MiniModule™ PCC III
PC/104-Plus Expansion Module
QuickStart Guide
and Reference Manual

P/N 5001685A Revision A

Notice Page

NOTICE

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REVISION HISTORY

Revision	Reason for Change	Date
A	Initial Release	Sept/03

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Audience Assumptions

This 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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Chapter 1 About This Manual

Purpose

This manual provides information for the installation and setup of the MiniModule™ PCC III peripheral interface board with a PC card in a socket, as well as, sufficient technical information for embedded system designers to easily expand their embedded systems based on any additional design requirements.

NOTE	The MiniModule PCC III is designed to plug into CPU boards with PC/104-Plus interface only. PC/104-only CPU boards are not supported.

Information provided in the QuickStart Setup Chapter (2) of this manual includes:

- Removing the MiniModule PCC III from the shipping container
- Inventorying the accessories
- Connecting the MiniModule PCC III to the respective target board
- Powering up the MiniModule PCC III with the target board

Information provided in the Reference Chapters (1, 3, and 4) of this manual include:

- MiniModule PCC III Specifications
- Environmental requirements
- Major integrated circuits (chips) and features implemented
- MiniModule PCC III board connector/pin numbers and definitions

Information not provided in this reference manual includes:

- Detailed chip specifications
- Internal component operation
- Internal registers or signal operations
- Bus or signal timing for industry standard busses and signals

Reference Material

The following list of reference materials may be helpful for you to complete your custom design successfully. Most of this reference material is also available on the Ampro web site in the Embedded Design Resource Center. The Embedded Design Resource Center was created for embedded system developers to share Ampro's knowledge, insight, and expertise gained from years of experience.

Reference Specifications

- PC/104 Spec Revision 2.4, August 2001
- PC/104-Plus Spec Revision 1.2, August 2001

  For latest revision of the PC/104 specifications, contact the PC/104 Consortium, at:

  Web site: http:// www.pc104.org

- PCI 2.2 Compliant Specifications, Revision 2.2, December 18, 1998

  For latest revision of the PCI specifications, contact the PCI Special Interest Group at:

  Web site: http:// www.pcisig.com

- PC Card Specification, Release 2.1 (February 1995)

  For latest revision of the PC Card specifications, contact the Personal Computer Memory Card International Association (PCMCIA) standards group at:

  Web site: http:// www.pcmcia.org

- JEIDA 4.1 concerning PC cards

  For latest revision of the PC Card JEIDA 4.1 specifications, contact the Japan Electronics and Information Technology Industries Association (JEITA, formerly Japan Electronic Industry Development Association (JEIDA)) standards group at:

  Web site: http:// it.jeita.or.jp/jhistory

Chip Specifications

The following chip specifications are used in the MiniModule PCC III expansion board:

- Texas Instruments and the chip PCI1520, used as the CardBus host controller for PC Cards

  Web site: http://www.ti.com

Related Ampro Products

The following items are directly related to successfully using the Ampro product you have just purchased or plan to purchase. Ampro highly recommends that you purchase and utilize a QuickStart Kit simultaneously with the design of your product.

MiniModule Support Products

- MiniModule PCC III QuickStart Kit (QSK)

  The MiniModule PCC III QuickStart Kit includes the MiniModule PCC III expansion board, documentation, and drivers for Ampro supported operating systems on the MiniModule Documentation and Support Software (Doc & SW) CD-ROM.

Other MiniModule Products

- MiniModule™ PCC II Expansion Board – This MiniModule is a compact, low power PC/104 peripheral board with two PCMCIA card sockets for connecting one or two PCMCIA memory or peripheral cards to an Ampro embedded system. Up to two MiniModule PCC IIs can be installed in a system. This MiniModule allows the integration of PCMCIA memory cards and PCMCIA peripheral cards into systems based on Ampro's CoreModule™ and Little Board™ CPUs.

  The MiniModule PCC II supports memory cards such as Flash EPROM, SRAM, and One Time Programmable EPROM (OTPROM) and I/O devices such as modems, LAN adapters, or PCMCIA-ATA (IDE) drives. PCMCIA XIP (eXecute In Place) is fully supported. The MiniModule PCC II has two PCMCIA card sockets that are compatible with Type I, Type II, Type III, and Type IV cards. The MiniModule PCC II can be used with any PC/104 compatible CPU including the Ampro CoreModule™ or Little Board™ families (See Other Ampro Products).

  The MiniModule PCC II also comes in a local and remote version where the Local Version is used as a stand-alone board, mounted directly on a CPU board. The Remote Version is connected to the CPU remotely through an additional board, the Buffer Module and its ribbon cable. The Remote Version can be mounted up to 14 inches from the Buffer Module and CPU.

- MiniModule™ ESB Expansion Board – This MiniModule is a multipurpose communications board with one Ethernet port, two serial ports, and one byte-wide socket. The MiniModule ESB size and expansion bus connectors conform to the PC/104-Plus standard and can be installed directly on Ampro's Little Board™ and CoreModule™ computer systems supporting the PC/104-Plus expansion bus. The MiniModule ESB supports one 10/100BaseT Ethernet port, two 16C550-type RS232 Serial Ports (with optional RS485 and TTL interfaces) and the byte-wide socket supports Disk-On-Chip, flash EPROM, SRAM, or NVRAM.
- MiniModule™ USB2 Expansion Board – This MiniModule is a compact, low power PC/104-Plus peripheral board with four USB 2.0 high speed interface connectors. The MiniModule USB2 supports both legacy speeds (1.5Mbps and 12Mbps) and the new high speed (480Mbps) USB 2.0 standard (December 21, 2000). The MiniModule USB2 supports a USB host, root hub and four downstream USB ports with hot insertion or removal of any USB 2.0 cable. The MiniModule USB2 can be used with any PC/104-Plus compatible CPU including the Ampro CoreModule or Little Board families (See Other Ampro Products).
- MiniModule™ 1394 Expansion Board – This MiniModule is a compact, low power PC/104-Plus peripheral board with two IEEE 1394 (FireWire™) interface connectors. The MiniModule 1394 supports the IEEE 1394 standard (1394-1995 and 1394a-2000), including a host controller at speeds of 100, 200, or 400Mbps. This allows easy integration of cameras or other FireWire devices, with hot insertion or removal of any IEEE 1394 cables.

Other Ampro Products

- CoreModule™ Family – These complete embedded-PC subsystems on single PC/104 or PC/104-Plus form-factor (3.6x3.8 inches) modules feature 486 and Mobile Pentium CPUs. Each CoreModule includes a full complement of PC core logic functions, plus disk controllers, and serial and parallel ports. Some modules also include CRT and flat panel graphics controllers or an Ethernet interface. The CoreModules also come with built-in extras to meet the critical reliability requirements of embedded applications. These include onboard solid state disk compatibility, watchdog timer, smart power monitor, and other embedded-PC BIOS enhancements.
- EnCore™ Family – These high-performance, compact, modular CPU solutions use various processor technologies including Intel x86, MIPS, and PowerPC architectures to plug into your custom logic board. Each EnCore module provides standard peripherals, including IDE, floppy drive interface, PCI bus, serial, parallel, PS/2 keyboard and mouse interfaces, 10/100BaseT Ethernet, and USB ports. Some EnCore modules also provide video and AC97 sound. Depending on the model, EnCore modules can hold between 16MB and 512MB of SODIMM SDRAM memory.
- Little Board™ Family – These high-performance, highly integrated single board computers use the EBX form factor (5.75x8.00 inches), and are available with 486, Mobile Pentium, Pentium II, Pentium III, and Celeron processors. The EBX-compliant Little Board single board computers offer functions equivalent to a complete laptop or desktop PC system, plus several expansion cards. Built-in extras to meet the critical requirements of embedded applications include onboard solid state disk capability, Watchdog timer, smart power monitor, and other embedded-PC BIOS enhancements.

Chapter 2 Setting Up the MiniModule PCC III

Using the MiniModule PCC III QuickStart Kit

This QuickStart setup chapter provides the most efficient way to set up your MiniModule PCC III board (MM PCC III) installed on Ampro's target board (CoreModule or Little Board). The instructions provided in this guide include:

- Removing the MiniModule PCC III board from the shipping container
- Inventorying the accessories
- Connecting the MiniModule PCC III board to the respective target board
- Powering up the MiniModule PCC III board with the target board

Information not provided in this QuickStart II Guide includes:

- MiniModule PCC III Specifications
- Environmental requirements
- MiniModule PCC III connector pin numbers and definitions
- Supplied software driver use and programming considerations

Requirements

The following devices are needed to make full use of the MiniModule PCC III and the target board.

- Target System (PC/104-Plus compliant)
  - Ampro CoreModule CPU
  - Ampro Little Board SBC
  - 3rd party target system
- Power supply:
  - AT or lab power supply – A target system power supply is required to provide power to the target board and the MiniModule PCC III board.
  - Optional power cable for auxiliary +5V and +12V input
- Boot Device for the target system
- PC Card (32-bit or 16-bit)
- Optional Devices/Connections for Target System
  - Display, keyboard, mouse, etc.
  - Ethernet connection

What's in the Box

Refer to the QuickStart Kit Contents sheet for a list of the items in the shipping container.

Setup Steps

It is important to follow the setup steps in this section in the exact order listed here, but skip any steps that do not apply to your situation. References are provided to chapters within this guide or other Ampro guides, for more information about installation and use of the MiniModule PCC III board.

Preparations

1) Open shipping box.	• Locate the QuickStart Kit Contents sheet. • Unpack the contents of the shipping box.
2) Verify Contents.	• Verify the contents of the shipping box against the QuickStart Kit Contents sheet included with your MiniModule PCC III shipping box. • If anything is missing or damaged, contact your sales representative or Ampro Technical Support.
3) Support Documentation (MiniModule PCC III Doc & SW CD-ROM)	MiniModule PCC III QuickStart Setup Chapter 2 describes how to setup, install, and power up the MiniModule PCC III board found in the QuickStart Kit. This chapter is found in the *MiniModule PCC III QuickStart Guide and Reference Manual* found under the MiniModule PCC III menu on the MiniModule Documentation & Support Software CD-ROM (MiniModule Doc & SW CD-ROM) as a PDF file.
	MiniModule PCC III Reference Material Chapters 1, 3, and 4 describe the MiniModule PCC III board in more detail and provide more reference information. These chapters are found in the *MiniModule PCC III QuickStart Guide and Reference Manual* found under the MiniModule PCC III menu on the MiniModule Documentation & Support Software CD-ROM (MiniModule Doc & SW CD-ROM) as a PDF file.

Setting Up the MiniModule PCC III

CAUTION	To prevent damage to the electronic components on the MiniModule PCC III board, do not handle the board until you have used Electrostatic Discharge precautions. Always touch a grounded, unpainted metal surface before touching the MiniModule PCC III board or any of the components on the board. Always use an anti-static wrist or ankle strap connected to a grounding mat, which has static-dissipating characteristics and attached to earth ground.

4) Select workbench location	• The workbench location should be flat, clear of debris, and have a static-free mat (or the equivalent) to place the target board and MiniModule PCC III onto for setup and operation (including the target system power supply, peripherals, and support devices).
5) Connect an ESD strap to your body.	• Connect an ESD strap between your body (wrist or ankle) and ground or the static-free mat. If you do not have your own ESD strap, an ESD kit is provided in the QuickStart II Kit with an anti-static wrist strap.

Setting Up the Target System

- If the target system has already been setup on the workbench and is ready for installation of the MM PCC III, skip this section and go to Step 9.
- Refer also to the target system Quickstart Guide for all instructions referenced in the following steps. See Figures 2-1 and 2-2 for examples of CoreModule and Little Board Target Systems.

6) Place the target system on the workbench	• If the target system is in its protective plastic case, remove from the plastic case and place it on a flat, static-free work surface.
7) Connect all cables to the target system	• This includes connecting cables for any peripherals, boot devices, and the power supply used for the target system.
8) Connect the peripherals and boot devices	• This includes the keyboard, mouse, monitor, floppy drive, and IDE devices.
9) Connect the power supply	• Connect the power supply to the target system, but **do not turn** it on, or connect the power cord to the AC power source yet.

CAUTION To prevent damage to the MiniModule PCC III expansion board or the target system, do not connect the power cord to the AC power source or apply power to the target system, until you have completely installed the MiniModule PCC III onto the target system. The typical AT power supply will supply standby current to the target system as long as the power cord is connected.

