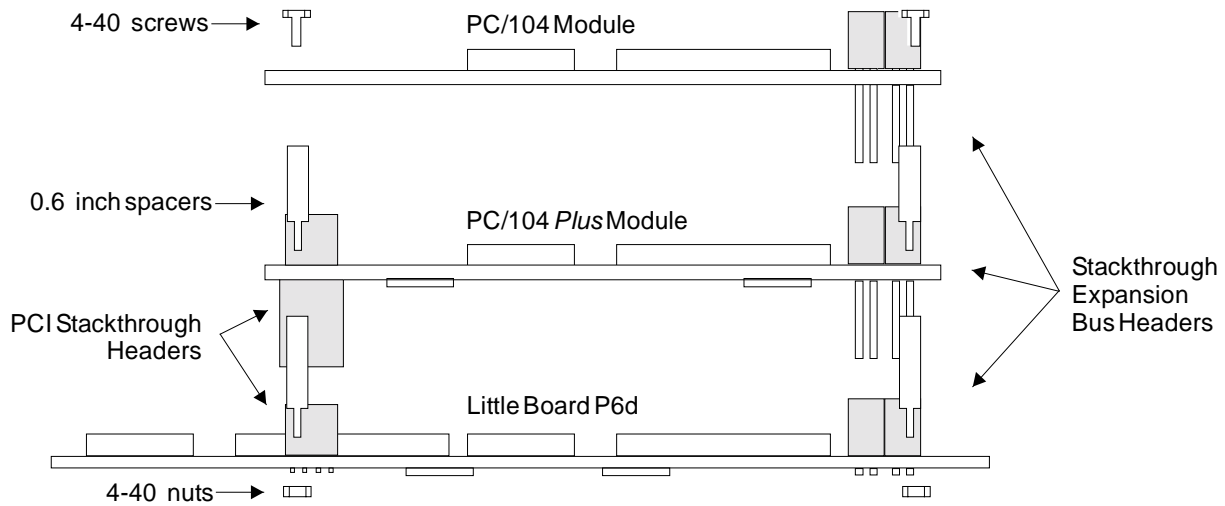
Figure 2-6. Stacking PC/104 Modules on the Little Board P6d Module

Using Standard PC and AT Bus Cards

Ampro offers several options that allow you to add conventional 8-bit and 16-bit ISA expansion cards to the Little Board P6d system. Contact Ampro for further information about optional bus expansion products.

Expansion Bus Connector Pinouts

Table 2-43 and Table 2-44 show the pinout and signal functions on the ISA portion. Table 2-45 shows the PCI portion of the PC/104-Plus expansion bus connectors. These include J1, J2, and J3. The expansion bus pin numbers for J1 and J2 correspond to the scheme normally used on ISA expansion bus card sockets. Rather than numerical designations (1, 2, 3) they have alpha-numeric designations (A1, A2…, B1, B2…, etc.). Similarly, the rows of J3 are designated A, B, C, and D.

The Little Board P6d system does not generate ±12VDC, 3.3V, or -5VDC for the expansion bus. If devices on the bus require these voltages, -12V and -5V can be supplied to the bus connector from the Utility 1 connector (J19). +12V can be supplied through J10-4. If a PCI peripheral board requires 3.3V, you can attach this voltage to J10-5.

Table 2-43. PC/104 Expansion Bus Connector, J1 (A1-B32)

Pin #	Signal Name	Function	Pin #	Signal Name	Function
A1	IOCHCK*	Bus NMI input	B1	GND	Ground
A2	SD7	Data bit 7	B2	RSTDRV	System reset signal
A3	SD6	Data bit 6	B3	+5V	+5 Volt power
A4	SD5	Data bit 5	B4	IRQ9	Interrupt request 9
A5	SD4	Data bit 4	B5	-5V	To J16-3
A6	SD3	Data bit 3	B6	DRQ2	DMA request 2
A7	SD2	Data bit 2	B7	-12V	To J16-1
A8	SD1	Data bit 1	B8	ZWS*	Zero wait state
A9	SD0	Data bit 0	B9	+12V	To J10-1
A10	IOCHRDY	I/O Ready Ctrl	B10	N/A	Keyed pin
A11	AEN	Address Enable	B11	SMEMW*	Mem Write(lwr 1MB)
A12	SA19	Address bit 19	B12	SMEMR*	Mem Read(lwr 1MB)
A13	SA18	Address bit 18	B13	IOW	I/O Write
A14	SA17	Address bit 17	B14	IOR	I/O Read
A15	SA16	Address bit 16	B15	DACK3*	DMA Acknowledge 3
A16	SA15	Address bit 15	B16	DRQ3	DMA Request 3
A17	SA14	Address bit 14	B17	DACK1*	DMA Acknowledge 1
A18	SA13	Address bit 13	B18	DRQ1	DMA Request 1
A19	SA12	Address bit 12	B19	RFSH*	Memory Refresh
A20	SA11	Address bit 11	B20	SYSCLK	Sys Clock
A21	SA10	Address bit 10	B21	IRQ7	Interrupt Request 7
A22	SA9	Address bit 9	B22	IRQ6	Interrupt Request 6
A23	SA8	Address bit 8	B23	IRQ5	Interrupt Request 5
A24	SA7	Address bit 7	B24	IRQ4	Interrupt Request 4
A25	SA6	Address bit 6	B25	IRQ3	Interrupt Request 3
A26	SA5	Address bit 5	B26	DACK2*	DMA Acknowledge 2
A27	SA4	Address bit 4	B27	TC	DMA Terminal Count
A28	SA3	Address bit 3	B28	BALE	Address latch enable
A29	SA2	Address bit 2	B29	+5V	+5V power
A30	SA1	Address bit 1	B30	OSC	14.3MHz clock
A31	SA0	Address bit 0	B31	GND	Ground
A32	GND	Ground	B32	GND	Ground

Table 2-44. PC/104 Expansion Bus Connector, J2 (C0-D19)

Pin #	Signal Name	Function	Pin #	Signal Name	Function
C0	GND	Ground	D0	GND	Ground
C1	SBHE*	Bus High Enable	D1	MCS16*	16-bit Mem Access
C2	LA23	Address bit 23	D2	IOCS16*	16-bit I/O Access
C3	LA22	Address bit 22	D3	IRQ10	Interrupt Request 10
C4	LA21	Address bit 21	D4	IRQ11	Interrupt Request 11
C5	LA20	Address bit 20	D5	IRQ12	Interrupt Request 12
C6	LA19	Address bit 19	D6	IRQ15	Interrupt Request 15
C7	LA18	Address bit 18	D7	IRQ14	Interrupt Request 14
C8	LA17	Address bit 17	D8	DACK0*	DMA Acknowledge 0
C9	MEMR*	Memory Read	D9	DRQ0	DMA Request 0
C10	MEMW*	Memory Write	D10	DACK5*	DMA Acknowledge 5
C11	SD8	Data Bit 8	D11	DRQ5	DMA Request 5
C12	SD9	Data Bit 9	D12	DACK6*	DMA Acknowledge 6
C13	SD10	Data Bit 10	D13	DRQ6	DMA Request 6
C14	SD11	Data Bit 11	D14	DACK7*	DMA Acknowledge 7
C15	SD12	Data Bit 12	D15	DRQ7	DMA Request 7
C16	SD13	Data Bit 13	D16	+5V	+5 Volt Power
C17	SD14	Data Bit 14	D17	MASTER*	Bus Master Assert
C18	SD15	Data Bit 15	D18	GND	Ground
C19	Key	Key Pin	D19	GND	Ground

