# MiniModule™ ISA RoHS PC/104 Expansion Module QuickStart Guide and Reference Manual

**P/N 5001814A  Revision A**

## Notice Page

**NOTICE**



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**REVISION HISTORY**

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| A, A | Initial Release | Oct/06 |
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## 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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# Chapter 1 About This Manual

## Purpose

This manual provides information regarding the installation and setup of the MiniModule ISA, as well as sufficient technical information to allow embedded system designers to expand their embedded systems with specific design requirements.

| NOTE | The MiniModule ISA is designed for CPU modules and Single Board Computers (SBCs) with PCI-104 only. PC/104 only CPU modules and SBCs are not supported. |
|---|---|

**Information provided** in Chapter 3 of this manual includes:

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

**Information provided** in Chapters 4 and 5 of this manual include:

- MiniModule ISA board specifications
- Environmental requirements
- Major integrated circuits (chips) and features implemented
- MiniModule ISA board connector/pin numbers and definition

**Information not provided** in this 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 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.

**Specifications**

- EPIC Specification Revision 1.1, July 16, 2004

  Web site: http://www.epic-sbc.org/images/pdfs/EPICspec.pdf
- PC/104 Specification Revision 2.5, November 2003
- PC/104-Plus Specification Revision 2.0, November 2003
- PCI-104 Specification, Revision 1.0, November 2003

  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

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

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

**Chip specifications** used on the MiniModule ISA expansion board:

- Integrated Technology Express, Inc. and the PCI-to-ISA Bridge, IT8888F

  Web site: http://www.iteusa.com or http://www.ite.com.tw

# 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 MiniModule ISA QuickStart Kit simultaneously with the design of your product.

**MiniModule Support Products**

- MiniModule ISA QuickStart Kit (QSK)

  The MiniModule ISA QuickStart Kit includes the MiniModule ISA 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 module. 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™ PCC III Expansion Board – This MiniModule is a compact, low power PC/104-Plus peripheral board with two PCMCIA card sockets for connecting one or two PCMCIA memory or peripheral cards to an Ampro CPU module or single board computer. Up to two MiniModule PCC III boards can be installed in a system. This MiniModule allows the integration of commercially available 16-bit or 32-bit PC cards or PCMCIA memory cards and peripheral cards.

  The MiniModule PCC III supports memory cards such as EPROM, SRAM, and One Time Programmable EPROM (OTPROM) and I/O devices such as 802.11 Wireless LAN (Wi-Fi®) cards, modems, 10/100BaseT LAN adapters, or PCMCIA-ATA (IDE) drives. PCMCIA XIP (eXecute In Place) is fully supported. The MiniModule PCC III has two PCMCIA card sockets that are compatible with Type I, Type II, Type III, and Type IV cards. The MiniModule PCC III 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 400 Mbps. This allows easy integration of cameras or other FireWire devices, with hot insertion or removal of any IEEE 1394 cables.

- 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).

**Other Ampro Products**

- CoreModule™ Family – These complete embedded-PC subsystems on single PC/104 or PC/104-Plus form-factor (3.6"x3.8") modules feature 486, Celeron, or Celeron M CPUs. Each CoreModule includes a full complement of PC core logic functions, plus disk controllers, and serial and parallel ports. Most modules also include CRT and flat panel graphics controllers and/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, and smart power monitor.

- ETX Family – These high-performance, compact, rugged Computer-on-Module (COM) solutions use various x86 processors from Intel Celeron to Pentium M CPUs in an ETX Revision 2.7 form factor to plug into your custom baseboard. Each ETX module provides standard peripherals, including dual Ultra/DMA 33/66/100 IDE, floppy drive interface, PCI bus, ISA bus, serial, parallel, PS/2 keyboard and mouse interfaces, 10/100BaseT Ethernet, USB ports, Video, and AC'97 audio. ETX modules support up to 1 GB of SODIMM DRAM and come with a 50% thicker PCB, and additional features, such as watchdog timer, battery-free boot, a customizable splash screen, BIOS recovery, and serial console. Optional –40°C to +85°C operation is also available to meet your rugged application requirements.

- LittleBoard™ Family – These high-performance, highly integrated single-board computers use the EBX form factor (5.75"x8.00"), and are available with the Intel Pentium M, Celeron M, Pentium III, or Celeron processors. The EBX-compliant LittleBoard 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, and smart power monitor.

- MightyBoard™ Family – These low-cost, high-performance single-board computers (SBC) use the Mini-ITX form factor (6.75"x 6.75") and are available with Intel Celeron M or Pentium M processors. MightyBoard products offer the equivalent functions of a complete laptop or desktop PC system, including DDR memory, high performance graphics, USB 2.0, Gigabit Ethernet, plus standard PCI expansion capability in one card slot.

- ReadyBoard™ Family – These low-cost, high-performance single-board computers (SBC) use the EPIC form factor (4.5"x6.5") and are available with the Intel Pentium M, Celeron M, and Celeron processors. ReadyBoard products offer functions equivalent to a complete laptop or desktop PC system with standard PC-style connections, and features such as DDR or DDR2 memory, high performance graphics, USB 2.0, Ethernet and Gigabit Ethernet ports, AC'97 Audio, plus several expansion cards. Ampro also includes such features as watchdog timer, battery-free boot, a customizable splash screen, Oops! jumper (BIOS recovery), and serial console.

# Chapter 2 Setting Up the MiniModule ISA

## Using the MiniModule ISA QuickStart Kit

This QuickStart setup chapter provides the most efficient way to set up your MiniModule ISA board and install it on Ampro's target board (CoreModule, LittleBoard, or ReadyBoard). The instructions provided in this setup chapter include:

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

Information not provided in this setup chapter includes:

- MiniModule ISA board specifications
- Environmental requirements
- MiniModule ISA board connector pin numbers and definitions
- Supplied software driver use and programming considerations

### Requirements

The following devices are needed to make full use of the target board with the MiniModule ISA board.

- Target System (PCI-104 compliant)
  - Ampro CoreModule CPUs
  - Ampro ReadyBoard SBCs
  - 3rd party target systems
- Power supply:
  - AT, ATX, or lab power supply – A target system power supply is required to provide power to the target board and the MiniModule ISA installed.
  - Optional power cable for auxiliary +5V and +12V input
- Boot Device for the target system
- Optional Devices/Connections for Target System
  - CRT (VGA) display
  - PS/2 keyboard and PS/2 mouse
  - Ethernet (LAN) 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 chapter 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 manuals, which provide more information about installation and use of the MiniModule ISA board.