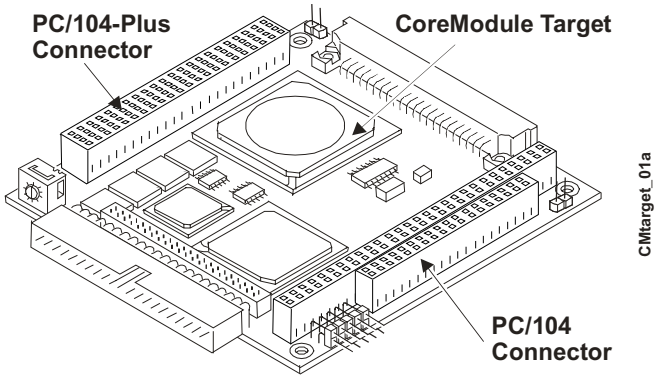

Figure 2-1. CoreModule Target System Example

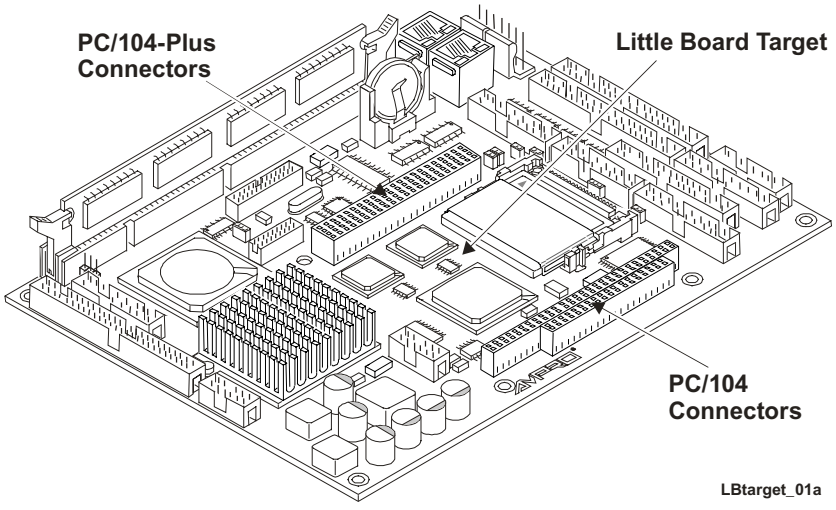

Figure 2-2. Little Board Target System Example

Mounting the MiniModule onto the Target System

CAUTION	To prevent damage to the MiniModule PCC III board or the target board, do not attempt to mount the MiniModule PCC III to a non-standard PC/104-Plus target board. The MiniModule PCC III, Little Board, and CoreModule boards conform to the standard PC/104-Plus mounting hole and board dimensions. Details about mounting hole positions, sizes, and board dimensions are provided in the Chapter 3, *Product Overview* later in this manual.

10) Install the spacers on the target board	• Install the threaded spacers onto the target board at the four corners of the MiniModule board. See Figures 2-4 and 2-5.
11) Unpack the MM PCC III board.	• Remove the MiniModule PCC III from its protective plastic case and place it on a flat, static-free work surface.
12) Check the MM PCC III for bent pins	• Ensure there are no bent or broken pins on the underside of the board at the PC/104 connector, before attempting to install the MM PCC III.
13) Position the MiniModule PCC III over the target system	• The MiniModule PCC III must be positioned over the PC/104 and PC/104-Plus connectors on the target system. See Figures 2-1 to 2-4. Typically the MiniModule PCC III board is installed on the topside of the target system, but in some cases, it may be installed underneath the target system.

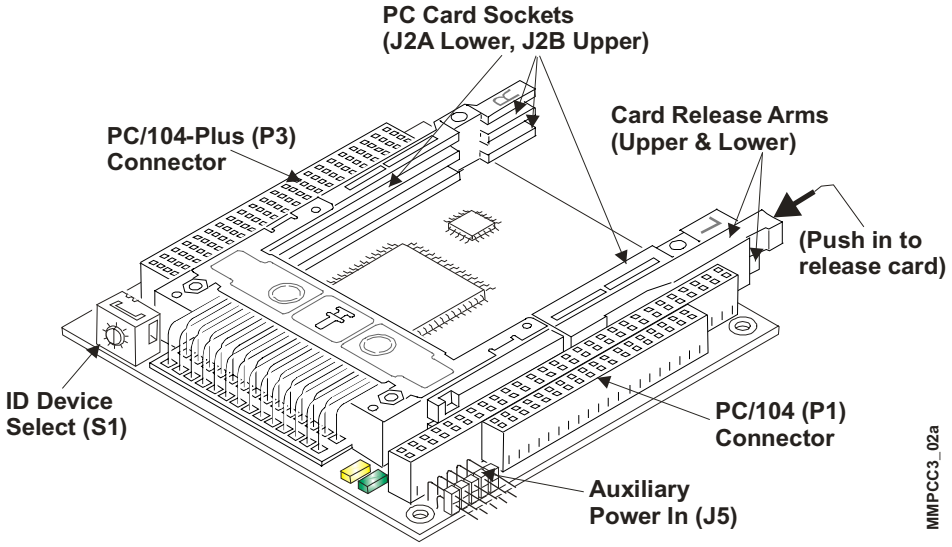

Figure 2-3. MiniModule PCC III

14) Gently align the connectors and pins	• Place the PC/104 pins over the connector beneath and align the pins to the connector. • Gently insert the PC/104 pins into the connector, ensuring each pin goes into its hole in the connector. If you have difficulty matching pins, do not try to force the pins in. Use a small flat blade screwdriver to help position the pins over the holes.
15) Slowly insert the MM PCC III into the connectors	• Once the pins are aligned with the proper holes, slowly insert the MM PCC III into the connectors. • Ensure the pins go all the way into the connector and are seated on the target board. There should just enough space between the target board and the MM PCC III to insert the threaded spacers and secure.

16) If necessary, install any additional MM PCC IIIs	If there are any additional expansion boards, install the boards now, before powering up the target system.
17) Set the Device ID in the stack, if known.	The Device ID Select switch (S1) is used to configure the PCI position of MiniModule PCC III in the board stack. Refer to Figure 2-3, Table 2-1, and Table 3-3 in Chapter 3, *Product Overview* for more information.

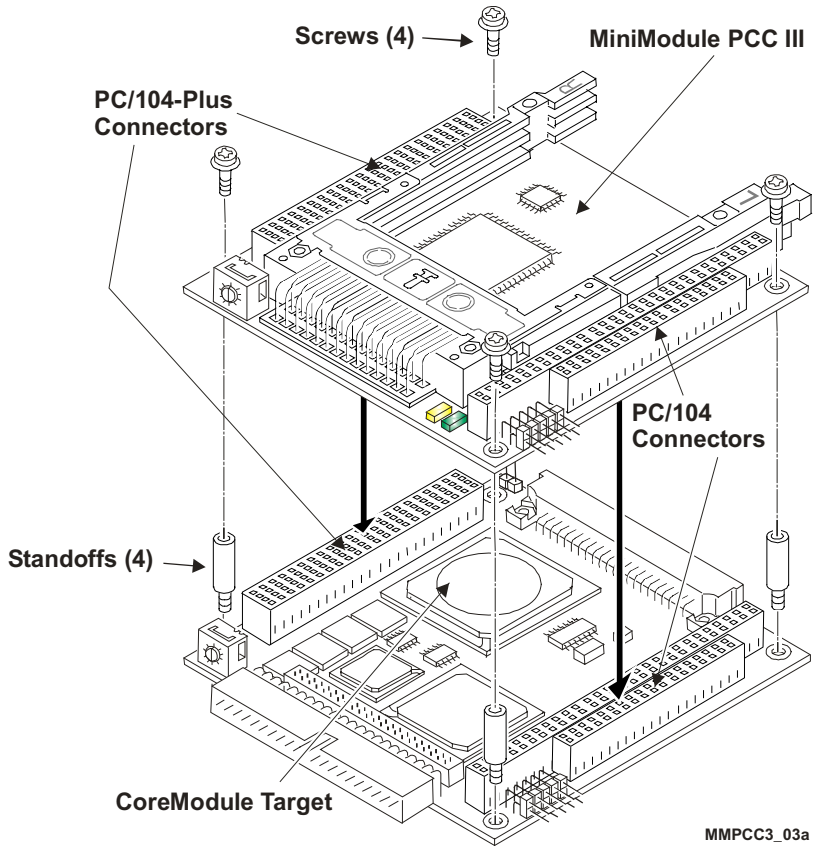

Figure 2-4. Installing MiniModule PCC III on CoreModule Target

Table 2-1. Device ID Select Position Switch (S1)

Switch Position	MiniModule Position in PCI Stack
0 (or 4)	1
1 (or 5)	2
2 (or 6)	3
3 (or 7)	4

NOTE There are no jumpers to set for voltage or card type. The CardBus Host Controller chip automatically recognizes the voltage and card type after the card is inserted into the PC Card socket at power up or during hot insertion or removal.

The MiniModule PCC III supports Type I, Type II and Type III PC Cards and 5V cards, 3.3V cards (5V tolerant), and 3.3V only cards.

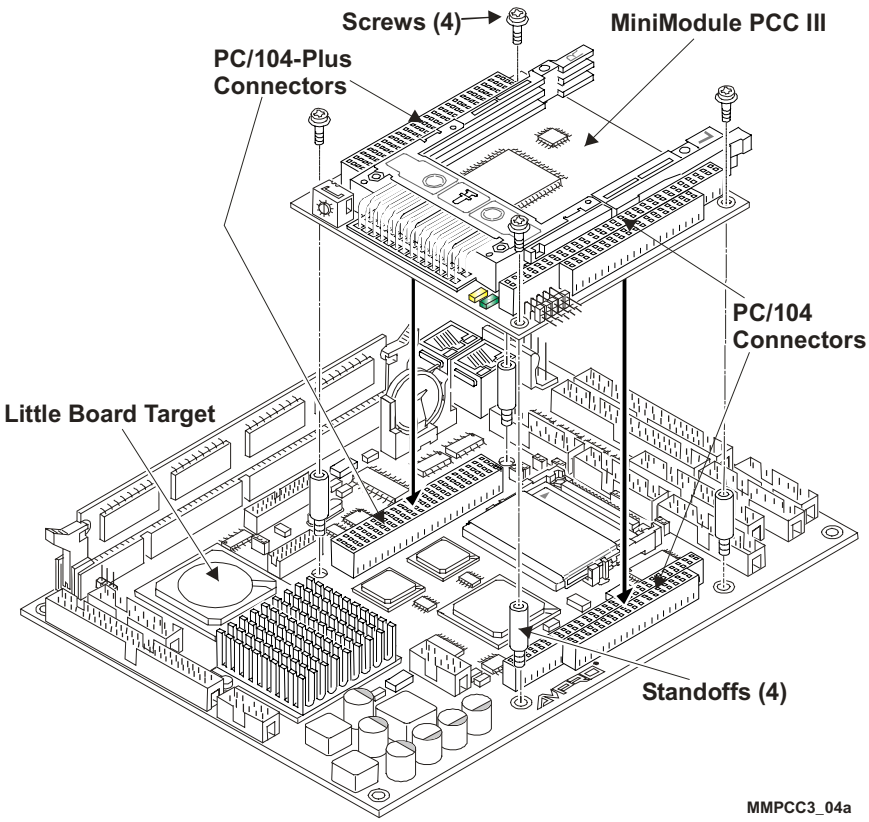

Figure 2-5. Installing MiniModule PCC III on Little Board Target

Applying Power to the Target System

18) Check/Set the Power Supply Input Voltage	• If the power supply uses auto-ranging operation at 50/60Hz, skip this step. • Check the input voltage switch on the power supply located on the rear of the supply just below the power connector. The input voltage switch typically has two positions: 115 or 230 volts – 115 volts is default position.
19) Power up the the target system.	• Plug the CRT monitor's power cord into an AC outlet and turn on the monitor. • Plug the AT power supply's power cord into the AC outlet. • Turn the AT power supply's power switch to On before continuing.
20) Verify the target system powers-up satisfactorily.	• Refer to the target system's QuickStart Guide for further instructions about completing the boot process.

The MiniModule PCC III does not require any further setup, except the insertion of a PC card into one of the PC Card sockets on the board, as shown in Figure 2-6.

- The MiniModule PCC III supports hot insertion or removal of the PC Cards.
- The MiniModule PCC III supports Plug and Play operation with Plug 'n Play operating systems.
- The MiniModule PCC III board is backward compatible to older operating systems.
- The BIOS of target system is not affected by the MiniModule PCC III board.

For more information about the MiniModule PCC III, refer to the reference chapters in the remainder of this manual.