Table 2-45. PC/104-Plus Expansion Bus Connector, J3 (A1-D30)

Pin	A	B	C	D
1	GND/5.0V KEY4	Reserved	+5	AD00
2	VI/O (+5V)	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0*	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O (+5V)	AD10	M66EN1
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1*	AD15	+3.3V
9	SERR*	GND	SB0*	PAR
10	GND	PERR*	+3.3V	SDONE
11	STOP*	+3.3V	LOCK*	GND
12	+3.3V	TRDY*	GND	DEVSEL*
13	FRAME*	GND	IRDY*	+3.3V
14	GND	AD16	+3.3V	C/BE2*
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3*	VI/O (+5V)	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0*	GND	REQ1*	VI/O
24	GND	REQ2*	+5V	GNT0*
25	GNT1*	VI/O (+5V)	GNT2*	GND
26	+5V	CLK0	GND	CLK1F
27	CLK2	+5V	CLK3	GND
28	GND	INTD*	+5V	RST*
29	+12V	INTA*	INTB*	INTC*
30	-12V	Reserved	Reserved	GND/3.3V KEY4

Notes: The shaded cells in the table denote unsupported signals.

Signal M66EN is grounded on the motherboard (Ground = 33MHz bus speed).

The KEY pins are to guarantee proper module installation. Pin A1 will be removed and the female side plugged for 5.0V I/O signals and Pin D30 will be modified in the same manner for 3.3V I/O. Both pins will be removed for 3.3/5.0 operation.

Setup

Many options provided on the Little Board P6d system are controlled by the Setup function. The parameters are displayed on several screens, selected from a main menu screen. To configure the board, you modify the fields in these screens and save the results in the on-board configuration memory.

The configuration memory consists of portions of the CMOS RAM in the battery-backed real-time clock chip and an Ampro-unique configuration EEPROM. To enhance embedded-system reliability, the contents of the EEPROM mirror the contents of the CMOS memory. The EEPROM retains your configuration information even if the clock's backup battery fails.

The Setup information is retrieved from configuration memory when the board is powered up or when it is rebooted with a CTL-ALT-DEL key combination. Changes made to the Setup parameters (with the exception of the real-time clock time and date settings) do not take effect until the system is rebooted.

The Setup program is located in the ROM BIOS. To access Setup, press DEL while the computer is in the Power On Self Test (POST), just prior to booting. This is called hot key access. The screen will display a message indicating when entering DEL will access Setup.

Some Setup fields, for example, the amount of DRAM memory installed on the board, are read-only fields, intended for informational purposes only.

Setup Help

You can access help information for many of the Setup options by pressing F1. The information is displayed in a popup window. Some help screens list all the available option settings, while others display additional information. Table 2-46 summarizes the choices found on each Setup page.

Table 2-46. Functions on Each Setup Page

Page	Menu Name	Functions
1	Main Menu	Select various Setup screens Load Setup defaults Save and/or Exit Setup
2	Standard CMOS Setup	Set date and time Enter IDE hard disk parameters Set type and number of floppy disks Set default video state Configure BIOS error handling Displays amount of installed DRAM memory
3	BIOS Features Setup	Enable/disable virus warning message Enable/disable internal CPU cache Enable/disable external cache Enable/disable quick POST Select boot sequence Additional floppy parameters Set NumLock default state Set initial system speed Configure keyboard typematic rates Enable/disable PCI/VGA palette snoop Select VGA video IRQ Set watchdog timer parameters Enable/disable system status messages Select OS for DRAM > 64MB Enable/disable shadowing of memory areas Enable/disable serial console Enable/disable boot loader
4	Chipset Features Setup	Configure memory timing (not recommended) Enable/disable cache options
5	Power Management Setup	Set power management level Set power management options Set power management timers Select power management events
6	PCI Configuration Setup	IRQ configuration IDE interrupt configuration
7	Integrated Peripherals Setup	Set IDE mode Enable/disable/configure IDE interfaces Enable/disable support for USB keyboard Enable/disable floppy disk controller Enable/disable/configure serial ports Configure for IrDA support Enable/disable/configure parallel port Configure video mode, select flat panel type Enable/disable Ethernet interface

Setup 1 — Main Menu

The first Setup page contains a menu for accessing several Setup screens, plus several additional parameters. Figure 2-7 shows Setup page 1. Sections following the figure describe each option.

```
┌─────────────────────────────────────────────────────────────────────┐
│                        CMOS SETUP UTILITY                             │
│                     Ampro Computers, Inc.                             │
├─────────────────────────────────────┬─────────────────────────────────┤
│   STANDARD CMOS SETUP                │    INTEGRATED PERIPHERALS        │
│                                      │                                  │
│   BIOS FEATURES SETUP                │    LOAD SETUP DEFAULTS           │
│                                      │                                  │
│   CHIPSET FEATURES SETUP             │    SAVE & EXIT SETUP             │
│                                      │                                  │
│   POWER MANAGEMENT SETUP             │    EXIT WITHOUT SAVING           │
│                                      │                                  │
│   PCI CONFIGURATION SETUP            │                                  │
├─────────────────────────────────────┴─────────────────────────────────┤
│ ESC : Quit                      ↑ ↓ → ←        : Select Item           │
│ F10 : Save & Exit Setup         (Shift)F2 : Change Color               │
├─────────────────────────────────────────────────────────────────────┤
│                                                                        │
│         Help messages for each feature line appear here                │
│                                                                        │
└─────────────────────────────────────────────────────────────────────┘
```

Figure 2-7. Setup 1 — Main Menu

The main menu screen allows the selection of other optional SETUP screens.

■ STANDARD CMOS SETUP allows the setup of time, date, hard and floppy disk, video, and POST halt conditions.

■ BIOS FEATURES SETUP selects BIOS features including Virus Warning, caching, POST speed, boot sequence, floppy features, A20 options, memory parity, keyboard typematic selection, security, PCI/VGA palette snoop, and shadowing.

■ CHIPSET FEATURES SETUP allows the modification of CHIPSET function including configuration, AT bus clock, DRAM timing, SRAM timing, refresh, ISA bus timing, memory allocation at 15M, CPU pipelining, IDE controller, IDE buffering, secondary IDE, IDE modes, and onboard FDC, serial, and parallel port.

■ POWER MANAGEMENT SETUP selects the power management features and the related implementation.

■ PCI CONFIGURATION SETUP configures the PCI interrupt and other PCI unique features.

■ INTEGRATED PERIPHERALS configures the onboard peripheral device such as serial, parallel and other devices.

■ LOAD SETUP DEFAULTS initializes all CMOS settings to a predefined default state.

■ SAVE & EXIT SETUP option prompts to save CMOS information and exits.

■ EXIT WITHOUT SAVING exits SETUP without writing setup information to CMOS.