## Preparations

| | |
|---|---|
| 1) Open shipping box. | • Locate the QuickStart Kit Contents sheet.<br>• 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 ISA shipping box.<br>• If anything is missing or damaged, contact your sales representative. |
| 3) Support Documentation (MiniModule Documentation & Support Software (Doc & SW) CD-ROM) | • MiniModule ISA QuickStart Setup<br>Chapter 2 describes how to setup, install, and power up the MiniModule ISA board found in the QuickStart Kit. This chapter is found in the *MiniModule ISA QuickStart Guide and Reference Manual* found under the MiniModule ISA menu on the MiniModule Documentation & Support Software CD-ROM (MiniModule Doc & SW CD-ROM) as a PDF file.<br>• MiniModule ISA Reference Material<br>Chapters 4 and 5 describe the MiniModule ISA board in more detail and provide more reference information. These chapters are found in the *MiniModule ISA QuickStart Guide and Reference Manual* found under the MiniModule ISA menu on the MiniModule Documentation & Support Software CD-ROM (MiniModule Doc & SW CD-ROM) as a PDF file. |

## Setting Up the MiniModule ISA

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| **CAUTION** | To prevent damage to the MiniModule ISA board or the target system, do not touch the boards until you have followed Electrostatic Discharge precautions.<br>Use an anti-static wrist or ankle strap connected to a grounding mat.<br>Always touch a grounded, unpainted metal surface before touching the MiniModule ISA board or the target system board. |

| | |
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| 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 ISA 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.<br>If you do not have your own ESD strap, an ESD kit is provided in the QuickStart Kit with an anti-static wrist strap. |

## Setting Up the Target System

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| • If the target system has already been setup on the workbench for installation of the MiniModule ISA board, skip this section and go to Step 9.<br>• Refer also to the target system QuickStart Guide for the installation instructions referenced in the following steps. See Figures 2-1 and 2-2 for examples of CoreModule and LittleBoard Target Systems. | |
| 6) Place the target system on the workbench. | • If the target system is in its protective plastic case, remove it 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 used 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, CRT display, 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. |

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| **CAUTION** | To prevent damage to the MiniModule ISA 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 ISA onto the target system. The typical ATX power supply will continue to supply current to the target system as long as the power cord is connected, and the switch is on. |

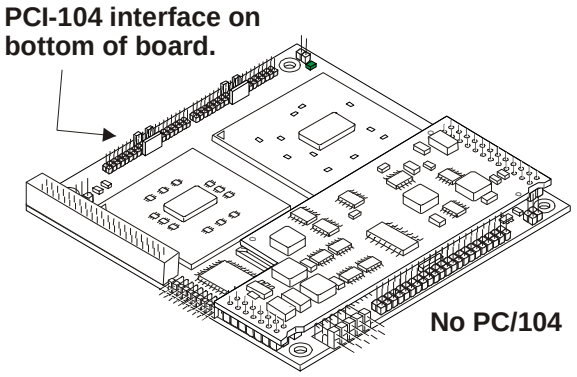


**Figure 2-1. CoreModule Target System Example**

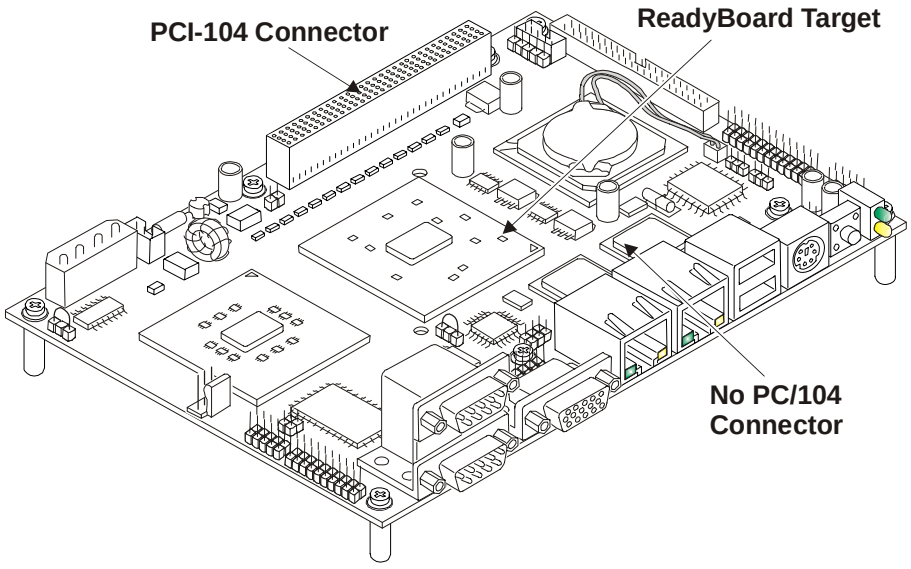


**Figure 2-2. ReadyBoard Target System Example**

## Mounting the Module onto the Target System

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| **CAUTION** | To prevent damage to the MiniModule ISA board or the target board, do not attempt to mount the MiniModule ISA to a non-standard PC/104-Plus target board. The MiniModule ISA , LittleBoard, 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 Chapter4, *Product Overview* later in this manual. |

| | |
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| 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 MiniModule ISA board. | • Remove the MiniModule ISA board from its protective plastic case and place it on a flat, static-free work surface. |
| 12) Check the MiniModule ISA for bent pins. | • Ensure there are no bent or broken pins on the underside of the board at the PC/104 and PCI-104 connectors, before attempting to install the MiniModule ISA board on the target system. |
| 13) Position the MiniModule ISA onto the target system. | • The MiniModule ISA must be positioned over (or under) the PCI-104 connector on the target system. See Figures 2-1 to 2-4.<br>Typically the MiniModule ISA board is installed on the top side of the target system, but in some cases, it may be installed underneath or below the target system. |

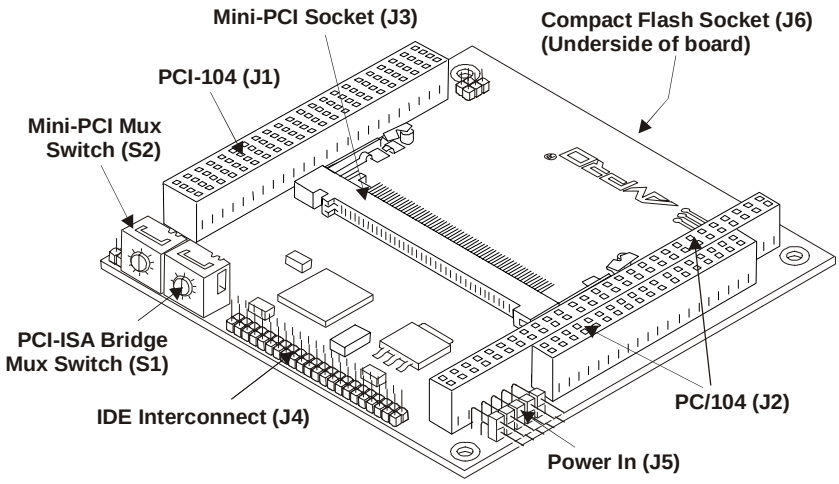


**Figure 2-3. MiniModule ISA**

| | |
|---|---|
| 14) Gently align the connectors and pins | • Place the PCI-104 pins over the connector or beneath the connector and align the pins to the connector.<br>• Gently insert the PCI-104 pins into the connector, ensuring each pin goes into the respective hole in the connector.<br>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 MiniModule board into the connectors | • Once the pins are aligned with the proper holes, slowly insert the MiniModule board into the connector.<br>• Ensure the pins go all the way into the connector and are seated on the target board.<br>There should just be enough space between the target board and the MiniModule ISA board to insert the threaded spacers and secure. |
| 16) If necessary, install any additional MiniModule boards | 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 ISA in the board stack. Refer to Figure 2-3, Table 2-1, and Table 3-3 in Chapter 3, *Product Overview* for more information. |