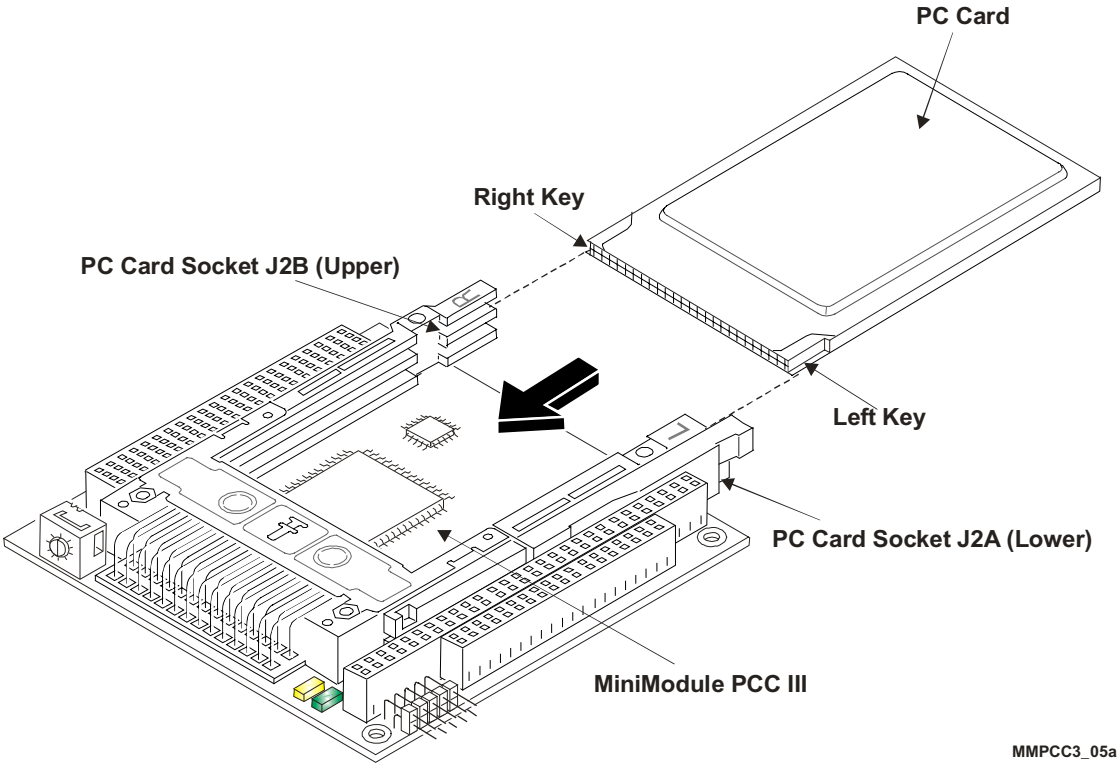

Figure 2-6. PC Card Installation

NOTE	The PC Cards and the card sockets are keyed for insertion in only one orientation. You must match the card socket slots (L = Left and R=Right) with the keys on the PC Card.

CAUTION	To prevent damage to the card or the card sockets, ensure you check the card and card socket for any debris before inserting the card into the socket. If you can not insert the card all of the way into the card socket, you probably have inserted the card into the socket with the wrong orientation. Turn the card over and try again.

Accessing Drivers and Documentation

To check for updates, access drivers for supported operating systems that do not support Plug 'n Play operation, or get a PDF copy of this manual, refer to the following steps.

1. Run the MiniModule Documentation & Support Software CD-ROM (Doc & SW CD-ROM) to access the CD's contents.

   This includes the MiniModule PCC III documentation, release notes, and any OS drivers that are not part of the target system OS or on the OS manufacturer's diskette(s) or CD-ROM.

   The Doc & SW CD-ROM will operate on any Windows PC, allowing you to view, download, or print the contents of the CD-ROM. This includes the MiniModule PCC III *QuickStart Guide and Reference Manual*, Release Notes, and any software drivers.

NOTE	You must have an Internet browser to view the main menu and make selections (examples: Microsoft Internet Explorer 4.x, or greater, Netscape Navigator version 4.x, or greater, or the equivalent on a PC). Software download links are provided for Adobe Acrobat Reader version 4.x or greater to view the manuals and documents.

   The Doc & SW CD-ROM should auto-start, but if it does not, go to the root level of the CD-ROM and locate the index.htm by:

   a. Selecting Run from the Start menu in any Windows PC.

   b. Browsing the contents of the CD-ROM until you find the index.htm at the root level.

   c. Selecting this file and pressing OK to start the CD-ROM.

      The CD-ROM starts and opens the main menu of the CD-ROM.

2. Select the MiniModule PCC III from the main menu.

   This menu has links to the documentation, including the manual and release notes, and links for any available software drivers for the supported operating systems.

3. Install any special OS drivers not found as part of the target system OS or on the OS manufacturer's diskette(s) or CD-ROM.

   Refer to the directory under the MiniModule PCC III menu item on the Doc & SW CD-ROM for instructions on installing the special drivers for the desired OS.

   If the desired drivers can not be found, contact Ampro through the Virtual Technician on the web site with a request for the driver(s), or use the *Check for Latest Updates* link on the Doc & SW CD-ROM to check for the latest drivers on the web site.

Chapter 3 Product Overview

This chapter presents general information about the PC/104 architecture and the MiniModule PCC III expansion board. After reading this chapter you should understand:

- PC/104 Concept
- MiniModule PCC III Architecture and Features
- Major Components and Connectors
- Specifications

PC/104 Architecture

The PC/104 architecture affords a great deal of flexibility in system design. You can build a simple system using only CPU/Controller, such as an Ampro Little Board SBC or CoreModule CPU, which provides the processor, memory, and standard input/output device connections (keyboard, mouse, serial, parallel, floppy drive, and IDE drives). To expand the I/O capability of a simple system, simply add self-stacking PC/104 and PC/104-Plus expansion boards, such as Ampro's MiniModules, to provide additional capabilities, such as:

- Additional serial and Ethernet ports
- USB or IEEE 1394 (FireWire)
- PC card interfaces (PCMCIA)
- Sound cards

PC/104-Plus expansion boards can be stacked with the CPU Board avoiding the need for card cages and backplanes. The PC/104-Plus expansion boards can be mounted directly to the PC/104 and PC/104-Plus bus connectors of the CPU Boards. PC/104-Plus compliant boards can be stacked with an inter-board spacing of ~0.66 inches so that a 3-board system fits in a 3.6 inch by 3.8 inch by 2.4 inch space. See Figure 3-1.

One or more PC/104 and PC/104-Plus boards can be installed on the CPU board's expansion connectors. When installed on an Ampro CoreModule or Little Board, the expansion board fits within the CoreModule or Little Board outline dimensions. Most MiniModule products have stackthrough connectors compatible with the PC/104 and PC/104-Plus Version 2.1 specification. Each additional board increases the thickness of the package by 15mm (0.66"). See Figures 3-1 and 3-2.

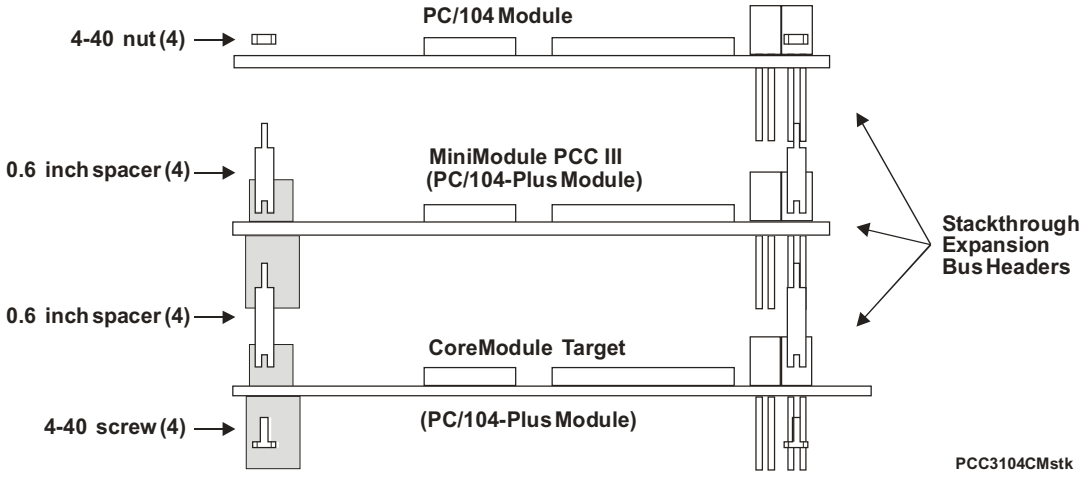

Figure 3-1. CoreModule Target Stackthrough Connections

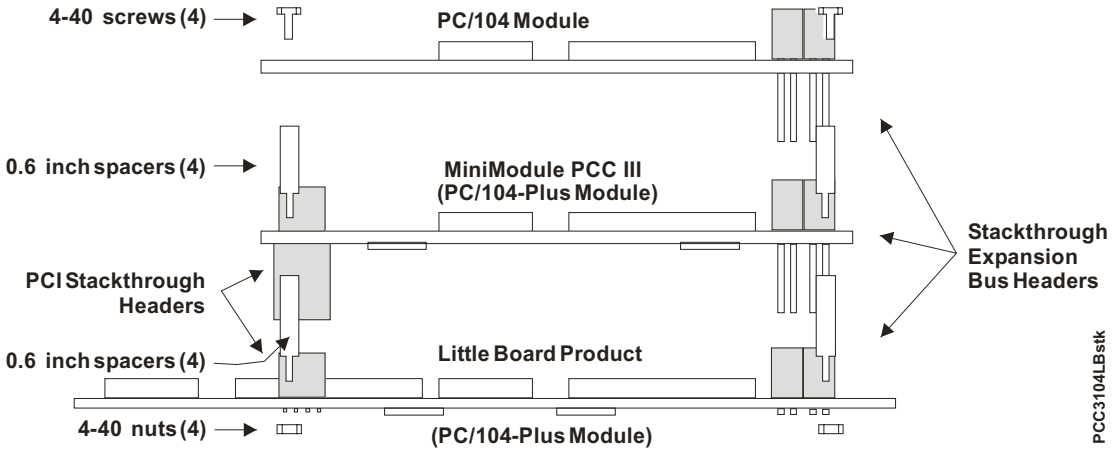

Figure 3-2. Little Board Target Stackthrough Connections

Product Description

The MiniModule PCC III expansion board is a PC/104-Plus compliant, compact, low power peripheral board with two PC Card sockets for connecting one or two PC Cards or peripheral cards to an Ampro embedded system. This MiniModule also allows the integration of PCMCIA memory cards and PCMCIA peripheral cards into systems based on Ampro's CoreModule™ and Little Board™ CPUs.

The PCMCIA standard has gained acceptance in mobile computing, instrumentation, and embedded applications for data storage and peripheral interfacing. The MiniModule PCC III supports the mechanical and electrical characteristics defined in the PCMCIA Release 2.1 and JEIDA 4.1 specifications. PC Cards are accessed using OS drivers compliant with these standards. The MiniModule PCC III board can be used with any Ampro 32-bit or 16-bit CPU in the CoreModule or Little Board families. In this case, "32-bit or 16-bit" refers to the I/O expansion bus width, not the CPU internal bus width.

The MiniModule PCC III supports memory cards such as EPROM, SRAM, and One Time Programmable EPROM (OTPROM). It also supports I/O devices such as modems, LAN adapters, or PCMCIA-ATA (IDE) drives. PCMCIA XIP (eXecute In Place) is fully supported. The MiniModule PCC III provides two PC Card sockets compatible with Type I, Type II, or Type III cards. Up to two MiniModule PCC III boards can be installed onto one target system.

The MiniModule PCC III is also compatible with the PC/104-Plus specification Version 1.2, an embedded computer standard for PCI-compatible boards. For more information about PC/104 and PC/104-Plus standards refer to the PC/104 Consortium listed in the reference section in Chapter 1. The MiniModule PCC III only requires a single +5V power source, typically provided over the PC/104-Plus bus. The +12 volts provided by the PC/104-Plus bus is available for the PC cards.

MiniModule Features

- Platform Support
  - Supports PC/104-Plus
  - Supports Little Board family
  - Supports CoreModule family (PC/104-Plus only)
- CardBus Host Controller
  - Supports PCMCIA PC Card Standard (February 1995) with DMA support
  - Supports JEIDA 4.1 (PCMCIA) specifications

- Support 32-bit CardBus bus mastering capability (Type III)
- Supports legacy 16-bit PCMCIA cards (Type I and Type II)
- Supports PCI bus specification version 2.2 interface (32-bit, 33MHz, PCI bus master and target)
- Supports 4-wire 4k-bit Serial EEPROM (SEEP)
- Supports automatic voltage and card type recognition

- PC Card Socket
  - Supports Type I, Type II and Type III cards
  - Supports 5V cards, 3.3V cards (5V tolerant), and 3.3v only cards
  - Supports hot insertion/removal (while power is applied)
  - Supports PC card latch mechanism to improve shock and vibration resistance
  - Does not support extension cables from the PCMCI PC Card sockets
- Operating Systems
  - Supports CPUs and Operating Systems with Plug-n-Play support
  - Windows 2000
  - Windows 98se/Me/XP/XP Embedded
  - TimeSys Linux
  - VxWorks 5.5
  - Windows CE.NET (4.1)
  - QNX 6.2
- Power supply
  - +5.0 V +/-5% @ 0.08 Amps (inrush current) Max current depends on number of PC cards inserted and type of file transfers (Typically provided through PC/104-Plus connector)

Block Diagram

Figure 3-3 provides a functional diagram of the MiniModule PCC III expansion board.