Setup 2 — Standard CMOS Setup

Use Setup 2 to set the date and time, configure your hard and floppy disks, and report system memory. Figure 2-8 shows what can be configured on Setup 2, and the sections that follow describe each parameter.

```
                         STANDARD CMOS Setup
                        Ampro Computers, Inc.

   Date (mm:dd:yyyy) : Wed, Feb 23, 1998
   Time (hh:mm:ss)   :  8 : 17 : 25


   HARD DISK           TYPE  SIZE   CYLS HEAD PRECOMP LANDZ SECTOR MODE
   Primary Master    : Auto    0       0    0       0     0      0 AUTO
   Primary Slave     : Auto    0       0    0       0     0      0 AUTO
   Secondary Master  : Auto    0       0    0       0     0      0 AUTO
   Secondary Slave   : Auto    0       0    0       0     0      0 AUTO


   Drive A       : 1.44M, 3.5 in.        Base Memory:     640K
   Drive B       : None              Extended Memory:   31744K
                                         Other Memory:    384K
   Video         : EGA/VGA          ——————————————————————————
   Halt On       : All Errors           Total Memory:   32768K
   ESC : Quit       ↑ ↓ → ←  : Select Item     PU/PD/+/- : Modify
   F1  : Help         (Shift)F2 : Change Color
```

Figure 2-8. Setup 2 — Standard CMOS Setup

The Standard CMOS Setup screen allows you to configure the following parameters:

■ DATE – Requires the numeric entry of mm:dd:yyyy. Calendar month is displayed and year requires all 4 digits of century plus year.

■ No parameters are displayed for auto-detect hard disk.

■ The value displayed for Other Memory is required and utilized for system BIOS, video BIOS, and other system extension ROM shadowing. It is not available for general OEM use.

■ HARD DISK – When Auto TYPE is used the MODE should also be AUTO.

■ When using any IDE hard drive, Auto is the best choice.

EIDE Hard Disk Drives

The module supports up to two hard disk drives connected to the IDE interface. Only hard disk drives are directly supported in the system's ROM BIOS. IDE CD-ROM drives and other IDE-interfaced peripherals are configured by software or drivers supplied separately.

Physical drives can have one or more logical partitions. You can install up to eight logical drives using drive partitions. To configure the system for the IDE hard drives in your system, set the drive parameters with Setup, as outlined here:

Drive Types — the configuration memory contains a default list of parameters that specify the physical format of each drive. Each type specifies the total number of cylinders, number of heads, cylinder to begin precompensation, landing zone cylinder number, and the number of sectors per

cylinder. The drive manufacturer supplies these parameters. The list contains "legacy values", standard for PCs — a number of older (smaller) drives are defined.

Drive type USER lets you enter drive parameters manually. If no built-in drive type matches your drive, select drive type USER and enter the drive parameters in the fields provided.

Drive type AUTO selects Autoconfigure. Autoconfigure queries the drive for its parameters. Most modern drives will respond to the query, allowing the BIOS to set the drive parameter values automatically. This option also provides Logical Block Addressing (LBA) capability, which is used to support drives larger than 512MB.

Note

LBA uses a translation scheme to convert physical heads, sectors and cylinders to logical block numbers. Due to differences in the translation schemes used by different system BIOSs, LBA-compatible drives that have been formatted on Ampro systems may not function properly in other systems that support LBA mode. However, due to the intelligent translation algorithm in the Ampro BIOS, drives formatted in other systems are likely to be usable on the Little Board P6d CPU. This only applies to IDE drives that support LBA mode. Consult the technical literature for the drive you select to find out if it supports LBA mode.

Drive Selection

Besides specifying the physical characteristics of each IDE drive, you must also specify whether a drive is a master or slave drive. The first drive in a system is always configured as a master drive. A second drive would be a slave drive. Each manufacturer may use a different scheme to handle the master and slave relationship, so drives from different manufacturers may not be compatible. Be sure to test drive compatibility in systems with two IDE drives.

Drives default to master from the factory, so if you only have one IDE drive in a system it is generally already set up properly.

Once you have set the system's configuration memory, the IDE drive(s) can be formatted and otherwise prepared normally. Refer to your operating system and disk drive documentation for specific procedures and requirements.

Floppy Drives

The ROM BIOS supports all of the popular DOS-compatible floppy disk formats. This includes all the 5-1/4 inch and 3-1/2 inch floppy formats — 360K, 720K, 1.2M, and 1.44M.

Drive Parameter Setup

Enter the number and type of floppy drives in the system. If the drives connected to the system do not match the parameters in the configuration memory, POST displays an error message. To eliminate the error message, set the drive parameters to match your floppy drives.

Video

Specify the initial video mode. Select Mono, CGA40, CGA80, or EGA/VGA. If your video display card is VGA, super VGA, or any other high resolution standard, specify EGA/VGA no matter how it is configured to come up.

Error Halt

Select which kinds of errors will halt the Power-On Self Test (POST). If you plan to use the module without a keyboard, be sure to set this option to not halt on keyboard error.

DRAM Memory

The ROM BIOS automatically detects the amount of memory during POST and stores the result when you save the configuration values when exiting Setup. This Setup page displays the amount of memory found in the system.

Setup 3 — BIOS Features Setup

Use Setup 3 to set a variety of BIOS feature options. Figure 2-9 shows what can be configured on Setup 3, and the sections that follow describe each parameter.

```
                         BIOS FEATURES Setup
                       Ampro Computers, Inc.
Virus Warning             : Disabled  Video  BIOS Shadow  : Enabled
CPU Internal Cache        : Enabled
External Cache            : Disabled  Serial Console      : Disabled
                                      Serial Boot Loader  : Disabled
Quick Power On Self Test  : Disabled
Boot Sequence             : A,C,SCSI
Swap Floppy Drive         : Disabled
Boot Up Floppy Seek       : Enabled
Boot Up Numlock Status    : Off
Gate A20 Option           : Fast
Typematic Rate Setting    : Disabled
Typematic Rate (chars/Sec)  : 6
Typematic Delay(Msec)     : 250


PS/2 mouse function       : Disabled  ESC:Quit       ↑ ↓ → ←: Select
PCI/VGA Palette Snoop     : Disabled  Item
OS Select for DRAM >64MB  : Non-OS2   F1 :Help       PU/PD/+/- : Modify
Report No FDD For WIN 95  : Yes       F5 :Old Values (Shift)F2:Color
Watchdog Timer            : Disabled  F6 :Load BIOS Defaults
                                      F7 :Load Setup Defaults
```

Figure 2-9. Setup 3 — BIOS Features Setup

This Setup screen allows you to configure the following parameters:

■ VIRUS WARNING – default is disabled. Virus Warning monitors for writes to the hard disk boot sector. It will display the following warning message, beep the speaker and wait for user confirmation.

```
                         !!! WARNING !!!
                 Disk Boot sector is to be modified
                 type "Y" to accept, any key to abort
                        Award Software, Inc.
```

■ BOOT SEQUENCE – is, [A,C], [C,A], [A,SCSI], [SCSI,A], [CD,A,C], [C only], or [SCSI only].

Note

"C" refers to IDE/ATA drive and "CD" refers to a IDE/ATA CD-ROM
drive.

■ SWAP FLOPPY DRIVE – This allows swapping A and B drives.
■ PS/2 MOUSE FUNCTION – The interface uses IRQ12. Disabling the interface will allow other
  uses for IRQ12. The PS2 mouse must be disabled before usingIRQ12 for other functions.
■ PCI/VGA PALETTE SNOOP – With this enabled graphic screens may be distorted when booting
  Windows 95.
■ OS SELECT FOR DRAM > 64MB – This is used to limit the reporting of memory above 64MB.
  Some operating systems will fail when more than 64MB of memory is reported. Some versions
  of OS/2 are known to have this problem.
■ VIDEO BIOS SHADOW – PCI devices with onboard ROM always run from shadow ram
  regardless of settings. The onboard video always runs in shadow ram.
■ SERIAL CONSOLE – This selection is limited to Serial Port 1 or 2.
■ WATCHDOG TIME – This is located in the second SuperI/O chip. Read the Game port to tickle.