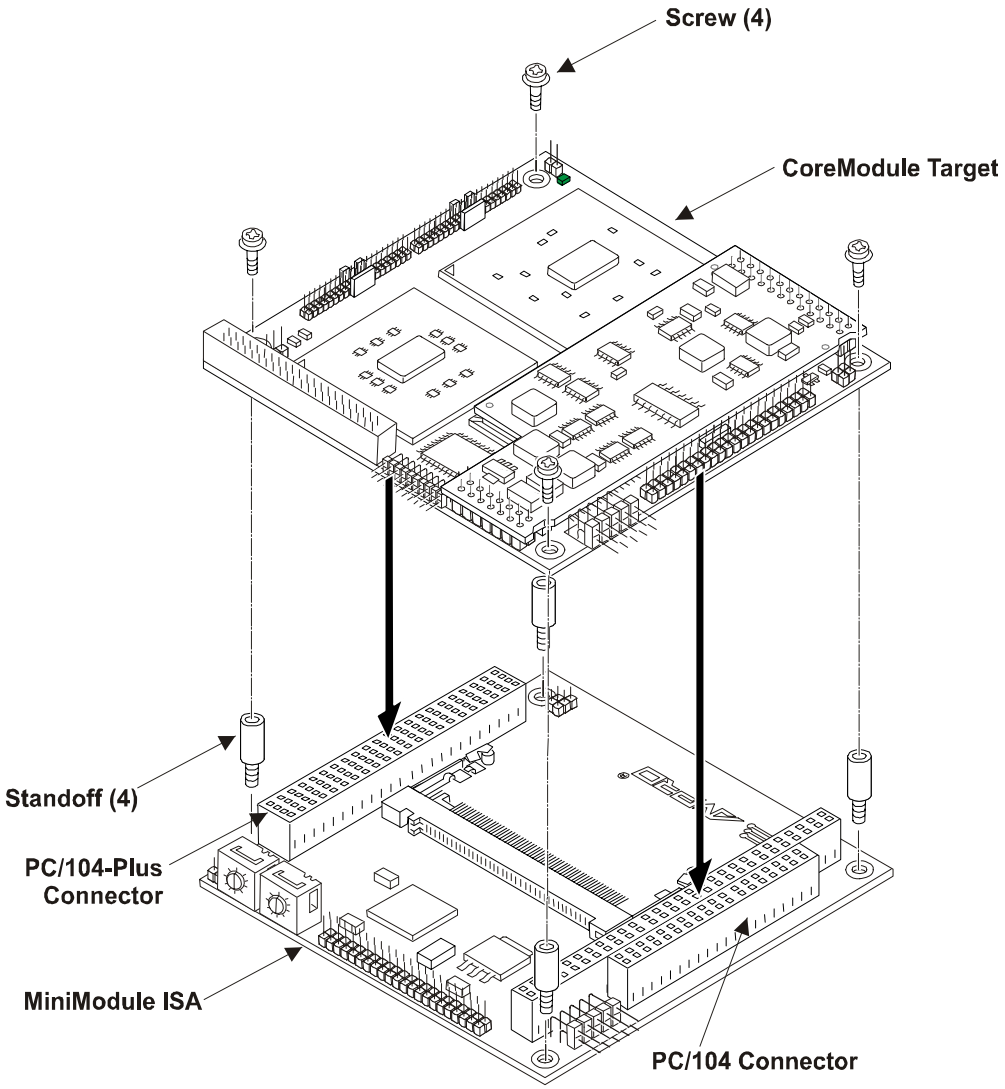


**Figure 2-4. Installing MiniModule ISA on CoreModule Target**

**Table 2-1. PCI-ISA Bridge Mux Selection Switch (S1)**

| Switch Position | MiniModule Position in PCI Stack |
|---|---|
| 4 | ReadyBoard 800 |
| 4 | CoreModule 800 |