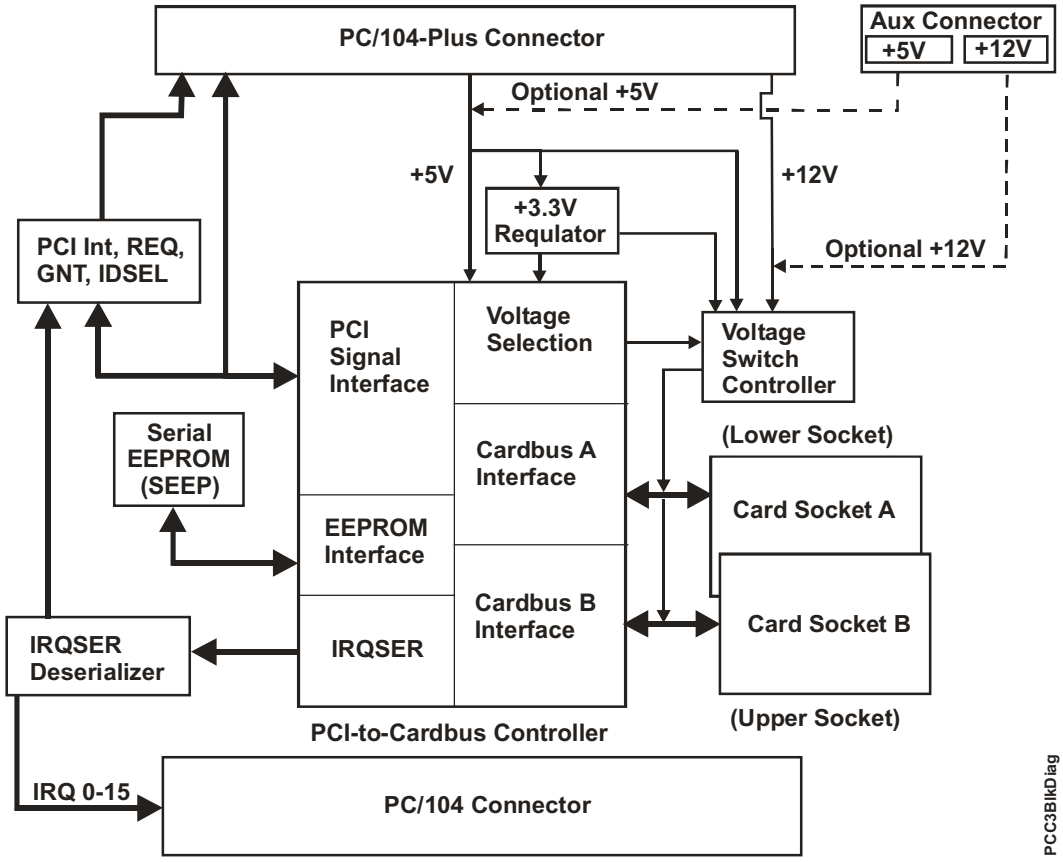

Figure 3-3. MiniModule PCC III Block Diagram

Major Integrated Circuits (ICs)

Table 3-1 lists the major integrated circuits (chips), including a brief description of each, on the MiniModule PCC III and Figure 3-4 shows the location of the major integrated circuits.

Table 3-1. Major Integrated Circuit Descriptions and Function

Chip Type	Mfg.	Model	Description	Function
CardBus Host Controller (U1)	Texas Instrument	PCI1520	Dual-Slot PC Card Controller	PCI-to-CardBus Controller

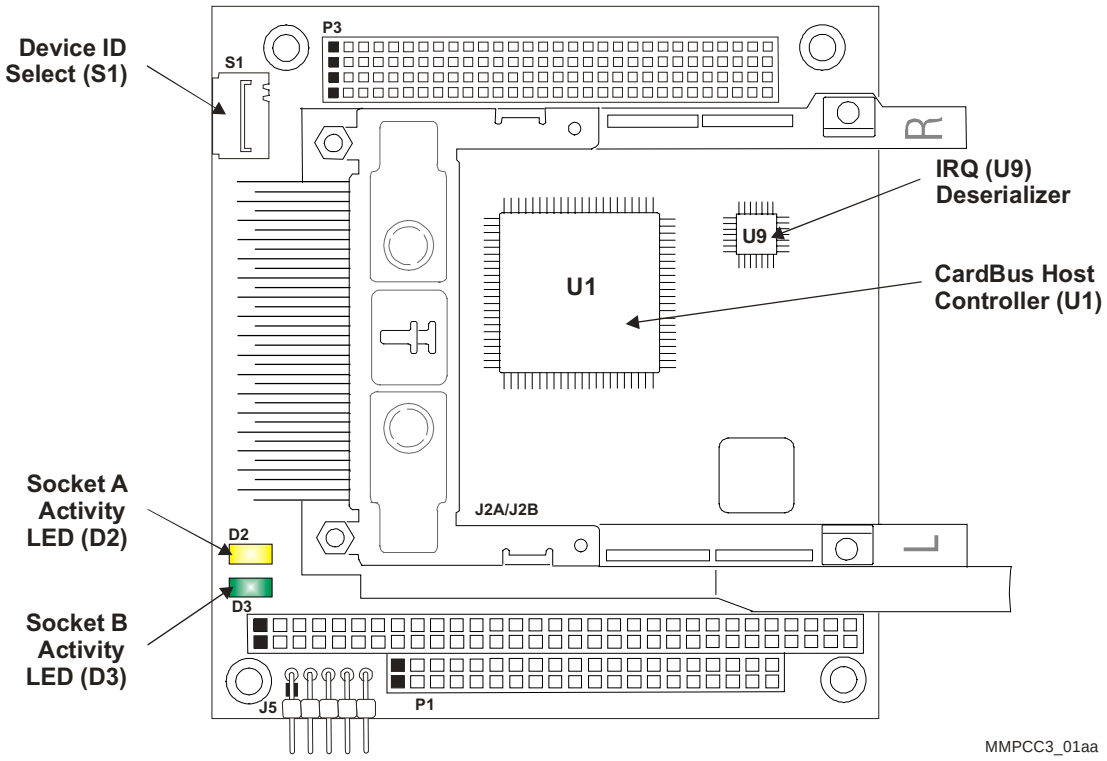

Figure 3-4. MiniModule PCC III Components (Top View)

NOTE	Pin 1 is shown as a black or white square pin in all connectors and in all illustrations.

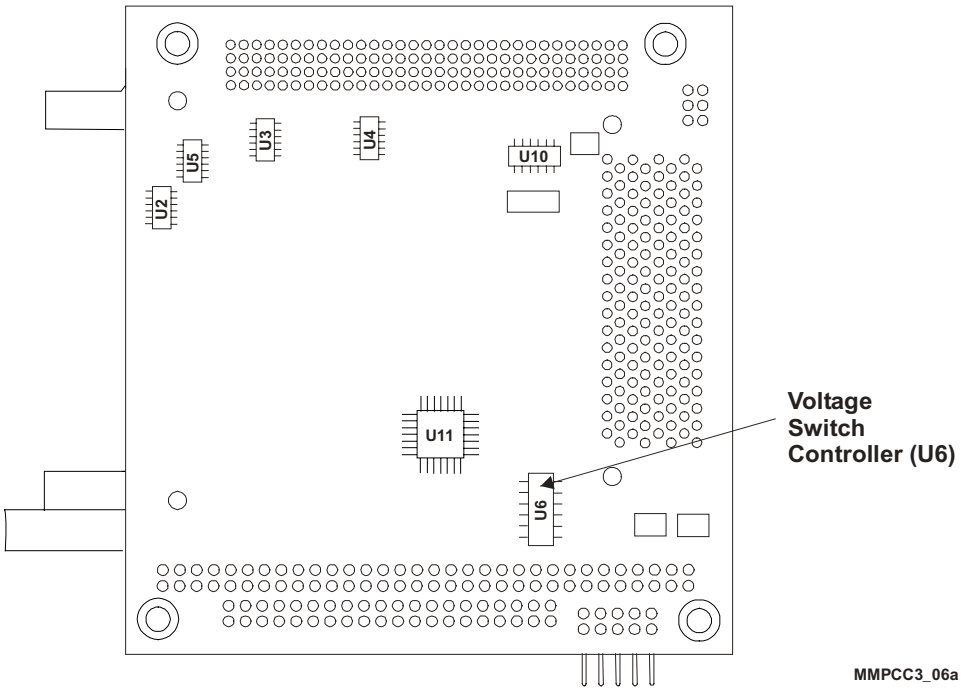

Figure 3-5. MiniModule PCC III Components (Bottom View)

NOTE	The MiniModule PCC III supports automatic voltage and card type selection. The CardBus Host Controller (U1) and the Voltage Switch Controller (U6) monitor the card type and voltage during power up and normal operation (card installation or removal). During power up or when a PC card is installed, the Controllers initialize the card based on its characteristics (specific pin on the card) and set the correct Vcc voltage (+5V or +3.3V) for the card type.

Connectors, Switches, and LEDs

Connector Definitions

Table 3-2 describes the connectors shown in Figures 3-4 to 3-8.

Table 3-2. Module Connector Descriptions

Jack/Plug #	Board Access	Description
P1A/P1B & P1C/P1D – PC/104 Bus	Top/Bottom	104-pin connector used for the PC/104 bus
P3 – PC/104-Plus	Top/Bottom	120-pin connector used for the PC/104-Plus
J2B – PC Card Socket (Upper)	Top	68-pin connector used for PC cards
J2A – PC Card Socket (Lower)	Top	68-pin connector used for PC cards
J5 – Auxiliary Power Connector	Top	10-pin connector for auxiliary power

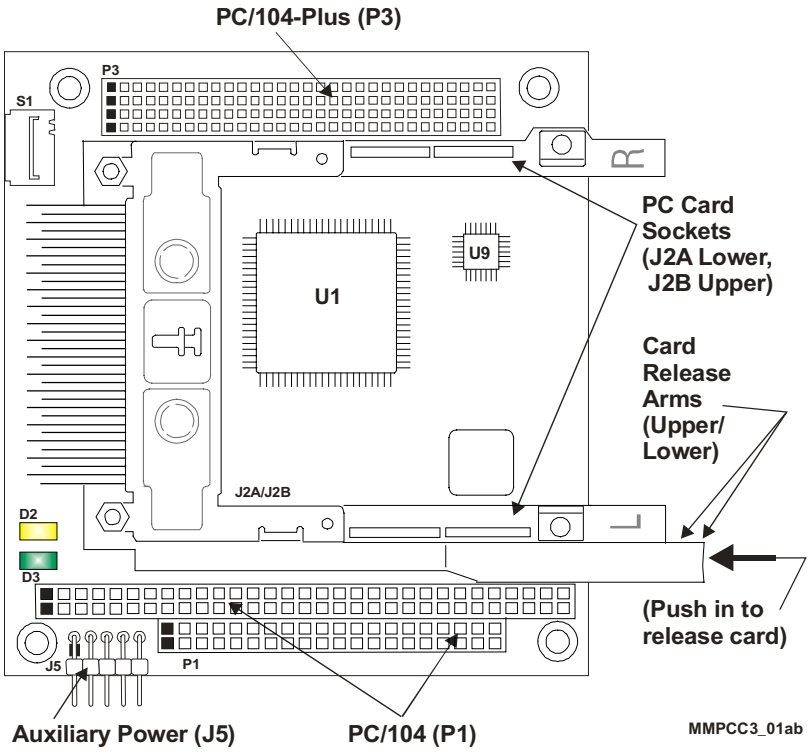

Figure 3-6. Connector Locations (Top View)

NOTE	The MiniModule PCC III does not support extension cables from the PC Card sockets.