Serial Console Operation during SETUP.

When SETUP is being run using the serial console interface, the "ARROW" keys and "F" keys must
be simulated.

■ Arrow Keys – Arrow keys may be entered as displayed on the screen. The "^", "v", "<", and ">"
  keys will move the cursor in the represented direction. The WordStar diamond keys are also
  implemented identical to the MS-DOS editor.

Note

These keys only respond in this manner during SETUP and not
during normal operation.

Table 2-47. Key Simulations

^, Ctrl-e	Up arrow	>, Ctrl-d	Right arrow
v, Ctrl-x	Down arrow	<, Ctrl-s	Left arrow
Ctrl-r	Page up	Ctrl-c	Page down
Note: These keys simulate the arrow keys only during Setup, but not during normal computer operation.			

- F keys – F keys are entered with two keystrokes. The first entry is "F" followed by the number. So that "F" followed by "1" is the same as using the "F1" key. F10 is simulated by entering F0, "F" and "0".

Note

This unique operation only occurs during SETUP.

Setup 4 — Chipset Features Setup

Setup 4 — Chipset Features Setup controls internal chipset features. The OEM or end user should never change most of these items, as they specify internal parameters that have been chosen to support the existing motherboard design. Change these parameters only if directed to by Ampro Technical Support. Figure 2-10 shows what can be configured on Setup 4. The items that can be changed by the OEM are listed below.

```
                        Chipset Features Setup
                        Ampro Computers, Inc.
 Auto Configuration       :Enabled    CPU Warning Temperature:100°C/212°F
 EDO DRAM Speed Selection :60ns       Current CPU Temperature:68°C/154°F
 EDO CASx# MA Wait State  :2
 EDO RASx# Wait State     :2
 SDRAM RAS-to-CAS Delay   :3
 SDRAM RAS Precharge Time :3
 SDRAM CAS Latency Time   :3
 SDRAM Prechard Control   :Disabled
 DRAM Data Integrity Mode :Non-ECC
 System BIOS Cacheable    :Disabled
 Video BIOS Cacheable     :Disabled
 Video RAM Cacheable      :Disabled
 8 Bit I/O Recovery Time  :1
 16 Bit I/O Recovery Time :1
 Memory Hole At 15M-16M   :Disabled   ESC:Quit      ↑ ↓ → ←   : Select Item
 Passive Release          :Enabled    F1 :Help    PU/PD/+/-  : Modify
 Delayed Transaction      :Disabled   F5 :Old Values (Shift)F2:Color
 AGP Aperture Size        :64         F6 :Load BIOS Defaults
                                      F7 :Load Setup Defaults
```

Figure 2-10. Setup 4 — Chipset Features Setup

This Chipset Features Setup screen allows you to configure the following parameters:

- AUTO CONFIGURATION — This controls the configuration of DRAM and SDRAM timing.
- MEMORY HOLE AT 15M-16M — Local Memory option creates a 1 Meg memory hole below 16 Meg (special video hardware) and is only used by external video or a video board located in an ISA bus slot.

Setup 5 — Power Management Setup

The Little Board P6d CPU BIOS incorporates power management features compliant with Advanced Power Management (APM) BIOS Interface Specification Revision 1.1, created by Intel and Microsoft. Setup 5 — Power Management Setup allows you to configure your system to most effectively save energy while operating at the speed and response level you need in your application. Figure 2-11 shows what can be configured on the Setup 5 page. A description of each option is listed below.

Note

When features of the APM BIOS are enabled, some reduced power states are entered automatically. Reduced power states alter the performance of the system, usually slowing or halting the CPU. Use the power management functions with care when using the Little Board P6d in applications that require guaranteed maximum response times.

```
                         POWER MANAGEMENT Setup
                          Ampro Computers, Inc.
Power Management      : User Defined   ** Reload Global Timer Events **
PM Control by APM     : Yes            IRQ[3-7,9-15],NMI   : Enabled
Video Off Option      : VH Sync+Blank  Primary IDE 0       : Disabled
Video Off After       : Standby        Primary IDE 1       : Disabled
Modem Use IRQ         : 3              Secondary IDE 0     : Disabled
Doze Mode             : Disabled       Secondary IDE 1     : Disabled
Standby Mode          : Disabled       Floppy Disk         : Disabled
Suspend Mode          : Disabled       Serial Port         : Enabled
HDD Power Down        : Disabled       Parallel Port       : Disabled
Throttle Duty Cycle   : 62.5%
PCI/VGA Act-Monitor   : Disabled
Soft Off by PWR-BTTN  : Instant-Off
CPU Fan Off In Suspend: Enabled
Power-On By Ring      : Disabled
IRQ 8 Break Suspend   : Disabled
                                       ESC:Quit          ↑↓→←: Select Item
                                       F1 :Help      PU/PD/+/- : Modify
                                       F5 :Old Values (Shift)F2:Color
                                       F6 :Load BIOS Defaults
                                       F7 :Load Setup Defaults
```

Figure 2-11. Setup 5 — Power Management Setup

This Power Management Setup screen allows you to configure the following parameters:

■ Power Management — This sets the type or degree of power savings and is directly related to the power management modes defined by the APM specification. Settings are Disable (default), Min. Savings, Max Savings, and User Defined. The difference between Min and Max Savings is the time period delays between modes.

■ PM Control by APM — This selection, when enabled, allows operating systems with power management support to control the modes required for safe operation of shutdown occurrences. The default setting is Yes (Enabled).

■ Video Off Option — This selection sets the conditions under which the BIOS powers down the video (assuming your video interface supports power management).

– DPMS – Select this option only if your monitor supports the VESA Display Power Management Signaling standard.

– H/H Sync+Blank – This options turns off the horizontal and vertical sync signals and blanks the video buffer.

– Blank Screen – This option only blanks the video buffer.

■ Power Management Timers — These timing modes are only configurable if the Power Management option is set to User Defined. Each timer sets the amount of idle time before the system enters the specified power-saving mode. These modes are:

– Doze Mode — This mode reduces the CPU clock speed after a set time of system inactivity, when it is enabled. Other devices remain active.

– Standby Mode — This mode reduces the CPU clock speed and shuts down the disk drives and video monitor after a set time of system inactivity, when it is enabled. Other devices remain active.

– Suspend Mode — This mode shuts down all activities except DRAM refresh after a set time of system inactivity,.

– HDD Power Down — This mode shuts down the hard disk drives after a set time of system inactivity, when it is enabled. All other devices remain active.

– Throttle Duty Cycle — This mode selects a percentage of time the CPU runs in Doze Mode.

– PCI/VGA Active Monitor — This mode restarts the Standby Mode timer, if there is any video activity, when enabled.

– Soft-Off by PWR-BUTTN — This mode enables the PWR-BUTTN (Power Button) input. A 4 second signal from this input will cause a power-down of all on-board systems. External power is not controlled. The CPU fan may still run.

– Power-On by Ring (also Resume by Ring) — The mode uses a ring to power on the board, but is Disabled by default. When power is suspended to the board, Windows shuts down and power is removed from the ring input. This also causes the ring input to act as a startup event if a ring occurs, which will restart the board.

– IRQ 8 Break Suspend — This mode uses the RTC Interrupt to cause the power management mode to exit.