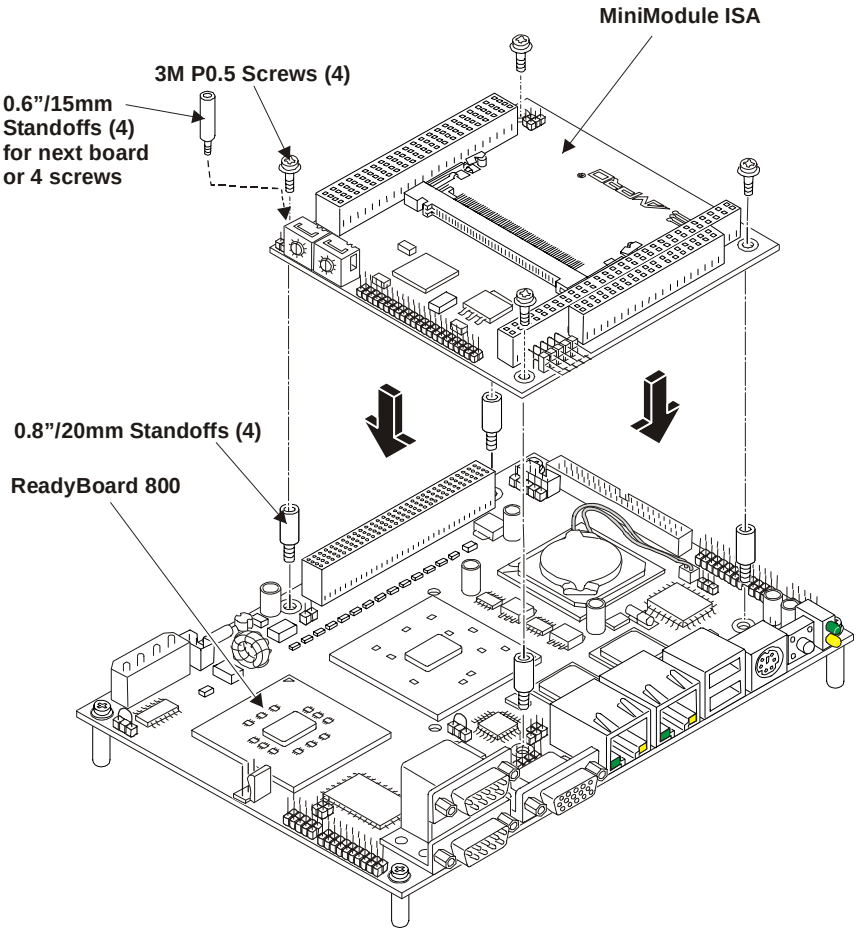


**Figure 2-5. Installing MiniModule ISA on ReadyBoard Target**

## Applying Power to the Target System

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| 18) Check/Set the Power Supply Input Voltage | • If the power supply uses auto-ranging operation at 50/60Hz, skip this step.<br>• Check the input voltage switch on the power supply located on the rear of the supply just below the power connector.<br>The input voltage switch typically has two positions: 115 or 230 volts – 115 volts is typically the default position. |
| 19) Power up the target system. | • Plug the CRT monitor's power cord into an AC outlet and turn on the monitor.<br>• Plug the AT or ATX power supply's power cord into the AC outlet.<br>• Turn the AT or ATX 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 ISA board does not require any further setup.

- The MiniModule ISA supports FAX modems, LAN adapters, or Wifi LAN cards in the Mini-PCI card socket.
- The MiniModule ISA supports most commercial compact flash cards in the compact flash socket.

- The MiniModule ISA supports the Plug and Play option with operating systems that have those features.
- The BIOS of the target system is not affected by the MiniModule ISA board.

For more specific technical information about the MiniModule ISA, refer to Chapters 4 and 5.

## Accessing Drivers and Documentation

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

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

   This includes the MiniModule ISA documentation, release notes, and drivers for supported Oss.

   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 ISA *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 ISA 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 ISA 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 Installing MiniModule ISA Options

The procedures in the first part of this chapter describe how to install or remove the MiniModule ISA options onto or from the board, including the compact flash card and the Mini-PCI card.

## Compact Flash Installation

The compact flash interface allows you to substitute solid-state flash memory cards for a conventional hard disk drive. Any of the supported operating system, utilities, drivers, and application programs can easily be run from the compact flash card without modification.

| **NOTE** | You may use Type I or Type II compact flash cards from commercially available suppliers. CF types include DMA compatibility, such as DMA, UDMA, or non-DMA as well as removable or non-removable storage. |
|---|---|

### Tools Required

The following tools are needed to remove and install the compact flash card onto or off of the MiniModule ISA.

- Anti-static service kit - Use a complete anti-static service kit (or the equivalent) to remove or install the compact flash card. A complete anti-static service kit should include a static-dissipating work surface, a chassis clip lead, and a wrist or ankle strap.

### Installation Guidelines

The MiniModule ISA only supports the compact flash card on the same channel of the EIDE disk controller as on the target board.

- Configure the compact flash card according the target boards BIOS Setup Utility. Refer to the target boards Reference Manual for BIOS Setup Utility instructions.
- Use the Master/Slave jumper (JP3) to determine the Master/Slave status of the compact flash card.
- The MiniModule ISA supports +3.3V, +5V tolerant, or +5V compact flash cards.

  Newer compact flash cards will typically work with either 5V or +3.3V systems. These newer compact flash cards sense the input voltage and adjust accordingly.
- No two devices on the IDE channel can both be master or both be slave at the same time.

| **NOTE** | Ampro does not recommend using a compact flash card with a preinstalled OS from another model computer to boot the target board. This has proven to cause problems or provide unreliable operation. Use a bootable device (floppy or CD-ROM) to load the desired OS onto compact flash card and then the drivers, while attached to the target board. Then the compact flash card can be used to boot the target board without difficulty. |
|---|---|

## Installing the Compact Flash Card

This procedure describes all of the cables to turn the MiniModule ISA over, exposing the bottom of the board to install or remove the compact flash card. However, depending on how you have the MiniModule ISA mounted and the location of the socket near the edge of the board, this may not be necessary. It is possible to install or remove the compact flash card without all of the cables and turning the board over, but doing so provides the safest method of checking the condition of the compact flash socket before installing the compact flash card.

You may have to remove the two Ethernet cables and the USB cables to have full access to the compact flash socket and card, but you must power down the system before installing or removing the compact flash card.

| | |
|---|---|
| **NOTE** | To simplify this procedure, power down the system and disconnect any cables that prevent you from full access to the compact flash socket and card. If you have the target board securely mounted, with enough clearance, it is not necessary to turn the board over to access the compact flash card.<br><br>However, the procedures described here and on the following pages provide the safest method of checking the condition of the compact flash socket before installing the compact flash card. |

1. Prepare the MiniModule ISA for compact flash card installation:
   - Plug in a 2mm, 44-pin standard cable to J4 on the MiniModule ISA and into the corresponding IDE connector on the target. See Figure 2-3.
   - If the MiniModule ISA is already prepared for compact flash installation, with power disconnected, skip to step 5.
   - If the MiniModule ISA is connected to power and operating, power down the system and continue with next step.

| | |
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| **CAUTION** | To prevent damage to the MiniModule ISA, ensure the power supply to the target board is turned off and the power cord has been removed from the AC power source. A typical ATX power supply will continue to provide standby current to the chassis until the power cord is disconnected. |

2. Disconnect the AC power cord to target board's power supply from the AC power source.

| | |
|---|---|
| **CAUTION** | To prevent damage to the MiniModule ISA or the compact flash card, do not touch either one until you have discharged yourself and have followed good Electrostatic Discharge principals. The MiniModule ISA and the compact flash card are sensitive to static electricity and can be easily damaged by improper handling. Do the following when handling either one:<br><br>Use an anti-static wrist/ankle strap and a grounding mat connected to ground.<br><br>Leave the compact flash in the anti-static bag until you are ready to install it.<br><br>Before you touch the compact flash card, touch a grounded, unpainted metal surface to discharge any static electricity. |

3. Disconnect any cables that would prevent you from turning the MiniModule ISA over exposing the bottom of the board.

4. Turn the MiniModule ISA over to access the bottom of the board and lay it on a flat anti-static surface. See Figure 3-1.
5. Check for bent pins or debris on the pins of the compact flash socket (J6).
6. Remove the compact flash from its protective bag, handling the compact flash card by its edges.

| | |
|---|---|
| **CAUTION** | To prevent damage to your compact flash card, ensure you set the CF Voltage Select jumper before applying power to the MiniModule ISA. The MiniModule ISA supports +3.3V, +5V or Universal (+5V tolerant) compact flash cards, but you must set the CF Voltage Select jumper.<br><br>If you are using a newer compact flash card, it will typically work with either 5V or +3.3V. The newer compact flash cards sense the input voltage and adjust accordingly. |

7. Insert the compact flash card into the socket provided by the tabs on the protective cover as shown in Figure 3-1.

   The compact flash card edges and the socket are keyed to install in only one orientation.