LED Indicators

Table 3-3. PC Card Socket LED Indicators (D2/D3)

Indicator	Definition
PC Card Socket J2A (Lower) LED (D2)	Socket A LED – This yellow LED indicates Socket A (J2A) activity. **Yellow On** – This indicates Socket A is in use and active. **Yellow Off** – This indicates Socket A is not in use or active.
PC Card Socket J2B (Upper) LED (D3)	Socket B LED – This green LED indicates Socket B (J2B) activity. **Green On** – This indicates Socket B is in use and active. **Green Off** – This indicates Socket B is not in use or active.

Selection Switch

The 10-position rotary switch (S1) is used to configure the PCI position of the MiniModule PCC III board in the board stack. Every PCI card must have a unique address. Table 3-3 provides the switch settings shown in Figure 3-7.

Table 3-4. Device ID Selection Switch (S1)

Switch Position	Module Slot	REQ#	GNT#	CLK	INT#0	INT#1	INT#2	INT#3
0 (or 4)	1	REQ0#	GNT0#	CLK0	INTA#	INTB#	INTC#	INTD#
1 (or 5)	2	REQ1#	GNT1#	CLK1	INTB#	INTC#	INTD#	INTA#
2 (or 6)	3	REQ2#	GNT2#	CLK2	INTC#	INTD#	INTA#	INTB#
3 (or 7)	4	REQ3#	GNT3#	CLK3	INTD#	INTA#	INTB#	INTC#

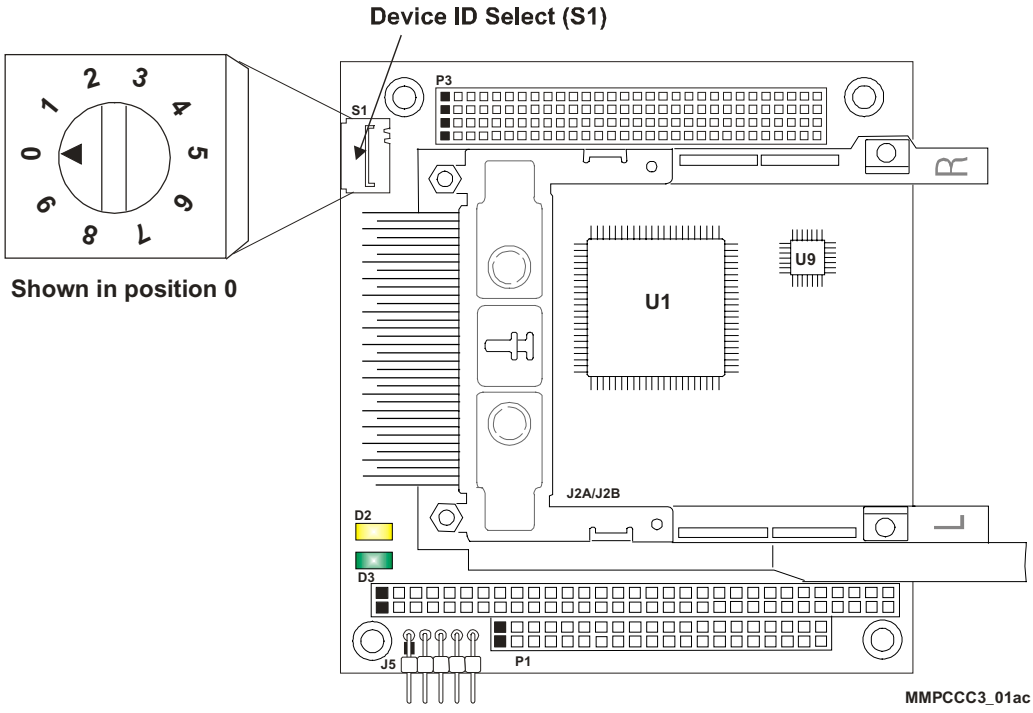

Figure 3-7. Device ID Selection Switch (Top View)

Specifications

Physical Specifications

Table 3-5 gives the physical dimensions of the board and Figure 3-8 gives the mounting and pin-1 connector dimensions.

Table 3-5. Weight and Footprint Dimensions

Item	Dimension
Weight	0.09kg. (0.2lbs.)
Height (overall)	23mm (0.905 inches)
Width	90mm (3.543 inches)
Length	96mm (3.779 inches)

Mechanical Specifications

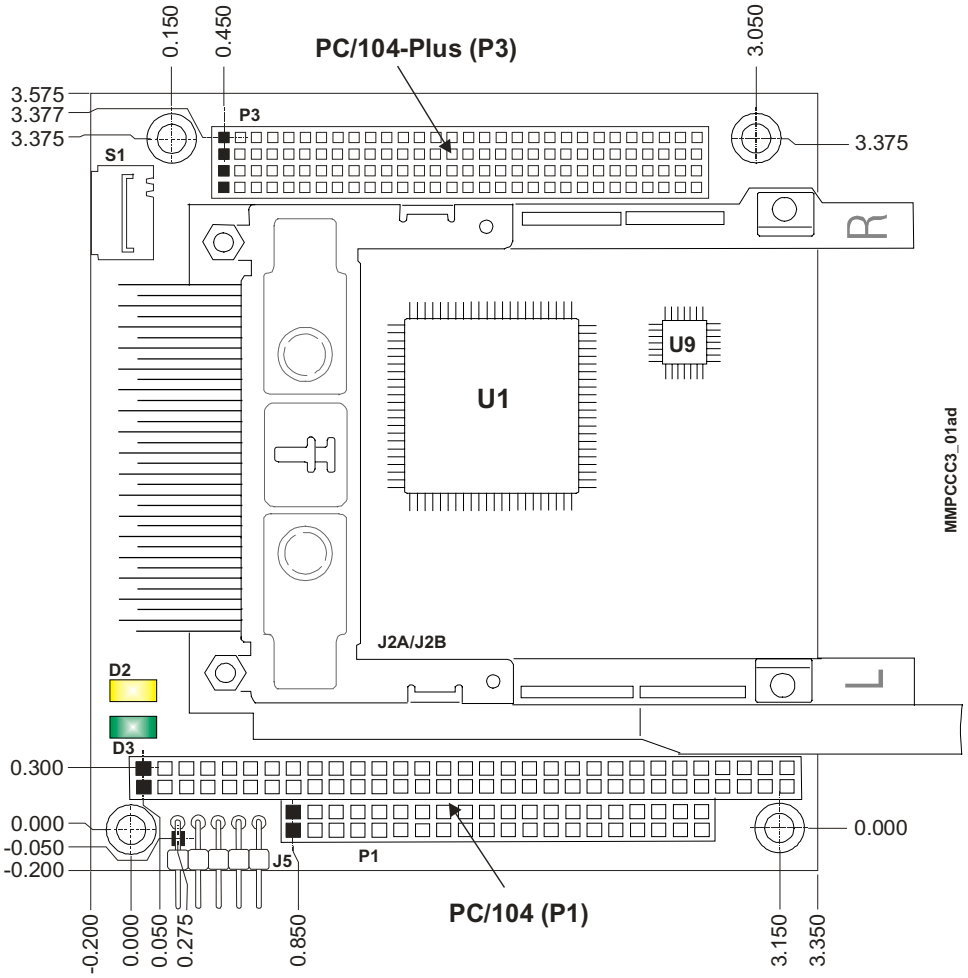

Figure 3-8. Mechanical Dimensions (Top View)

NOTE	All dimensions are given in inches. Pin 1 is shown as a black or white square pin in all connectors in all illustrations.

Power Specifications

Table 3-6 provides the power requirements.

Table 3-6. Power Supply Requirements

Parameter	Characteristics
Input Type	Regulated DC voltages
Input Power Requirements	+5 VDC +/- 5% @ 0.088 Amps during inrush
*Normal operation (During file transfer)	+5 VDC +/- 5% @ 0.12* Amps during file transfer
Operating Power	*0.61W Continuous (During file transfer)

Note: *Current/power measured during file transfer with one PC card installed using MS Windows 2000.

Environmental Specifications

Table 3-7 provides the most efficient operating and storage condition ranges required for this board.

Table 3-7. Environmental Requirements

Parameter	Conditions
Temperature	
Operating	+0° to +70° C (32° to 158° F)
Extended (Optional)	Contact the Factory
Storage	–45° to +85° C (–49° F to +185° F)
Humidity	
Operating	20% to 80% relative humidity, non-condensing
Non-operating	5% to 95% relative humidity, non-condensing

Thermal/Cooling Specifications

The CardBus Host Controller (U1) does not require a heatsink.

Chapter 4 Hardware Description

Overview

This chapter describes the MiniModule PCC III connectors on the board and the related pin-signal definitions in the following order:

- PC/104-Plus (P3)
- PC/104 (P1A, B, C, D)
- PC Card sockets (J2A, J2B)
- Auxiliary Power Connector (J5)

NOTE	Ampro Computers, Inc. only supports the features/options tested and listed in this manual. The integrated circuits (chips) used in the MiniModule PCC III may provide more features or options than are listed for the MiniModule PCC III, but some of these chip features/options are not supported on the board and will not function as specified in the chip documentation.

PC/104-Plus Interface (P3)

The PC/104-Plus uses a 120-pin (30x4) header interface. This interface header will carry all of the appropriate PCI signals operating at clock speeds up to 33MHz. This interface header is stackable and is located on the top and bottom of the board. .

Table 4-1 provides the signals and descriptions for each PC/104-Plus connector pin.

Table 4-1. PC/104-Plus Pin/Signal Descriptions (P3)

Pin #	Signal	Input/ Output	Description
1 (A1)	GND/ (Key)		Key - Digital Ground
2 (A2)	VI/O		+5 volts ±5% power supply
3 (A3)	AD05	T/S	Address and Data Bus Line 5 – This is one of 32 (0-31) multiplexed signal lines (address and data). A bus transaction consists of an address followed by one or more data cycles.
4 (A4)	C/BE0*	T/S	Bus Command/Byte Enable 0 – This signal is one of four multiplexed signal lines. During the address cycle, the command is defined and during the data cycle, the byte enable is defined.
5 (A5)	GND		Digital Ground
6 (A6)	AD11	T/S	Address/Data Bus Line 11 – Refer to Pin A3 for more information.
7 (A7)	AD14	T/S	Address/Data Bus Line 14 – Refer to Pin A 3 for more information.
8 (A8)	+3.3V		+3.3 volts ±5% power supply
9 (A9)	SERR*	O/D	System Error – This signal is for reporting address parity errors.
10 (A10)	GND		Digital Ground
11 (A11)	STOP*	S/T/S	Stop – This signal indicates the currently selected device is requesting the master stop the current transaction.

Pin #	Signal	Input/ Output	Description
12 (A12)	+3.3V		+3.3 volts ±5% power supply
13 (A13)	FRAME*	S/T/S	Frame Access – This signal, driven by the current master to indicate the start of a transaction, remains active until the final data cycle.
14 (A14)	GND		Digital Ground
15 (A15)	AD18	T/S	Address/Data Bus Line 18 – Refer to Pin A3 for more information.
16 (A16)	AD21	T/S	Address/Data Bus Line 21 – Refer to Pin A3 for more information.
17 (A17)	+3.3V		+3.3 volts ±5% power supply
18 (A18)	IDSEL0	In	Initialization Device Select 0 – This signal is one of four signal lines used as the chip-select signals during configuration.
19 (A19)	AD24	T/S	Address/Data Bus Line 24 – Refer to Pin A3 for more information.
20 (A20)	GND		Digital Ground
21 (A21)	AD29	T/S	Address/Data Bus Line 29 – Refer to Pin A3 for more information.
22 (A22)	+5V		+5 volts ±5% power supply
23 (A23)	REQ0*	T/S	Bus Request 0 – This signal is one of three signal lines that indicate to the arbitrator when the requesting device desires use of the bus.
24 (A24)	GND		Digital Ground
25 (A25)	GNT1*	T/S	Grant 1 – This signal is one of three signal lines that indicate access has been granted to the requesting device (PCI Masters).
26 (A26)	+5V		+5 volts ±5% power supply
27 (A27)	CLK2	In	PCI clock 2 – This is one of four signal lines providing timing outputs for four external PCI devices and timing for all transactions on the PCI bus.
28 (A28)	GND		Digital Ground
29 (A29)	+12V		+12 volts ±5% power supply
30 (A30)	NC		Not connected – Reserved
31 (B1)	NC		Not connected – Reserved
32 (B2)	AD02	T/S	Address/Data Bus Line 2 – Refer to Pin A3 for more information.
33 (B3)	GND		Digital Ground
34 (B4)	AD07	T/S	Address/Data Bus Line 7 – Refer to Pin A3 for more information.
35 (B5)	AD09	T/S	Address/Data Bus Line 9 – Refer to Pin A3 for more information.
36 (B6)	VI/O		+5 volts ±5% power supply
37 (B7)	AD13	T/S	Address/Data Bus Lines 13 – Refer to Pin A3 for more information.
38 (B8)	C/BE1*	T/S	Command/Byte Enable 1 – Refer to Pin A4 for more information.
39 (B9)	GND		Digital Ground
40 (B10)	PERR*		Parity Error – This signal reports data parity errors.
41 (B11)	+3.3V		+3.3 volts ±5% power supply
42 (B12)	TRDY*	S/T/S	Target Ready – This signal indicates the selected device's ability to complete the current transaction cycle. Both IRDY* and TRDY* must be asserted to terminate a data cycle.
43 (B13)	GND		Digital Ground