– CPU Fan Off in Suspend — This feature turns off the CPU Fan in suspend mode, or keeps the fan running, allowing it to cool off the CPU.

■ Reload Global Timer Events — Any of the Reload Global Timer Events will cause the Standby Mode timer to be restarted when the event is detected.

Setup 6 — PCI Configuration Setup

The Little Board P6d CPU BIOS incorporates automatic PCI IRQ configuration for peripherals. You can, however, override the automatic features and specify PCI IRQ settings with SETUP 6. Figure 2-12 shows what can be configured on SETUP 6. A description of each option is listed below.

```
                          PCI CONFIGURATION SETUP
                           Ampro Computers, Inc.
1st Available IRQ        :10
2nd Available IRQ        :11
3rd Available IRQ        :9
4th Available IRQ        :5




                                    ESC:Quit                 ↑ ↓ → ← :
                                    Select Item
                                    F1 :Help                 PU/PD/+/- :
                                    Modify
                                    F5 :Old Values           (Shift)F2:Color
                                    F6 :Load BIOS Defaults
                                    F7 :Load Setup Defaults
```

Figure 2-12. Setup 6 — PCI Configuration Setup

This Setup screen allows you to configure the following parameters:

■ Nth Available IRQ — selects the order in which ISA IRQ channels can be assigned to PCI devices.

■ PCI IDE Options — these options must be left in their default state.

Note

PCI interrupts may not be sharable with NON-PCI hardware onboard or on the ISA bus. For example, if you are using IRQ10 for a serial port and also have it assigned to the PCI bus, the serial interrupt will not occur.

Setup 7 — Integrated Peripherals Setup

The peripheral interfaces integrated on the Little Board P6d system can be configured on Setup 7 — Integrated Peripherals Setup (Figure 2-13). You can configure the IDE port, USB port, floppy controller, IrDA port, serial ports, and parallel port from this screen.

```
                       INTEGRATED PERIPHERALS SETUP
                          Ampro Computers, Inc.
IDE HDD Block Mode          : Enabled   Onboard Parallel Port       : 378/IRQ7
IDE Primary Master PIO      : Auto      Parallel Port Mode          : ECP+EPP1.9
IDE Primary Slave PIO       : Auto      ECP Mode use DMA            : 3
IDE Secondary Master PIO    : Auto      Onboard Serial Port 3       : 3E8H/IRQ4
IDE Secondary Slave PIO     : Auto      Onboard Serial Port 4       : 2E8H/IRQ3
IDE Primary Master UDMA     : Auto      Interface Select Ser1       : RS232
IDE Primary Slave UDMA      : Auto      Interface Select Ser2       : RS232
IDE Secondary Master UDMA   : Auto      Interface Select Ser3       : RS232
IDE Secondary Slave UDMA    : Auto      Interface Select Ser4       : RS232
On-Chip Primary PCI IDE     : Enabled   On-Board Sound Chip    : Enabled
ON-Chip Secondary PCI IDE   : Enabled   On-Board LAN Chip      : Enabled
USB Keyboard Support        : Disabled  Assign IRQ for USB     : Enabled
Init Display First          : PCI Slot  Onboard VGA Display    : Enabled
                                        VGA Flat Panel Type    : 1
Onboard FDC Controller      : Enabled   ESC:Quit        ↑ ↓ → ← : Select Item
Onboard Serial Port 1       : 3F8/IRQ4  F1 :Help            PU/PD/+/-: Modify
Onboard Serial Port 2       : 2F8/IRQ3  F5 :Old Values    (Shift)F2:Color
UART2 Mode                  : Standard  F6 :Load BIOS Defaults
                                        F7 :Load Setup Defaults
```

Figure 2-13. Setup 7 — Integrated Peripherals Setup

- IDE HDD Block Mode —This items allows your hard drive system to use a mode where the interface transfers large blocks of data instead of the normal small blocks, when enabled. Enabled is the default state, and works for newer hard drives. Disable this feature if your drive does not support block mode transfers.

- IDE Primary/Secondary Master/Slave PIO Mode — This item sets the PIO mode for devices attached to the IDE interface. Auto (default) lets the BIOS automatically determine what mode is the fastest for each device. Mode 1 through Mode 4 forces the BIOS to use the specified mode, and overrides the MODE setting on the Standard CMOS Setup Screen, Setup 2.

- IDE Primary/Secondary Master/Slave UDMA — This item enables or disables support for Ultra DMA/33 mode on the selected IDE device. When set to "AUTO", Ultra DMA/33 will be used if it is supported by the connected IDE drive.

- On-Chip Primary/Secondary PCI IDE — This items enables or disables the primary or secondary IDE controller.

- USB Keyboard Support — This item is a legacy entry and must remain Disabled to use the ISA memory region from D000:0 to D000:FFFF. This IRQ may be disabled for use elsewhere. This does not prevent the USB keyboard from functioning.

- Onboard FDC Controller — This item enables or disables the on-board floppy disk controller.

- Onboard Serial Ports — These items configure each serial port's address and interrupt. Available choices for the I/O addresses are 3F8, 2F8, 3E8H, and 2E8H. Available IRQ choices for all four serial ports are IRQ3 and IRQ4. You also use IRQ10 and IRQ12 for serial ports 3 and 4, if these IRQs are not already assigned. If you select Auto, the BIOS automatically selects the IRQ for you. You may also disable any serial port.

- Onboard Parallel Port — This item sets the parallel port address and IRQ assignments. Available addresses are 378, 278, or 3BC. Available IRQ assignments are IRQ7 and IRQ5. You may also disable the port.

- Parallel Port Mode — This item sets the type of parallel port mode (ECP or ECP/EPP).

- ECP Mode Use DMA — This item selects a DMA channel to use with the ECP mode of the parallel port. This selection only applies if the parallel port is configured for ECP or ECP/EPP modes.

- Interface Select SerX — These items set the respective port for RS232 or RS485 compatibility.

- Onboard Sound Chip — This item enables or disables the on-board Audio subsystem.

- Onboard LAN Chip — This item enables or disables the on-board Ethernet controller.

- Assign IRQ for USB — This item allows you to manual select an IRQ for the USB port by setting this to Enable. If you set this to Disable, the IRQ for the USB port is automatically assigned.

- Onboard VGA Display — Choices are CRT, FP (Flat Panel), CRT/FP (CRT and Flat panel-display default setting), NTSC, and PAL.

Note

In CRT/FP mode the CRT may not display correctly depending on the Flat Panel selected and the scan capabilities of the CRT monitor.

- VGA Flat Panel Type — There is support for 8 VGA Flat Panel Types, numbered 1 to 8. The list in Table 2-48 details the flat panel types available for each support number. For panel support not listed in Table 2-48, contact Ampro for more information.