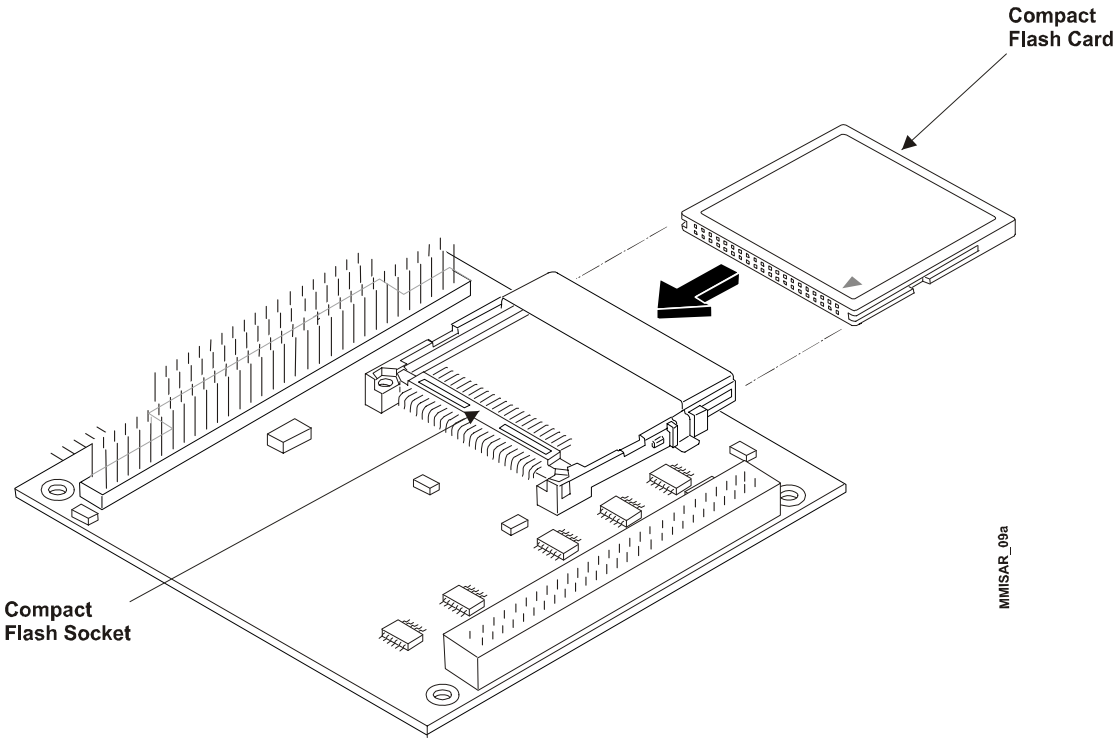


**Figure 3-1. Installing the Compact Flash Card**

8. Push the compact flash card into the socket until it firmly mates with the pins. See Figure 3-1.
9. Turn the MiniModule ISA back over onto the bottom of the board, placing it on the work surface.
10. Reconnect any cables you disconnected earlier and verify all other connections to the MiniModule ISA are still connected.
11. Set the Master/Slave jumper (JP3) to the master/slave status before continuing. See Table 3-1.
12. Set the CF Voltage Select jumper (JP4) to the matching voltage before continuing. See Table 3-1.

**Table 3-1. Compact Flash Jumper Setting**

| Jumper # | Installed | Removed |
|---|---|---|
| JP3 – CF Master/Slave | Master (pins 1-2) | Slave (removed) **Default** |
| JP4 – CF Voltage Select | +3.3V (pins 1-2) **Default** | +5V (pins 2-3) |

13. Plug the ATX power supply's power cord into the AC power source and restore power.
14. Go into the BIOS Setup Utility and change the settings for the compact flash card placing it in thedrive and boot settings.

| **NOTE** | The compact flash must be listed in Drive Assignment and the Boot Order to be recognized by the BIOS. The compact flash can be listed in any of the drive positions. |
|---|---|

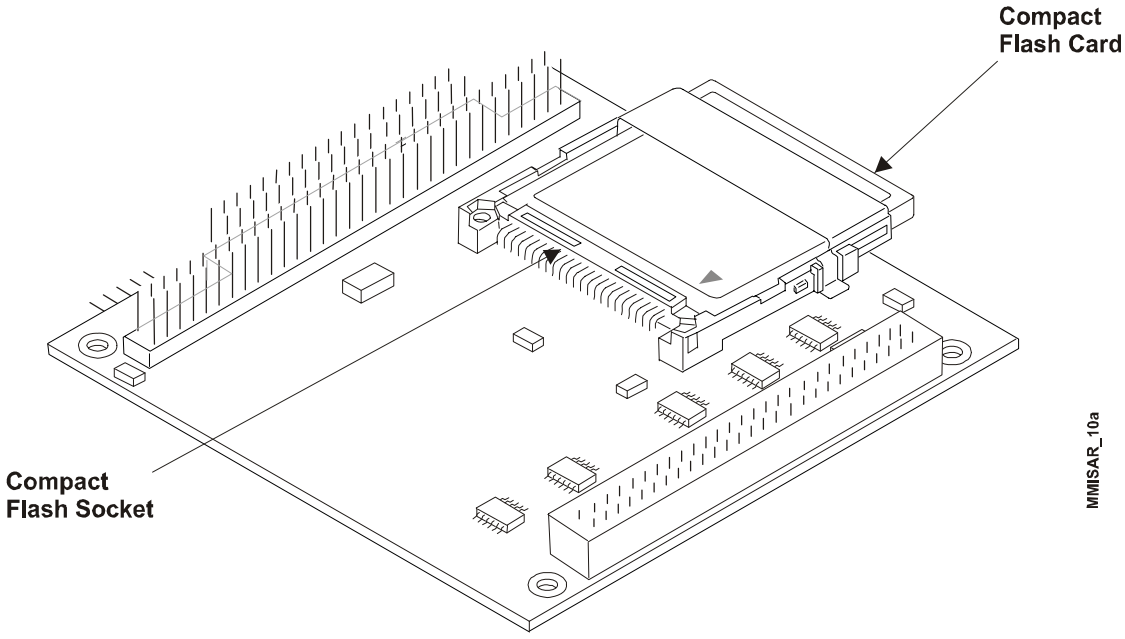


**Figure 3-2. Compact Flash Card Installed**

## Removing the Compact Flash Card

1. Prepare the MiniModule ISA for compact flash card removal:
   - If the MiniModule ISA is already prepared for compact flash card removal, with power disconnected, skip to Step 5.
   - If the MiniModule ISA is connected to power and operating, power down the system and continue with the next step.