Pin #	Signal	Input/ Output	Description
44 (B14)	AD16	T/S	Address/Data Bus Line 16 – Refer to Pin A3 for more information.
45 (B15)	+3.3V		+3.3 volts ±5% power supply
46 (B16)	AD20	T/S	Address/Data Bus Lines 20 – Refer to Pin A3 for more information.
47 (B17)	AD23	T/S	Address/Data Bus Line 23 – Refer to Pin A3 for more information.
48 (B18)	GND		Digital Ground
49 (B19)	C/BE3*	T/S	Command/Byte Enable 3 – Refer to Pin A4 for more information.
50 (B20)	AD26	T/S	Address/Data Bus Line 26 – Refer to Pin A3 for more information.
51 (B21)	+5V		+5 volts ±5% power supply
52 (B22)	AD30	T/S	Address/Data Bus Line 30 – Refer to Pin A3 for more information.
53 (B23)	GND		Digital Ground
54 (B24)	REQ2*	T/S	Bus Request 2 – Refer to Pin A23 for more information.
55 (B25)	VI/O		+5 volts ±5% power supply
56 (B26)	CLK0	In	PCI clock 0 – Refer to Pin A27 for more information
57 (B27)	+5V		+5 volts ±5% power supply
58 (B28)	INTD*	O/D	Interrupt D – This signal only request interrupts for multi-function devices.
59 (B29)	INTA*	O/D	Interrupt A – This signal is used to request an interrupt.
60 (B30)	REQ3*	T/S	Bus Request 3 – Refer to Pin A23 for more information.
61 (C1)	+5		+5 volts ±5% power supply
62 (C2)	AD01	T/S	Address/Data Bus Line 1 – Refer to Pin A3 for more information.
63 (C3)	AD04	T/S	Address/Data Bus Lines 4 – Refer to Pin A3 for more information.
64 (C4)	GND		Digital Ground
65 (C5)	AD08	T/S	Address/Data Bus Line 8 – Refer to Pin A3 for more information.
66 (C6)	AD10	T/S	Address/Data Bus Line 10 – Refer to Pin A3 for more information.
67 (C7)	GND		Digital Ground
68 (C8)	AD15	T/S	Address/Data Bus Line 15 – Refer to Pin A3 for more information.
69 (C9)	NC	NC	Not connected (SB0* – Snoop Backoff)
70 (C10)	+3.3V		+3.3 volts ±5% power supply
71 (C11)	LOCK*	S/T/S	Lock – This signal indicates an operation that may require multiple transactions to complete.
72 (C12)	GND		Digital Ground
73 (C13)	IRDY*	S/T/S	Initiator Ready – This signal indicates the master's ability to complete the current transaction data cycle.
74 (C14)	+3.3V		+3.3 volts ±5% power supply
75 (C15)	AD17	T/S	Address/Data Bus Line 17 – Refer to Pin A3 for more information.
76 (C16)	GND		Digital Ground
77 (C17)	AD22	T/S	Address/Data Bus Line 22 – Refer to Pin A3 for more information.
78 (C18)	IDSEL1		Initialization Device Select 1 – Refer to Pin A18 for more information.
79 (C19)	VI/O	NC	(+5V) Not connected

Pin #	Signal	Input/ Output	Description
80 (C20)	AD25	T/S	Address/Data Bus Line 25 – Refer to Pin A3 for more information.
81 (C21)	AD28	T/S	Address/Data Bus Line 28 – Refer to Pin A3 for more information.
82 (C22)	GND		Digital Ground
83 (C23)	REQ1*	T/S	Bus Request 1 – Refer to Pin A23 for more information.
84 (C24)	+5V		+5 volts ±5% power supply
85 (C25)	GNT2*	T/S	Grant 2 – Refer to Pin A25 for more information.
86 (C26)	GND		Digital Ground
87 (C27)	CLK3	In	PCI clock 3 – Refer to Pin A27 for more information.
88 (C28)	+5V		+5 volts ±5% power supply
89 (C29)	INTB*	O/D	Interrupt B – This signal only request interrupts for multi-function devices.
90 (C30)	GNT3*	T/S	Grant 3 – Refer to Pin A25 for more information.
91 (D1)	AD00	T/S	Address/Data Bus Line 0 – Refer to Pin A3 for more information.
92 (D2)	+5V		+5 volts ±5% power supply
93 (D3)	AD03	T/S	Address/Data Bus Lines 3 – Refer to Pin A3 for more information.
94 (D4)	AD06	T/S	Address/Data Bus Lines 6 – Refer to Pin A3 for more information.
95 (D5)	GND		Digital Ground
96 (D6)	GND		Digital Ground
97 (D7)	AD12	T/S	Address/Data Bus Line 12 – Refer to Pin A3 for more information.
98 (D8)	+3.3V		+3.3 volts ±5% power supply
99 (D9)	PAR	T/S	Parity bit – This is the even parity bit on AD[31:0] and C/BE[3:0]*
100 (D10)	NC	NC	Not connected (SDONE – Snoop Done)
101 (D11)	GND		Digital Ground
102 (D12)	DevSel*	S/T/S	Device Select – This signal is driven by the target device when its address is decoded.
103 (D13)	+3.3V		+3.3 volts ±5% power supply
104 (D14)	C/BE2*		Command/Byte Enable 2 – Refer to Pin A4 for more information.
105 (D15)	GND		Digital Ground
106 (D16)	AD19	T/S	Address/Data Bus Line 19 – Refer to Pin A3 for more information.
107 (D17)	+3.3V		+3.3 volts ±5% power supply
108 (D18)	IDSEL2		Initialization Device Select 2 – Refer to Pin A18 for more information.
109 (D19)	IDSEL3		Initialization Device Select 3 – Refer to Pin A18 for more information.
110 (D20)	GND		Digital Ground
111 (D21)	AD27	T/S	Address/Data Bus Line 27 – Refer to Pin A3 for more information.
112 (D22)	AD31	T/S	Address/Data Bus Line 31 – Refer to Pin A3 for more information.
113 (D23)	VI/O		+5 volts ±5% power supply
114 (D24)	GNT0*	T/S	Grant 0 – Refer to Pin A25 for more information.

Pin #	Signal	Input/ Output	Description
115 (D25)	GND		Digital Ground
116 (D26)	CLK1	In	PCI clock 1 – Refer to Pin A27 for more information
117 (D27)	GND		Digital Ground
118 (D28)	RST*	In	PCI bus reset – This output signal resets the entire PCI Bus. This signal will be asserted during a system reset.
119 (D29)	INTC*	O/D	Interrupt C – This signal only request interrupts for multi-function devices.
120 (D30)	GND		Digital Ground

Notes: The shaded area denotes power or ground. The signals marked with * = Negative true logic.

The Input/Output signals in this table refer to the input/output signals listed in the *PCI Local Bus Manual*, Revision 2.2, Chapter 2, paragraph 2.1, Signal definitions. The following terms or acronyms are used in this table:

- In – Input is standard input only signal
- Out – Totem Pole output is a standard active driver
- T/S – Tri-State is a bi-directional input output pin
- S/TS – Sustained Tri-State is an active low tri-state signal driven by one and only one agent at a time
- O/D – Open Drain allows multiple devices to share as a wire-OR.

PC/104 Bus Interface (P1A,B,C,D)

The PC/104 Bus uses a 104-pin 100mm header interface. This interface header will carry all of the appropriate PC/104 signals operating at clock speeds up to 8MHz to other boards in the stack. The interface header is located on the both the top and bottom of the board.

NOTE	The PC/104 Bus connector is only used as a pass through connector to other boards in the stack and has no connections to the MiniModule PCC III expansion board except for the IRQs, the +5V and +12V, and the ground connections.

Table 4-2. PC/104 Bus Interface Pin/Signal Descriptions (P1A)

Pin #	Signal	Description (P1 Row A)
1 (A1)	NC (IOCHCHK*)	Not Connected (bus NMI input)
2 (A2)	NC (SD7)	Not Connected (Data bit 7)
3 (A3)	NC (SD6)	Not Connected (Data bit 6)
4 (A4)	NC (SD5)	Not Connected (Data bit 5)
5 (A5)	NC (SD4)	Not Connected (Data bit 4)
6 (A6)	NC (SD3)	Not Connected (Data bit 3)
7 (A7)	NC (SD2)	Not Connected (Data bit 2)
8 (A8)	NC (SD1)	Not Connected (Data bit 1)
9 (A9)	NC (SD0)	Not Connected (Data bit 0)
10 (A10)	NC (IOCHRDY)	Not Connected (Processor Ready Ctrl)
11 (A11)	NC (AEN)	Not Connected (Address Enable)
12 (A12)	NC (SA19)	Not Connected (Address bit 19)
13 (A13)	NC (SA18)	Not Connected (Address bit 18)
14 (A14)	NC (SA17)	Not Connected (Address bit 17)
15 (A15)	NC (SA16)	Not Connected (Address bit 16)
16 (A16)	NC (SA15)	Not Connected (Address bit 15)
17 (A17)	NC (SA14)	Not Connected (Address bit 14)
18 (A18)	NC (SA13)	Not Connected (Address bit 13)
19 (A19)	NC (SA12)	Not Connected (Address bit 12)
20 (A20)	NC (SA11)	Not Connected (Address bit 11)
21 (A21)	NC (SA10)	Not Connected (Address bit 10)
22 (A22)	NC (SA9)	Not Connected (Address bit 9)
23 (A23)	NC (SA8)	Not Connected (Address bit 8)
24 (A24)	NC (SA7)	Not Connected (Address bit 7)
25 (A25)	NC (SA6)	Not Connected (Address bit 6)
26 (A26)	NC (SA5)	Not Connected (Address bit 5)
27 (A27)	NC (SA4)	Not Connected (Address bit 4)
28 (A28)	NC (SA3)	Not Connected (Address bit 3)
29 (A29)	NC (SA2)	Not Connected (Address bit 2)

Pin #	Signal	Description (P1 Row A)
30 (A30)	NC (SA1)	Not Connected (Address bit 1)
31 (A31)	NC (SA0)	Not Connected (Address bit 0)
32 (A32)	GND	Ground

Notes: The shaded area denotes power or ground. The signals marked with * = Negative true logic.

Table 4-3. PC/104 Bus Interface Pin/Signal Descriptions (P1B)

Pin #	Signal	Description (P1 Row B)
33 (B1)	GND	Ground
34 (B2)	NC (RESETDRV)	Not Connected (System reset signal)
35 (B3)	+5V	+5V power
36 (B4)	IRQ9	Interrupt request 9
37 (B5)	NC (-5V)	Not Connected (-5V)
38 (B6)	NC (DRQ2)	Not Connected (DMA request 2)
39 (B7)	NC (-12V)	Not Connected (-12V)
40 (B8)	NC (ENDXFR*)	Not Connected (Zero wait state)
41 (B9)	+12V	+12V power
42 (B10)	GND	Key pin
43 (B11)	NC (SMEMW*)	Not Connected (System Memory Write (lower 1MB)
44 (B12)	NC (SMEMR*)	Not Connected (System Memory Read (lower 1MB)
45 (B13)	NC (IOW*)	Not Connected (I/O Write)
46 (B14)	NC (IOR*)	Not Connected (I/O Read)
47 (B15)	NC (DACK3*)	Not Connected (DMA Acknowledge 3)
48 (B16)	NC (DRQ3)	Not Connected (DMA Request 3)
49 (B17)	NC (DACK1*)	Not Connected (DMA Acknowledge 1)
50 (B18)	NC (DRQ1)	Not Connected (DMA Request 1)
51 (B19)	NC (REFRESH*)	Not Connected (Memory Refresh)
52 (B20)	NC (SYSCLK)	Not Connected (Sys Clock)
53 (B21)	IRQ7	Interrupt Request 7
54 (B22)	IRQ6	Interrupt Request 6
55 (B23)	IRQ5	Interrupt Request 5
56 (B24)	IRQ4	Interrupt Request 4
57 (B25)	IRQ3	Interrupt Request 3
58 (B26)	NC (DACK2*)	Not Connected (DMA Acknowledge 2)
59 (B27)	NC (TC)	Not Connected (DMA Terminal Count)
60 (B28)	NC (BALE)	Not Connected (Address latch enable)
61 (B29)	+5V	+5V power
62 (B30)	NC (OSC)	Not Connected (14.3MHz clock)
63 (B31)	GND	Ground
64 (B32)	GND	Ground

Notes: The shaded area denotes power or ground. The signals marked with * = Negative true logic.