Table 2-48. VGA Flat Panel Types

Panel #	Panel Class
1	1024x768 Dual Scan STN Color Panel
2	1280x1024 TFT Color Panel
3	640x480 Dual Scan STN Color Panel
4	800x600 Dual Scan STN Color Panel
5	640x480 Sharp TFT Color Panel
6	640x480 18-bit TFT Color Panel
7	1024x768 TFT Color Panel
8	800x600 TFT Color Panel

Other Setup Screens

Load Setup Defaults Screen

```
                        CMOS SETUP UTILITY
                       Ampro Computers, Inc.
┌──────────────────────────────────┬──────────────────────────────┐
│                                   │                              │
│   STANDARD CMOS SETUP             │   LOAD SETUP DEFAULTS         │
│   BIOS FEATURES SETUP             │   LOAD BIOS DEFAULTS          │
│   CHIPSET FEATURES SETUP          │   IDE HDD AUTO DETECTION      │
│   POWER MANAGEMENT SETUP          │   SAVE & EXIT SETUP           │
│   PCI CONFIGURATION ┌─────────────────────────────┐ VING         │
│                     │ Load Setup Defaults(Y/N)?N  │              │
│                     └─────────────────────────────┘              │
├───────────────────────────────────┴──────────────────────────────┤
│ ESC : Quit               ↑↓→←        : Select Item                │
│ F10 : Save & Exit Setup     (Shift)F2   : Change Color            │
├────────────────────────────────────────────────────────────────┤
│                                                                  │
│        Load Setup Defaults except Standard CMOS SETUP            │
│                                                                  │
└──────────────────────────────────────────────────────────────────┘
```

Figure 2-14. Load Setup Defaults Screen

IDE HDD Auto Detection Screen

The IDE HDD AUTO DETECTION screen provides one or more options other than AUTO for configuring the hard disk drive. These options may include Logical Block Mode (LBA), Normal Mode, or Large Mode.

```
┌──────────────────────────────────────────────────────────────────┐
│ HARD DISK            TYPE  SIZE   CYLS HEAD PRECOMP LANDZ SECTOR MODE │
│ ──────────────────────────────────────────────────────────────── │
│  Primary Master   :                                                │
│  Primary Slave    :                                                │
│  Secondary Master :                                                │
│  Secondary Slave  :                                                │
│                                                                    │
│    ┌──────────────────────────────────────────────────────────┐   │
│    │     Select Primary Master  Option (N=Skip) : N           │   │
│    │                                                          │   │
│    │   OPTIONS      SIZE    CYLS HEAD PRECOMP LANDZ SECTOR MODE │   │
│    │    1(Y)         0        0    0      0     0      0 NORMAL │   │
│    └──────────────────────────────────────────────────────────┘   │
│ Note: Some OSes (like SCO-UNIX) must use "NORMAL" for installation │
│                      ┌──────────────────┐                          │
└──────────────────────│   ESC : SKIP     │──────────────────────────┘
                       └──────────────────┘
```

Figure 2-15. IDE HDD Auto Detection Screen

Save & Exit Setup Screen

```
                           CMOS SETUP UTILITY
                         Ampro Computers, Inc.
 ┌──────────────────────────────────────────────────────────────────┐
 │                                                                    │
 │    STANDARD CMOS SETUP              LOAD SETUP DEFAULTS             │
 │    BIOS FEATURES SETUP              LOAD BIOS DEFAULTS              │
 │    CHIPSET FEATURES SETUP           IDE HDD AUTO DETECTION          │
 │    POWER MANAGEMENT SETUP           SAVE & EXIT SETUP               │
 │    PCI CONFIGURATION┌──────────────────────────────┐G              │
 │                     │ Save to CMOS and EXIT (Y/N)? N│              │
 │                     └──────────────────────────────┘              │
 │                                                                    │
 ├──────────────────────────────────────────────────────────────────┤
 │    ESC : Quit                  ↑ ↓ → ←      : Select Item          │
 │    F10 : Save & Exit Setup        (Shift)F2   : Change Color       │
 ├──────────────────────────────────────────────────────────────────┤
 │                                                                    │
 │              Save Data to CMOS & Exit SETUP                        │
 │                                                                    │
 └──────────────────────────────────────────────────────────────────┘
```

Figure 2-16. Save & Exit Setup Screen

Exit Without Saving Screen

```
                           CMOS SETUP UTILITY
                         Ampro Computers, Inc.
 ┌──────────────────────────────────────────────────────────────────┐
 │                                                                    │
 │    STANDARD CMOS SETUP              LOAD SETUP DEFAULTS             │
 │    BIOS FEATURES SETUP              LOAD BIOS DEFAULTS              │
 │    CHIPSET FEATURES SETUP           IDE HDD AUTO DETECTION          │
 │    POWER MANAGEMENT SETUP           SAVE & EXIT SETUP               │
 │    PCI CONFIGURATION┌──────────────────────────────┐G              │
 │                     │ Quit Without Saving(Y/N)? N   │              │
 │                     └──────────────────────────────┘              │
 │                                                                    │
 ├──────────────────────────────────────────────────────────────────┤
 │    ESC : Quit                  ↑ ↓ → ←      : Select Item          │
 │    F10 : Save & Exit Setup        (Shift)F2   : Change Color       │
 ├──────────────────────────────────────────────────────────────────┤
 │                                                                    │
 │              Abandon all Data & Exit SETUP                         │
 │                                                                    │
 └──────────────────────────────────────────────────────────────────┘
```

Figure 2-17. Exit Without Saving Screen

Chapter 3

Technical Specifications

Little Board P6d Technical Specifications

The following section provides technical specifications for the Little Board P6d system.

CPU/Motherboard

- CPU: Pentium-II processor
- System RAM:
    - DIMM module, utilizing 3.3V SDRAM memory chips
    - Supports from 32MB to 256MB total RAM
    - 256KB Internal level-two cache
    - Shadow RAM support provides fast system BIOS and video BIOS execution
- 15 interrupt channels (8259-equivalent)
- 7 DMA channels (8237-equivalent)
- 3 programmable counter/timers (8254-equivalent)
- Standard PC/AT keyboard port
- Standard PC speaker port with 0.1 watt output drive
- Battery-backed real-time clock and CMOS RAM:
- Up to 10 year battery life
- Supports battery-free operation
- Ampro Extended BIOS

Embedded-PC System Enhancements

- CompactFlash Socket:
    - Usable with standard CompactFlash modules
    - Equivalent to an IDE drive
    - OEM Flash Memory (available with 1MB Flash BIOS option). 768KB OEM Flash memory is available for OEM use
- 4k-bit configuration EEPROM:
    - Stores system Setup parameters
    - Supports battery-free boot capability
    - 512 bits available for OEM use
- Watchdog Timer
    - Selectable Timeout: 30 seconds/60 seconds/90 seconds/Disabled
    - Timeout triggers hardware reset
- Powerfail NMI triggers when +5 Volt power drops below +4.7 Volts.

On-board Peripherals

This section describes standard peripherals found on every Little Board P6d module.

- Four buffered serial ports (Two with full handshaking)
    - Implemented with 16550-equivalent controllers with built-in 16-byte FIFO buffers
    - On-board generation of RS232C signal levels
    - All support either RS232C, RS485, or RS422
    - Logged as COM1, COM2, COM3, and COM4 by DOS
    - Serial 1/Serial 3 and Serial2/Serial4 share interrupts (IRQs)
- Multi-mode Parallel Port
    - Superset of standard LPT printer port
    - Bidirectional data lines
    - IEEE-1284 (EPP/ECP) compliant
    - Standard hardware supports all four IEEE-1284 protocol modes
    - Internal 16-byte FIFO buffer
    - DMA option for data transfers
- Floppy Disk Controller
    - Supports one or two drives
    - Reliable digital phase-locked loop circuit
    - BIOS supports all standard PC/AT formats: 360K, 1.2M, 720K, and 1.44M
- PCI EIDE Disk Controllers
    - PCI bus implementation of Extended IDE (EIDE) hard disk controllers (2)
    - Supports up to four hard disk drives.
    - Fast ATA-capable interface supports high-speed PIO modes
    - BIOS supports drives larger than 528MB through Logical Block Addressing (LBA)
    - Supports CompactFlash interface
- PCI Audio Interface
    - SoundBlaster™ Pro/16 compatibility
    - Trident 4DWAVE-NX controller
    - National LM4549 AD97 CODEC
    - National LM4863 2W Audio Amplifier
- Flat Panel/CRT Video Controller
    - Supports CRTs and flat panel LCDs
    - Supports Enhanced AGP Bus Interface
    - Uses state-of-the-art 69030 Multimedia Accelerator
    - 4MB Embedded 83MHz SDRAM
    - MultiView for different/same images on separate displays (LCD with CRT or TV)
    - Video modes and resolutions, and memory requirements: See video tables starting on page 3-4.
    - Supports interlaced or non-interlaced displays in resolution modes up to 1280x1024.
    - Supports True Color at 800x600 VGA resolution
    - GUI accelerator for enhanced performance