| **CAUTION** | To prevent damage to the MiniModule ISA or the compact flash, ensure the power supply is turned off and the power cord has been removed from the power source. The typical ATX power supply will continue to provide standby current to the chassis until the power cord is disconnected. |
|---|---|

2. Disconnect the ATX power supply's power cord from the AC power source.

| CAUTION | To prevent damage to the MiniModule ISA or the compact flash card, do not touch either one until you have discharged yourself and have followed good Electrostatic Discharge principals. Do the following when handling either one:<br><br>Use an anti-static wrist/ankle strap and a grounding mat connected to ground.<br><br>Before you remove a compact flash card from its packaging, touch a grounded, unpainted metal surface to discharge any static electricity. |
|---|---|

3. Disconnect any cables that would prevent you from turning over the MiniModule ISA to expose the bottom of the board.
4. Turn over the MiniModule ISA over to access the bottom of the board and lay it on a flat anti-static surface. See Figure 3-3.
5. Insert a flat head screw driver between the compact flash card and the socket and turn the screw driver as shown in Figure 3-3.
6. Grasp the two sides of the compact flash card or the lip (catch edge) and gently pull it from the compact flash socket. Place the compact flash card on an anti-static surface or in an anti-static bag.

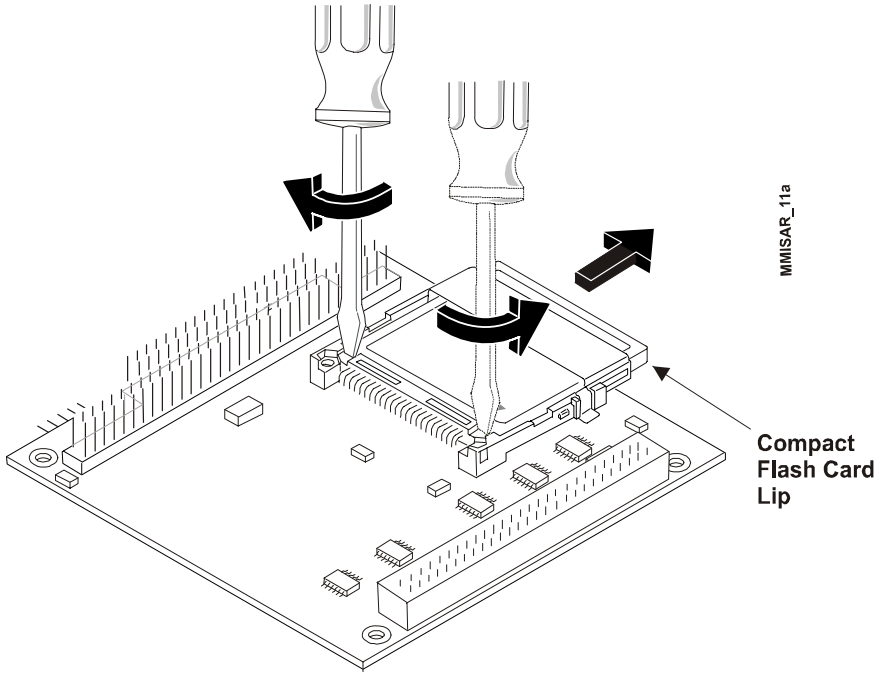


**Figure 3-3. Removing the Compact Flash Card**

7. Turn over the MiniModule ISA so that the compact flash socket faces the work surface.
8. Reconnect any cables you disconnected earlier and verify all other connections to the MiniModule ISA.
10. Restore power by plugging in the AC power to the the AC power source.

# Mini-PCI Card Installation/Removal

The MiniModule ISA offers a single Mini-PCI socket on the side of the board opposite the compact flash socket. The MiniModule ISA supports any compatible Mini-PCI card.

## Tools Required

Use an anti-static service kit (or the equivalent) to remove or install the Mini-PCI card. An anti-static service kit should include a static-dissipating work surface, a chassis clip lead, and a wrist or ankle strap.

## Installation Guidelines

- When handling a Mini-PCI card, observe Electrostatic Discharge precautions to avoid damage.
- The MiniModule ISA supports any Mini-PCI card in the socket.

## Installing the Mini-PCI card

If you want to install a Mini-PCI card or replace the existing Mini-PCI card, refer to the following procedure.

1. Prepare the MiniModule ISA for Mini-PCI card installation:
   - If the MiniModule ISA is already prepared for Mini-PCI card installation, with the power turned off, the power cord disconnected, and an empty Mini-PCI card socket, skip to Step 5.
   - If the MiniModule ISA and target board are operating, power down the system and continue with next step.

| | |
|---|---|
| **CAUTION** | To prevent damage to the MiniModule ISA and the Mini-PCI card, ensure the power switch on the power supply is turned off and the power cord has been removed from the power source. The typical ATX power supply will continue to provide standby current to the board until the power cord is disconnected. |

2. Disconnect the AC power cord to target board's power supply from the AC power source.

| | |
|---|---|
| **CAUTION** | To prevent damage to the Mini-PCI card, do not touch the Mini-PCI card until you have discharged yourself and followed good Electrostatic Discharge principals. The Mini-PCI cards are sensitive to static electricity and can be easily damaged by improper handling. Do the following when handling a Mini-PCI card:<br><br>Use an anti-static wrist/ankle strap and a grounding mat connected to ground.<br><br>Leave the Mini-PCI card in the anti-static bag until you are ready to install it.<br><br>Before you touch the Mini-PCI card, touch a grounded, unpainted metal surface to discharge any static electricity. |

3. Disconnect the two boards or any cables that would prevent you from installing the Mini-PCI card into the Mini-PCI socket.
4. If necessary, remove the existing Mini-PCI card from the Mini-PCI socket before continuing.

   Refer to the Step 4 in the procedure, *Removing the Mini-PCI Card*, and follow the remaining steps in that procedure before continuing with the next step in this procedure.
5. Grasp the Mini-PCI card by its edges and remove it from the bag.
6. Remove anything in the Mini-PCI socket that would prevent the card's installation.

7. Insert the Mini-PCI card into the socket at a 45° angle to the surface of the MiniModule ISA. See Figure 3-4.

   The Mini-PCI card edge and socket are keyed to install into the socket in only one orientation.