Table 4-4. PC/104 Bus Interface Pin/Signal Descriptions (P1C)

Pin #	Signal	Description (P1 Row C)
1 (C0)	GND	Ground
2 (C1)	NC (SBHE*)	Not Connected (System Bus High Enable)
3 (C2)	NC (LA23)	Not Connected (Address bit 23)
4 (C3)	NC (LA22)	Not Connected (Address bit 22)
5 (C4)	NC (LA21)	Not Connected (Address bit 21)
6 (C5)	NC (LA20)	Not Connected (Address bit 20)
7 (C6)	NC (LA19)	Not Connected (Address bit 19)
8 (C7)	NC (LA18)	Not Connected (Address bit 18)
9 (C8)	NC (LA17)	Not Connected (Address bit 17)
10 (C9)	NC (MEMR*)	Not Connected (Memory Read)
11 (C10)	NC (MEMW*)	Not Connected (Memory Write)
12 (C11)	NC (SD8)	Not Connected (Data Bit 8)
13 (C12)	NC (SD9)	Not Connected (Data Bit 9)
14 (C13)	NC (SD10)	Not Connected (Data Bit 10)
15 (C14)	NC (SD11)	Not Connected (Data Bit 11)
16 (C15)	NC (SD12)	Not Connected (Data Bit 12)
17 (C16)	NC (SD13)	Not Connected (Data Bit 13)
18 (C17)	NC (SD14)	Not Connected (Data Bit 14)
19 (C18)	NC (SD15)	Not Connected (Data Bit 15)
20 (C19)	GND	Ground - Key Pin

Notes: The shaded area denotes power or ground. The signals marked with * = Negative true logic.

Table 4-5. PC/104 Bus Interface Pin/Signal Descriptions (P1D)

Pin #	Signal	Description (P1 Row D)
21 (D0)	GND	Ground
22 (D1)	NC (MEMCS16*)	Not Connected (16-bit Memory Access)
23 (D2)	NC (IOCS16*)	Not Connected (16-bit I/O Access)
24 (D3)	IRQ10	Interrupt Request 10
25 (D4)	IRQ11	Interrupt Request 11
26 (D5)	IRQ12	Interrupt Request 12
27 (D6)	IRQ15	Interrupt Request 15
28 (D7)	IRQ14	Interrupt Request 14
29 (D8)	NC (DACK0*)	Not Connected (DMA Acknowledge 0)
30 (D9)	NC (DRQ0)	Not Connected (DMA Request 0)
31 (D10)	NC (DACK5*)	Not Connected (DMA Acknowledge 5)
32 (D11)	NC (DRQ5)	Not Connected (DMA Request 5)
33 (D12)	NC (DACK6*)	Not Connected (DMA Acknowledge 6)
34 (D13)	NC (DRQ6)	Not Connected (DMA Request 6)
35 (D14)	NC (DACK7*)	Not Connected (DMA Acknowledge 7)

Pin #	Signal	Description (P1 Row D)
36 (D15)	NC (DRQ7)	Not Connected (DMA Request 7)
37 (D16)	+5V	+5V Power
38 (D17)	NC (MASTER*)	Not Connected (Bus Master Assert)
39 (D18)	GND	Ground
40 (D19)	GND	Ground

Notes: The shaded area denotes power or ground. The signals marked with * = Negative true logic.

PC Card Sockets (J2A, J2B)

The MiniModule PCC III board uses two PC card sockets, which allows for insertion of two PC cards or peripheral cards. The PC Cards can also act as standard IDE drives and are connected to the primary or secondary IDE bus signals.

Table 4-6. PC Card Interface Pin/Signal Descriptions (J2A, Lower)

Pin #	Signal	Input/ Output	Description
1	GND	PWR	Power Ground
2	A_CAD0	I/O	Card A, CardBus Address and Data Bus Line 0 – This one of 32 multiplexed signal lines (address and data). A bus transaction consists of an address followed by one or more data cycles.
3	A_CAD1	I/O	Card A, CardBus Address and Data Bus Line 1 – Refer to Pin 2 for more information.
4	A_CAD3	I/O	Card A, CardBus Address and Data Bus Line 3 – Refer to Pin 2 for more information.
5	A_CAD5	I/O	Card A, CardBus Address and Data Bus Line 5 – Refer to Pin 2 for more information.
6	A_CAD7	I/O	Card A, CardBus Address and Data Bus Line 7 – Refer to Pin 2 for more information.
7	A_CBE0*	I/O	Card A, CardBus Command/Byte Enable 0 – This signal is one of four multiplexed signals for command and byte enable. During the address cycle, the command is defined and during the data cycle, the byte enable is defined.
8	A_CAD9	I/O	Card A, CardBus Address and Data Bus Line 9 – Refer to Pin 2 for more information.
9	A_CAD11	I/O	Card A, CardBus Address and Data Bus Line 11 – Refer to Pin 2 for more information.
10	A_CAD12	I/O	Card A, CardBus Address and Data Bus Line 12 – Refer to Pin 2 for more information.
11	A_CAD14	I/O	Card A, CardBus Address and Data Bus Line 14 – Refer to Pin 2 for more information.
12	A_CCBE1*	I/O	Card A, CardBus Command/Byte Enable 1 – Refer to Pin 7 for more information.
13	A_CPAR	I/O	Card A, CardBus Parity Bit – This signal is the even parity bit on AD[31:0] and C/BE[3:0]*
14	A_CPERR*	I/O	Card A, CardBus Parity Error – This signal is for reporting data parity errors.

Pin #	Signal	Input/ Output	Description
15	A_CGNT*	I	Card A, CardBus Bus Grant – This signal line, driven by the controller, grants a PC card access to the CardBus after the current data transaction has been completed.
16	A_CINT*	O	Card A, CardBus Interrupt – This signal is used by card A to request an interrupt from the host.
17	A_Vcc	PWR	+5V power ±5% or +3.3V power ±5% – The voltage available here depends on the voltage of the card, which is determined by the Controller (U1) and Voltage selection (U6) chips.
18	A_Vpp1	I/O	+12V power ±5% – This voltage (Vpp) is always +12 volts.
19	A_CCLK	I	Card A, PCI Clock – This clock signal provides timing outputs to all PCI devices on the PCI bus.
20	A_CIRDY*	I/O	Card A, CardBus Initiator Ready – This signal indicates the ability of the CardBus initiator to complete the current data phase of the transaction. A data phase is completes on a rising edge of CCLK when both CIRDY* and CTRDY* are asserted. Wait states are inserted in the current data phase until both CTRDY* and CIRDY* are sampled asserted.
21	A_CBE2*	I/O	Card A, CardBus Command/Byte Enable 2 – Refer to Pin 7 for more information.
22	A_CAD18	I/O	Card A, CardBus Address and Data Bus Line 18 – Refer to Pin 2 for more information.
23	A_CAD20	I/O	Card A, CardBus Address and Data Bus Line 20 – Refer to Pin 2 for more information.
24	A_CAD21	I/O	Card A, CardBus Address and Data Bus Line 21 – Refer to Pin 2 for more information.
25	A_CAD22	I/O	Card A, CardBus Address and Data Bus Line 22 – Refer to Pin 2 for more information.
26	A_CAD23	I/O	Card A, CardBus Address and Data Bus Line 23 – Refer to Pin 2 for more information.
27	A_CAD24	I/O	Card A, CardBus Address and Data Bus Line 24 – Refer to Pin 2 for more information.
28	A_CAD25	I/O	Card A, CardBus Address and Data Bus Line 25 – Refer to Pin 2 for more information.
29	A_CAD26	I/O	Card A, CardBus Address and Data Bus Line 26 – Refer to Pin 2 for more information.
30	A_CAD27	I/O	Card A, CardBus Address and Data Bus Line 27 – Refer to Pin 2 for more information.
31	A_CAD29	I/O	Card A, CardBus Address and Data Bus Line 29 – Refer to Pin 2 for more information.
32	RSRVD	NC	Reserved
33	A_CCLKRUN*	I	Card A, Clock Run – This signal is asserted when the clock is running normally, and is stopped for one cycle to inform PCI devices the clock is about to be stopped (or slowed).
34	GND	PWR	Power Ground
35	GND	PWR	Power Ground

Pin #	Signal	Input/ Output	Description
36	A_CCD1*	O	Card A, CardBus Detect 1 – These signals (CCD1 and CCD2) are used in conjunction with CVS1 and CVS2 to identify cards when inserted and then interrogate the cards to determine the operating voltage and card type.
37	A_CAD2	I/O	Card A, CardBus Address and Data Bus Line 2 – Refer to Pin 2 for more information.
38	A_CAD4	I/O	Card A, CardBus Address and Data Bus Line 4 – Refer to Pin 2 for more information.
39	A_CAD6	I/O	Card A, CardBus Address and Data Bus Line 6 – Refer to Pin 2 for more information.
40	RSRVD	NC	Reserved
41	A_CAD8	I/O	Card A, CardBus Address and Data Bus Line 8 – Refer to Pin 2 for more information.
42	A_CAD10	I/O	Card A, CardBus Address and Data Bus Line 10 – Refer to Pin 2 for more information.
43	A_CVS1	I/O	Card A, CardBus Voltage Sense 1 – These signals (CVS1 and CVS2) are used in conjunction with CCD1 and CCD2 to identify card when inserted and then interrogate the cards to determine the operating voltage and card type.
44	A_CAD13	I/O	Card A, CardBus Address and Data Bus Line 13 – Refer to Pin 2 for more information.
45	A_CAD15	I/O	Card A, CardBus Address and Data Bus Line 15 – Refer to Pin 2 for more information.
46	A_CAD16	I/O	Card A, CardBus Address and Data Bus Line 16 – Refer to Pin 2 for more information.
47	RSRVD	NC	Reserved
48	A_CBLOCK*	I/O	Card A, CardBus Lock – This signal indicates an operation that may require multiple transactions to complete
49	A_CSTOP*	I/O	Card A, CardBus Cycle Stop – This signal is driven by the PCI target when it makes a request of the initiator to stop the current PCI bus transaction.
50	A_CDEVSEL*	I/O	Card A, CardBus Device Select – This signal is asserted when the controller claims a PCI cycle as the target device.
51	A_Vcc	PWR	+5V power ±5% or +3.3V power ±5% – The voltage available here depends on the voltage of the card, which is determined by the Controller (U1) and Voltage selection (U6) chips.
52	A_Vpp2	PWR	+12V power ±5% – This voltage (Vpp) is always +12 volts.
53	A_CTRDY	O	Card A, CardBus Target Ready – This signal indicates the primary bus target is able to complete the current data phase of the transaction. Both CIRDY* and CTRDY* must be asserted to terminate a data cycle
54	A_CFRAME*	I/O	Card A, CardBus Cycle Frame – This signal is asserted indicating a bus transaction is beginning and data transfers will continue while this signal is asserted.
55	A_CAD17	I/O	Card A, CardBus Address and Data Bus Line 17 – Refer to Pin 2 for more information.

Pin #	Signal	Input/ Output	Description
56	A_CAD19	I/O	Card A, CardBus Address and Data Bus Line 19 – Refer to Pin 2 for more information.
57	A_CVS2	I/O	Card A, CardBus Voltage Sense 2 – Refer to pin 43 for more information.
58	A_CRESET*	I/O	Card A, CardBus Reset – This signal is an output signal to reset the entire PCI Bus. This signal will be asserted during system reset.
59	A_CSERR*	O	Card A, CardBus System Error – This signal is for reporting address parity errors.
60	A_CREQ*	O	Card A, CardBus Request – This signal indicates to the arbiter CardBus PC card A desires use of the CardBus bus as an initiator.
61	A_CCBE3*	I/O	Card A, CardBus Command/Byte Enable 3 – Refer to Pin 7 for more information.
62	A_CAUDIO	O	Card A, CardBus Audio – This digital input signal comes from the PC card to the system speaker.
63	A_CSTSCHG	O	Card A, CardBus Status Change – This signal alerts the system to a change in the Card A status and is used as a wake-up mechanism.
64	A_CAD28	I/O	Card A, CardBus Address and Data Bus Line 28 – Refer to Pin 2 for more information.
65	A_CAD30	I/O	Card A, CardBus Address and Data Bus Line 30 – Refer to Pin 2 for more information.
66	A_CAD31	I/O	Card A, CardBus Address and Data Bus Line 31 – Refer to Pin 2 for more information.
67	A_CCD2*	O	Card A, CardBus Detect 2 – Refer to pin 36 for more information.
68	GND	PWR	Power Ground

Notes: The shaded area denotes power or ground. The signals marked with * = Negative true logic.