- Software programmable flat panel interface. Flat panel video BIOS contained in an on-board Flash EPROM device for easy customization.
- Standard model supports 3.3V flat panels; support for 5V flat panels with external adapter.
- Supports Zoom Video Port
- Ethernet LAN Interface
  - Complies with IEEE 802.3 (ANSI 8802-3) MII
  - Controller: Intel 82559ER 10/100Mbps Ethernet controller
  - Topology: Ethernet bus, using CSMA/CD
  - Plug and Play compatible
  - 10/100BaseT via an on-board RJ45 connector
  - Data rate: automatic arbitration for 10/100Mbps operation
  - 32-bit PCI host interface for fast operation, up to 33MHz PCI clock frequency (PCI specification revision 2.1)
  - High-performance bus mastering capability
  - Boot ROM image can be installed in system using a Flash programming utility

Support Software

Ampro embedded PC-BIOS features:

- Watchdog timer (WDT) support
- Fail-safe boot logic
- Battery-free boot
- Serial console option
- Serial loader option
- EEPROM access functions
- Advanced Power Management (APM) support
- Large hard disk Logical Block Addressing (LBA) support
- See the Ampro Embedded-PC BIOS data sheet for additional details about these features.

Software Utilities included:

- Watchdog timer support
- Serial access and development support
- Display controller support
- Ethernet controller support

Mechanical and Environmental Specifications

146x203x30 mm (8.0x5.75x1.2"). Refer to Figure 2–1 for mounting dimensions.

Power requirements of 3.5A (typical, with 16MB DRAM, measured at 5V ± 5%). Power requirements can vary, depending on the installed CPU and type of system DRAM installed.

Operating environment:

- Standard: 0° to 60° C (with adequate airflow)
- Extended temperature range of −40° to +85° C can be tested by special order. Contact Ampro for more information.

- 5 to 95% relative humidity (non-condensing)
- Storage temperature: -55° to +85° C
- Weight: 11.6 oz. (329 gm), no DRAM installed
- Shock and Vibration: Designed to MIL-STD 202F, Method 213B, Table 213-I, Condition A (three 50G shocks in each axis) and MIL-STD 202F, Method 214A, Table 214-I, Condition D (11.95B random vibration, 100 Hz to 1000 Hz for 5 minutes per axis).
- ISA portion of the PC/104-Plus expansion bus
    - Female, non-stackthrough, 16-bit bus connectors, for expansion via PC/104 modules
    - Four mounting holes
- PCI portion of the PC/104-Plus expansion bus:
    - 4x30 (120-pin) 2 mm pitch non-stackthrough connector.
    - Electrical specifications equivalent to the PCI Local Bus Specification Rev. 2.1.

Flat Panel Displays

The Little Board P6d display controller supports all flat panel display technologies including plasma, electroluminescent (EL), and LCD. LCD panel types include single panel-single drive (SS), and dual panel-dual drive (DD) configurations. The features of the Little Board P6d display controller include graphics acceleration, MPEG1 and MPEG2 playback, Video capture, and motion compensation for DVD.

Note

Flat panel support in the Little Board P6d ROM BIOS will change from time to time to maintain compatibility with current panel technology.

BIOS Modes

The video modes listed in this section show supported video BIOS modes. The support for these modes is strictly from the video BIOS. No support from a software driver is needed to display one of these modes. For Standard VGA Modes, see Table 3-1. For Low Resolution modes, see Table 3-2. For Extended Modes, see Table 3-3.

Table 3-1. Supported CRT Video Modes—Standard VGA

Video Mode #	Pixel Resolution	Color Depth	Font Size	Character Resolution	Pixel Clock (MHz)	Horizontal Frequency (KHz)	Vertical Frequency (Hz)
00h	360x400	16	9x16	40x25	25.175	31.4	70
01h	360x400	16	9x16	40x25	25.175	31.4	70
02h	720x400	16	9x16	80x25	25.175	31.4	70
03h	720x400	16	9x16	80x25	25.175	31.4	70
04h	320x200	4	8x8	40x25	28.322	31.5	70
05h	320x200	4	8x8	40x25	28.322	31.5	70
06h	640x200	2	8x8	80x25	25.175	31.4	70
07h	720x400	Mono	9x16	80x25	25.175	31.4	70
08h -- 0Ch	Reserved	----	----	----	----	----	----
0Dh	320x200	16	8x8	40x25	25.175	31.4	70
0Eh	640x200	16	8x8	80x25	25.175	31.4	70
0Fh	640x350	Mono	8x14	80x25	25.175	31.4	70
10h	640x350	16	8x14	80x25	25.175	31.4	70
11h	640x480	2	8x16	80x30	25.175	31.4	60
12h	640x480	16	8x16	80x30	25.175	31.4	60
13h	320x200	256	8x8	40x25	25.175	31.4	70

Table 3-2. Supported CRT Video Modes—Low Resolution

Video Mode #	VESA VBE Mode	Pixel Resolution	Colors	Font Size	Character Resolution	Pixel Clock (MHz)	Horiz Freq (KHz)	Vert Freq (Hz)
14h	----	320x200	256	8x16	40x12	12.587	31.5	70
15h	----	320x200	64K	8x16	40x12	12.587	31.5	70
16h	----	320x200	16M	8x16	40x12	12.587	31.5	70
17h	----	320x240	256	8x16	40x15	12.587	31.5	60
18h	----	320x240	64K	8x16	40x15	12.587	31.5	60
19h	----	320x240	16M	8x16	40x15	12.587	31.5	60
1Ah	----	400x300	256	8x16	50x18	20	37.5	60
1Bh	----	400x300	64K	8x16	50x18	20	37.5	60
1Ch	----	400x300	16M	8x16	50x18	20	37.5	60
1Dh	----	512x384	256	8x16	64x24	32.5	48.4	60
1Eh	----	512x384	64K	8x16	64x24	32.5	48.4	60
1Fh	----	512x384	16M	8x16	64x24	32.5	48.4	60
31h	100h	640x400	256	8x16	80x25	25.175	31.5	70
61h	----	640x400	64K	8x16	80x25	25.175	31.5	70
62h	----	640x400	16M	8x16	80x25	25.175	31.5	70

Note: All modes in this table are Graphical and Linear, except where noted.