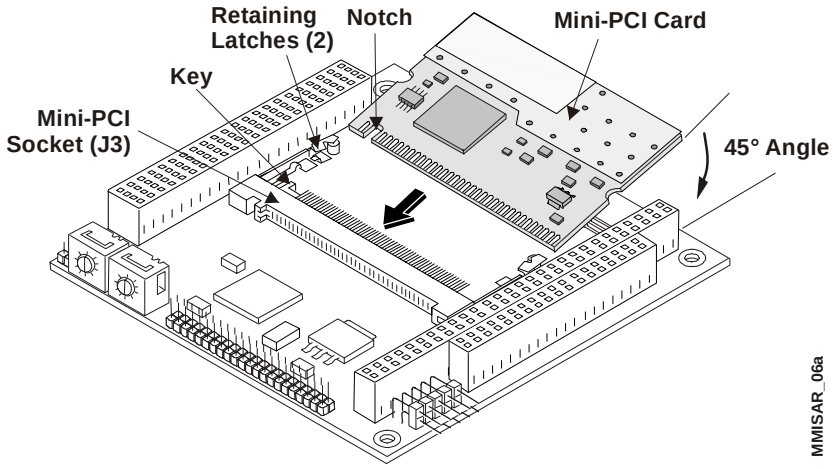


**Figure 3-4. Installing Mini-PCI Card into Socket**

8. Press the edges of the Mini-PCI card down between the latches, until the latches snap into place. See Figure 3-5.

   The latches should open to accept the Mini-PCI card without any resistance. If you encounter any resistance, you may not have inserted the Mini-PCI card far enough into the socket.

9. If the retaining latches do not close completely on the Mini-PCI card, remove it and repeat steps 6 to 8.

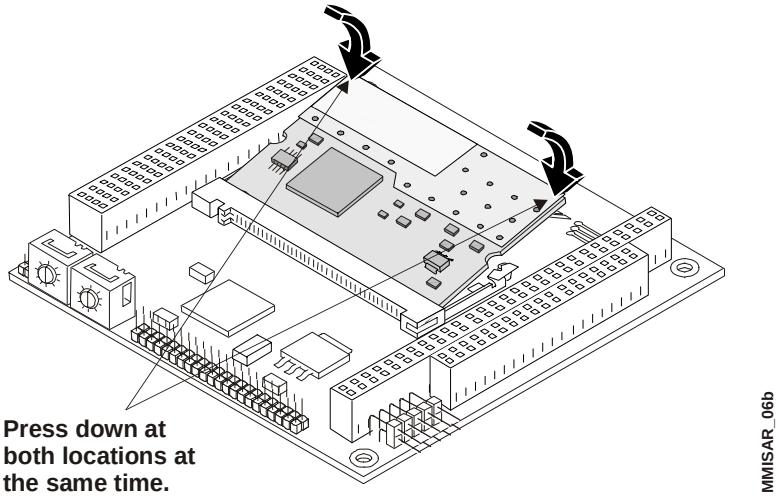


**Figure 3-5. Pressing down on the Mini-PCI Card**

10. If necessary, reconnect the MiniModule ISA module to the target board.
11. Reconnect any cables you disconnected earlier and verify all other connections to the MiniModule ISA are still connected.
12. Reconnect the power supply's power cord to the AC power source.
13. Restore power to the target board and MiniModule ISA while observing the boot screen for new board recognition.

## Removing the Mini-PCI Card

Use this procedure to remove the Mini-PCI card from the Mini-PCI socket on the MiniModule ISA.

1. Prepare the MiniModule ISA for Mini-PCI card removal:
   - If the MiniModule ISA is already prepared for Mini-PCI card removal, with the power turned off, and the AC power cord disconnected, skip to step 4.
   - If the MiniModule ISA is operating, power down the system and continue with next step.

| | |
|---|---|
| **CAUTION** | To prevent damage to the MiniModule ISA and the Mini-PCI card, ensure the power switch on the power supply is turned off and the power cord has been removed from the power source. A typical ATX power supply will continue to provide standby current to the board until the power cord is disconnected. |

2. Disconnect the target board's AC power cord from the AC power source.
3. If necessary, separate the MiniModule ISA from the target board to access the Mini-PCI socket (J3).

   The MiniModule ISA board is connected under the CoreModule 800 and must be separated before accessing the Mini-PCI socket (J3). Refer to the mounting instructions in chapter 2.
4. Disconnect any cables that would prevent you from accessing the Mini-PCI socket (J3) See Figure 3-6.

| | |
|---|---|
| **CAUTION** | To prevent damage to the Mini-PCI card, do not touch the Mini-PCI card until you have discharged yourself and followed good Electrostatic Discharge principals. Do the following when handling a Mini-PCI card:<br><br>Use an anti-static wrist/ankle strap and a grounding mat.<br><br>Before you touch the Mini-PCI card, touch a grounded, unpainted metal surface to discharge any static electricity. |

5. Locate the Mini-PCI socket (J3) on the top of the MiniModule ISA board. See Figure 3-6.

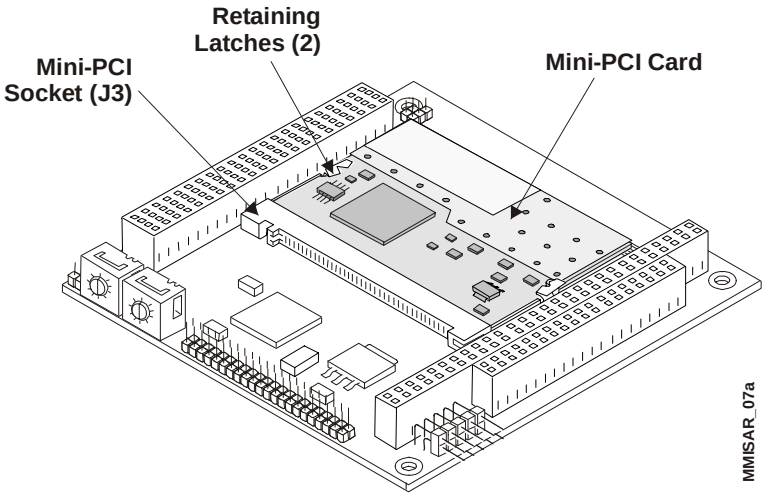


**Figure 3-6. Mini-PCI Card Location (Top view)**

6. Open both retaining latches to release the Mini-PCI card from the socket. See Figure 3-6.

The Mini-PCI card will spring up to a 45° angle to the board once you open both retaining latches. If the Mini-PCI card does not spring up to a 45° angle, then the retaining latches have not released the Mini-PCI card from the socket.

7. Using the card edges, lift the Mini-PCI card completely away from the socket. See Figure 3-7.
8. Place the Mini-PCI card on an anti-static surface or in an anti-static bag.