Table 4-7. PC Card Interface Pin/Signal Descriptions (J2B, Upper)

Pin #	Signal	Input/ Output	Description
1	GND	PWR	Power Ground
2	B_CAD0	I/O	Card B, CardBus Address and Data Bus Line 0 – This one of 32 multiplexed signal lines (address and data). A bus transaction consists of an address followed by one or more data cycles.
3	B_CAD1	I/O	Card B, CardBus Address and Data Bus Line 1 – Refer to Pin 2 for more information.
4	B_CAD3	I/O	Card B, CardBus Address and Data Bus Line 3 – Refer to Pin 2 for more information.
5	B_CAD5	I/O	Card B, CardBus Address and Data Bus Line 5 – Refer to Pin 2 for more information.
6	B_CAD7	I/O	Card B, CardBus Address and Data Bus Line 7 – Refer to Pin 2 for more information.

Pin #	Signal	Input/ Output	Description
7	B_CBE0*	I/O	Card B, CardBus Command/Byte Enable 0 – This signal is one of four multiplexed signals for command and byte enable. During the address cycle, the command is defined and during the data cycle, the byte enable is defined.
8	B_CAD9	I/O	Card B, CardBus Address and Data Bus Line 9 – Refer to Pin 2 for more information.
9	B_CAD11	I/O	Card B, CardBus Address and Data Bus Line 11 – Refer to Pin 2 for more information.
10	B_CAD12	I/O	Card B, CardBus Address and Data Bus Line 12 – Refer to Pin 2 for more information.
11	B_CAD14	I/O	Card B, CardBus Address and Data Bus Line 14 – Refer to Pin 2 for more information.
12	B_CCBE1*	I/O	Card B, CardBus Command/Byte Enable 1 – Refer to Pin 7 for more information.
13	B_CPAR	I/O	Card B, CardBus Parity bit – This signal is the even parity bit on AD[31:0] and C/BE[3:0]*
14	B_CPERR*	I/O	Card B, CardBus Parity Error – This signal is for reporting data parity errors.
15	B_CGNT*	I	Card B, CardBus Grant – This signal line, driven by the controller, grants a PC card access to the CardBus after the current data transaction has been completed.
16	B_CINT*	O	Card B, Interrupt – This signal is used by card B to request an interrupt.
17	B_Vcc	PWR	+5V power ±5% or +3.3V power ±5% – The voltage available here depends on the voltage of the card, which is determined by the Controller (U1) and Voltage selection (U6) chips.
18	B_Vpp1	I/O	+12V power ±5% – This voltage (Vpp) is always +12 volts.
19	B_CCLK	I	Card B, PCI Clock – This clock signal provides timing outputs to all PCI devices on the PCI bus.
20	B_CIRDY*	I/O	Card B, CardBus Initiator Ready – This signal indicates the ability of the CardBus initiator to complete the current data phase of the transaction. A data phase is completes on a rising edge of CCLK when both CIRDY* and CTRDY* are asserted. Wait states are inserted in the current data phase until both CTRDY* and CIRDY* are sampled asserted.
21	B_CBE2*	I/O	Card B, CardBus Command/Byte Enable 2 – Refer to Pin 7 for more information.
22	B_CAD18	I/O	Card B, CardBus Address and Data Bus Line 18 – Refer to Pin 2 for more information.
23	B_CAD20	I/O	Card B, CardBus Address and Data Bus Line 20 – Refer to Pin 2 for more information.
24	B_CAD21	I/O	Card B, CardBus Address and Data Bus Line 21 – Refer to Pin 2 for more information.
25	B_CAD22	I/O	Card B, CardBus Address and Data Bus Line 22 – Refer to Pin 2 for more information.
26	B_CAD23	I/O	Card B, CardBus Address and Data Bus Line 23 – Refer to Pin 2 for more information.

Pin #	Signal	Input/ Output	Description
27	B_CAD24	I/O	Card B, CardBus Address and Data Bus Line 24 – Refer to Pin 2 for more information.
28	B_CAD25	I/O	Card B, CardBus Address and Data Bus Line 25 – Refer to Pin 2 for more information.
29	B_CAD26	I/O	Card B, CardBus Address and Data Bus Line 26 – Refer to Pin 2 for more information.
30	B_CAD27	I/O	Card B, CardBus Address and Data Bus Line 27 – Refer to Pin 2 for more information.
31	B_CAD29	I/O	Card B, CardBus Address and Data Bus Line 29 – Refer to Pin 2 for more information.
32	RSRVD	NC	Reserved
33	B_CCLKRUN*	I	Card B, Clock Run – This signal is asserted when the clock is running normally, and is stopped for one cycle to inform PCI devices the clock is about to be stopped (or slowed).
34	GND	PWR	Power Ground
35	GND	PWR	Power Ground
36	B_CCD1*	O	Card B, CardBus Detect 1 – These signals (CCD1 and CCD2) are used in conjunction with CVS1 and CVS2 to identify cards when inserted and then interrogate the cards to determine the operating voltage and card type.
37	B_CAD2	I/O	Card B, CardBus Address and Data Bus Line 2 – Refer to Pin 2 for more information.
38	B_CAD4	I/O	Card B, CardBus Address and Data Bus Line 4 – Refer to Pin 2 for more information.
39	B_CAD6	I/O	Card B, CardBus Address and Data Bus Line 6 – Refer to Pin 2 for more information.
40	RSRVD	NC	Reserved
41	B_CAD8	I/O	Card B, CardBus Address and Data Bus Line 8 – Refer to Pin 2 for more information.
42	B_CAD10	I/O	Card B, CardBus Address and Data Bus Line 10 – Refer to Pin 2 for more information.
43	B_CVS1	I/O	Card B, CardBus Voltage Sense 1 – These signals (CVS1 and CVS2) are used in conjunction with CCD1 and CCD2 to identify cards when inserted and then interrogate the cards to determine the operating voltage and card type.
44	B_CAD13	I/O	Card B, CardBus Address and Data Bus Line 13 – Refer to Pin 2 for more information.
45	B_CAD15	I/O	Card B, CardBus Address and Data Bus Line 15 – Refer to Pin 2 for more information.
46	B_CAD16	I/O	Card B, CardBus Address and Data Bus Line 16 – Refer to Pin 2 for more information.
47	RSRVD	NC	Reserved
48	B_CBLOCK*	I/O	Card B, CardBus Bus Lock – This signal indicates an operation that may require multiple transactions to complete

Pin #	Signal	Input/ Output	Description
49	B_CSTOP*	I/O	Card B, CardBus Cycle Stop – This signal is driven by the PCI target when it makes a request of the initiator to stop the current PCI bus transaction.
50	B_CDEVSEL*	I/O	Card B, CardBus Device Select – This signal is asserted when the controller claims a PCI cycle as the target device.
51	B_Vcc	PWR	+5V power ±5% or +3.3V power ±5% – The voltage available here depends on the voltage of the card, which is determined by the Controller (U1) and Voltage selection (U6) chips.
52	B_Vpp2	PWR	+12V power ±5% – This voltage (Vpp) is always +12 volts.
53	B_CTRDY	O	Card B, CardBus Target Ready – This signal indicates the primary bus target is able to complete the current data phase of the transaction. Both CIRDY* and CTRDY* must be asserted to terminate a data cycle.
54	B_CFRAM*	I/O	Card B, CardBus Cycle Frame – This signal when asserted indicates a bus transaction is beginning and the data transfers will continue while this signal is asserted.
55	B_CAD17	I/O	Card B, CardBus Address and Data Bus Line 17 – Refer to Pin 2 for more information.
56	B_CAD19	I/O	Card B, CardBus Address and Data Bus Line 19 – Refer to Pin 2 for more information.
57	B_CVS2	I/O	Card B, CardBus Voltage Sense 2 – Refer to pin 43 for more information.
58	B_CRESET*	I/O	Card B, CardBus Reset – This is an output signal to reset the entire PCI Bus. This signal will be asserted during system reset.
59	B_CSERR*	O	Card B, CardBus System Error – This signal is for reporting address parity errors.
60	B_CREQ*	O	Card B, CardBus Bus Request – This signal is asserted by the controller to request access to the PCI bus as an initiator.
61	B_CCBE3*	I/O	Card B, CardBus Command/Byte Enable 3 – Refer to Pin 7 for more information.
62	B_CAUDIO	O	Card B, CardBus Audio – This pin carries the card bus audio from the target to the host system.
63	B_CSTSCHG	O	Card B, CardBus Status Change – This signal alerts the system to a change in the Card B status and is used as a wake-up mechanism.
64	B_CAD28	I/O	Card B, CardBus Address and Data Bus Line 28 – Refer to Pin 2 for more information.
65	B_CAD30	I/O	Card B, CardBus Address and Data Bus Line 30 – Refer to Pin 2 for more information.
66	B_CAD31	I/O	Card B, CardBus Address and Data Bus Line 31 – Refer to Pin 2 for more information.
67	B_CCD2*	O	Card B, CardBus Detect 2 – Refer to pin 36 for more information.
68	GND	PWR	Power Ground

Notes: The shaded area denotes power or ground. The signals marked with * = Negative true logic.

Auxiliary Power Interface (J5)

The MiniModule PCC III board draws its power from the PC/104-Plus bus connector and only requires +5 volt input power. The +5V is used to generate the +3.3V on board.

- 5.0VDC +/- 5% @ 0.088 Amps (at inrush with no PC cards installed)

If additional +5V or +12V power is required to power a PCMCIA device, it can be provided by the auxiliary power connector (J5). The auxiliary power connector uses a 10-pin header with 0.100" spacing. The Auxiliary Power connector (J5) supplies the voltages listed in Tables 4-8 and 4-9 directly to the board, for internal or external use:

Table 4-8 gives the signals for auxiliary power pin/signals and Table 4-9 provides the pin arrangement.

Table 4-8. Auxiliary Power Interface Pins/Signals (J5)

Pin	Signal	Description
1	GND	Ground
2	+5	+5 Volts +/- 5%
3	Key - NC	Key - Not connected
4	+12V	+12 Volts +/- 5%
5	GND	Ground
6	NC	Not connected
7	GND	Ground
8	+5	+5 Volts +/- 5%
9	GND	Ground
10	+5	+5 Volts +/- 5%

Note: The shaded area denotes power or ground.

Table 4-9. Auxiliary Power Pin Arrangement (J5)

Pin #	Signal	Pin #	Signal
1	GND	2	+5V
3	KEY	4	+12V
5	GND	6	NC
7	GND	8	+5V
9	GND	10	+5V

Note: The shaded area denotes power or ground.

Appendix A Technical Support

Contacting Support

Ampro Computers, Inc. provides a number of methods for contacting Technical Support listed in the Table A-1 below. Requests for support through the Virtual Technician are given the highest priority, and usually will be addressed within one working day.

- Ampro Virtual Technician – This is a comprehensive support center designed to meet all your technical needs. This service is free and available 24 hours a day through the Ampro web site at http://ampro.custhelp.com. This includes a searchable database of Frequently Asked Questions, which will help you with the common information requested by most customers. This is a good source of information to look at first for your technical solutions. However, you must sign in to access this service.

  Personal Assistance – You may also request personal assistance by going to the "Ask a Question" area in the Virtual Technician. Requests can be submitted 24 hours a day, 7 days a week. You will receive immediate confirmation that your request has been entered. Once you have submitted your request you can go to the "My Stuff" area and log in to check status, update your request, and access other features.

- 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.

Table A-1. USA Technical Support Contact Information

Method	Contact Information
Virtual Technician	http://ampro.custhelp.com
Web Site	http://www.ampro.com
Standard Mail	Ampro Computers, Incorporated 5215 Hellyer Avenue San Jose, CA 95138-1007, USA

Getting Updates

This feature is provided for you on the MiniModule Doc & SW (Documentation & Software) CD-ROM and is a hot link to Ampro's Web site. You can access the latest updates by clicking on *Check for Latest Updates* in your CD-ROM's main menu. The link on the CD-ROM takes you to the Ampro web site where the search and compare engine on the web site compares your current CD-ROM to the latest files available on the Ampro web site.

Once you have made a selection of desired updated material, the search and compare engine generates a list of the current manuals or software updates not on your CD-ROM and displays this list on the screen for you to view. Once the list is displayed you can select the desired updates or new files from the list you want to download to your PC. You can then printout the updates or files, save it to disk, or store it on a new CD-ROM. This list includes documentation and software updates. However, you will have to login in to the Ampro web site to access this information.

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