Table 3-3. Supported CRT Video Modes—Extended Modes

Video Mode #	VESA VBE Mode	Pixel Resolution	Colors	Font Size	Character Resolution	Pixel Clock (MHz)	Horiz Freq (KHz)	Vert Freq (Hz)
30h	101h	640x480	256	8x16	80x30	25.175 31.5 36 46	31.5 37.5 43.3 53.2	60 75 85 100
31h	100h	640x400	256	8x16	80x25	25.175	31.5	70
32h	103h	800x600	256	8x16	100x37	40 49.5 56.25 74	37.9 46.9 53.7 66.1	60 75 85 100
34h	105h	1024x768	256	8x16	128x48	44.9 65 78.75 94.5 121	35.5 48.4 60 68.7 84	43 (I) 60 75 85 100
36h	----	Generic	256	8x16	---	---- ---- ---- ----	---- ---- ---- ----	---- ---- ---- ----
38h	107h	1280x1024	256	8x16	160x64	78.75 108 135	47 64 79.98	43 (I) 60 75
3Ah	----	1600x200	256	8x16	200x75	162	75	60
40h	110h	640x400	32K	8x16	80x30	25.175 31.5 36 46	31.5 37.5 43.3 53.2	60 75 85 100
41h	111h	640x480	64K	8x16	80x30	25.175 31.5 36 46	31.5 37.5 43.3 53.2	60 75 85 100
42h	113h	800x600	32K	8x16	100x37	40 49.5 56.25 74	37.9 46.9 53.7 66.1	60 75 85 100
43h	114h	800x600	64K	8x16	100x37	40 49.5 56.25 74	37.9 46.9 53.7 66.1	60 75 85 100
44h	116h	1024x768	32K	8x16	128x48	44.9 65 78.75 94.5 121	35.5 48.4 60 68.7 84	43 (I) 60 75 85 100
45h	117h	1024x768	64K	8x16	128x48	44.9 65 78.75 94.5 121	35.5 48.4 60 68.7 84	43 (I) 60 75 85 100

46h	----	Generic	32K	8x16	----	---- ---- ---- ----	---- ---- ---- ----	---- ---- ---- ----
47h	----	Generic	64K	8x16	----	---- ---- ---- ----	---- ---- ---- ----	---- ---- ---- ----
48h	119h	1280x1024	32K	8x16	160x64	78.75 108 135	47 64 79.98	43 (I) 60 75
49h	11Ah	1280x1024	64K	8x16	160x64	78.75 108 135	47 64 79.98	43 (I) 60 75
50h	112h	640x480	16M	8x16	80x30	25.175 31.5 36 46	31.5 37.5 43.3 53.2	60 75 85 100
52h	115h	800x600	16M	8x16	100x37	40 49.5 56.25 74	37.9 46.9 53.7 66.1	60 75 85 100
54h	118h	1024x768	16M	8x16	128x48	44.9 65 78.75 94.5 121	35.5 48.4 60 68.7 84	43 (I) 60 75 85 100
56h	----	Generic	16M	8x16	----	---- ---- ---- ----	---- ---- ---- ----	---- ---- ---- ----
58h	11Bh	1280x1024	16M	8x16	160x64	78.75 108 135	47 64 79.98	43 (I) 60 75
6Ah	102h	800x600**	16*	8x16	100x37	40 49.5 56.25 74	37.9 46.9 53.7 66.1	60 75 85 100
64h	104h	1024x768**	16*	8x16	128x48	44.9 65 78.75 94.5 121	35.5 48.4 60 68.7 84	43 (I) 60 75 85 100
68h	106h	1280x1024**	16*	8x16	160x64	78.75 108 135	47 64 79.98	43 (I) 60 75
70h	101h	640x480	256*	8x16	80x30	25.175 31.5 36 46	31.5 37.5 43.3 53.2	60 75 85 100
71h	100h	640x400	256*	8x16	80x25	25.175	31.5	70
72h	103h	800x600	256*	8x16	100x37	40 49.5 56.25	37.9 46.9 53.7	60 75 85

						74	66.1	100
74h	105h	1024x768	256*	8x16	128x48	44.9 65 78.75 94.5 121	35.5 48.4 60 68.7 84	43 (I) 60 75 85 100
78h	107h	1280x1024	256*	8x16	160x64	78.75 108 135	47 64 79.98	43 (I) 60 75

Notes: All modes in this table are Graphical, Linear, and the memory organization is Pack Pix, except where noted. Refer to manufacturer's data sheet for more information.
(I) = Interlaced
*These modes are non-Linear.
**The memory organization is Planar.

Hardware IRQ Map

Table 3-4 details the IRQ assignments for the Little Board P6d.

Table 3-4. Hardware IRQ Map

IRQ #	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Timer tick	X															
Keyboard		X														
Cascade			X													
COM1					D											
COM2				D												
COM3				O	D						O		O			
COM4				D	O						O		O			
Floppy							X									
LPT1						O		D								
RTC									X							
IDE															X	X
Math														X		
Mouse													X			
PCI INTA						O				D	O	O				
PCI INTB						O				O	O	D				
PCI INTC						D				O	O	O				
PCI INTD						O				O	D	O				

D = default

O = optional

X = hardwired

Appendix A

Standards Contact Information

To contact the PC/104 Consortium for a copy of the proposed PC/104-Plus specification:

PC/104 Consortium
1060–B North Fourth Street
San Jose, CA 95112
Telephone: 650-903-8304

EPP and ECP Operation

The board's parallel port is compliant with the IEEE-1284 Extended Capabilities Port Protocol and ISA Standard (Rev 1.09, January 7, 1993), developed by Microsoft. Contact IEEE Customer Service and request IEEE Std 1284 for information about EPP and ECP operation.

IEEE Customer Service
445 Hoes Lane
PO Box 1331
Piscataway, NJ 08855-1331 USA

Phone:	(800) 678-IEEE (in the US and Canada)
	(908) 981-0060 (outside the US and Canada)
FAX:	(908) 981-9667
Telex:	833233
Website:	http://standards.IEEE.org

Appendix B

Cables

Cables included in the QuickStart Kit (LB3-LB/P6d-K-00) and the Cable Kit (CBL-LB/P6d-Q-01) are detailed in this section. These cables are intended for use during your application development, and are only shown here to aid you in the design of cables for your particular application.
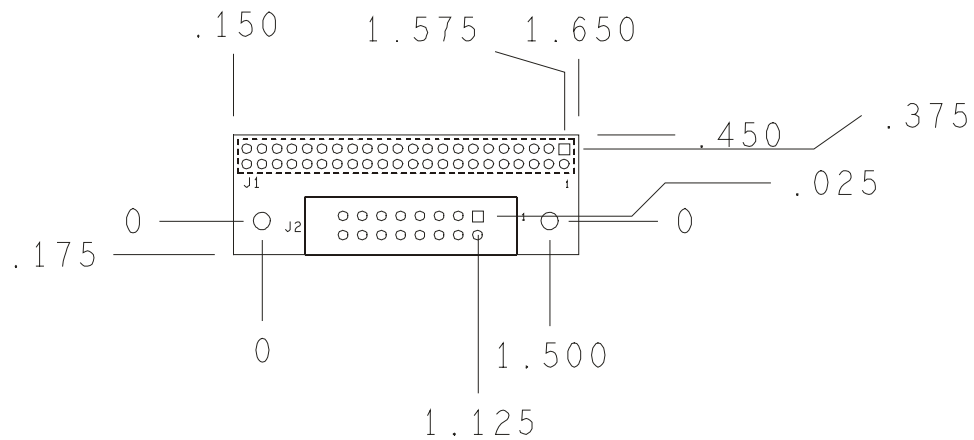
Figure B-1. Little Board P6d Utility Cable Adapter

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