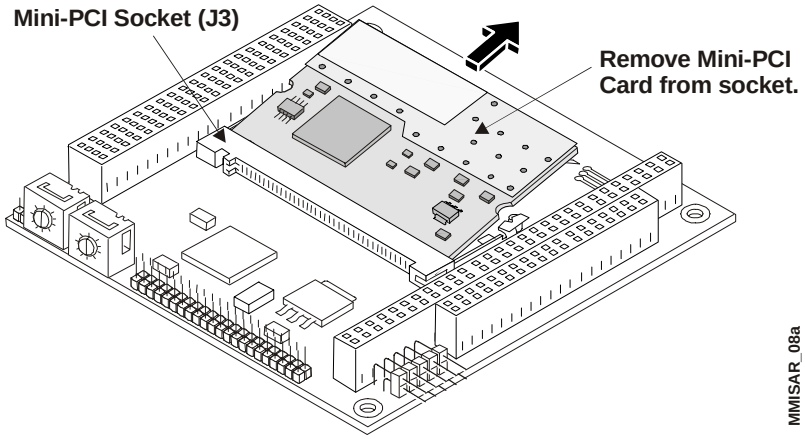


**Figure 3-7. Removing Mini-PCI Card from Socket**

# Chapter 4 Product Overview

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

- PC/104 and PC/104-Plus Concept
- MiniModule ISA 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 a CoreModule, LittleBoard, or ReadyBoard which provides the processor, memory, and input/output device connections (keyboard, mouse, serial, parallel, floppy drive, IDE drives, hard disk drives, solid state disk drives, or compact flash cards). To expand a simple CoreModule, LittleBoard or ReadyBoard system, simply add self-stacking Ampro MiniModules or 3rd party PC/104 and PC/104-Plus expansion boards to provide additional capabilities, such as:

- Analog or digital I/O expansion modules (including serial, parallel and USB 2.0)
- IEEE 1394 (FireWire) expansion modules
- IEEE 802.11 Wireless (WiFi) expansion modules
- PC card (compact flash) expansion modules

PC/104 expansion modules can be stacked with the CoreModule or LittleBoard avoiding the need for card cages and backplanes. The PC/104 expansion modules can be mounted directly to the PC/104 and PC/104-Plus bus connectors of the CoreModule or LittleBoard systems. PC/104-compliant modules can be stacked with an inter-board spacing of ~0.66 inches so that a 3-module system fits in a 3.6 inch by 3.8 inch by 2.4 inch space. See Figure 4-1.

One or more MiniModule products or other PC/104 and PC/104-Plus modules can be installed on the CoreModule or LittleBoard expansion connectors. When installed on the CoreModule or LittleBoard, the expansion module fits within the CoreModule or LittleBoard outline dimensions. Most MiniModule products have stackthrough connectors compatible with the PC/104 and PC/104-Plus Version 2.1 specification. Each additional module increases the thickness of the package by 15 mm (0.66”). See Figure 4-2.

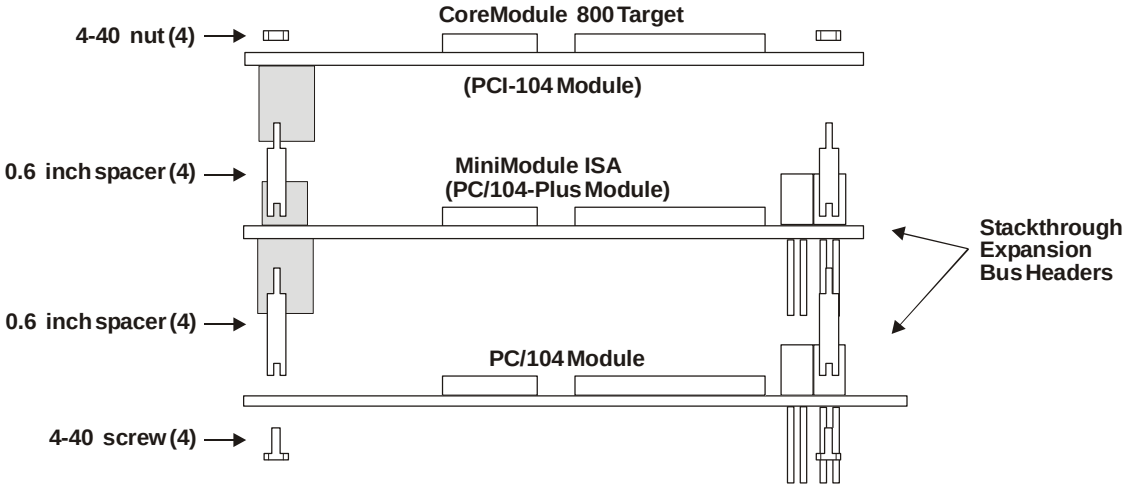


**Figure 4-1. Stacking the MiniModule ISA with CoreModule Product**

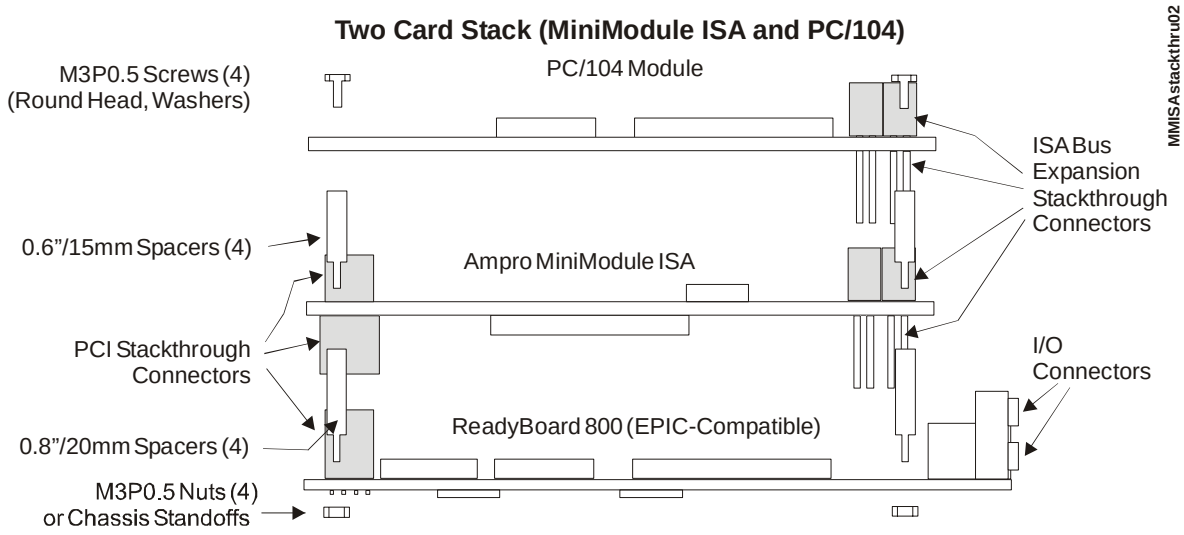


**Figure 4-2. MiniModule ISA in 2-Card Stack with ReadyBoard Product**

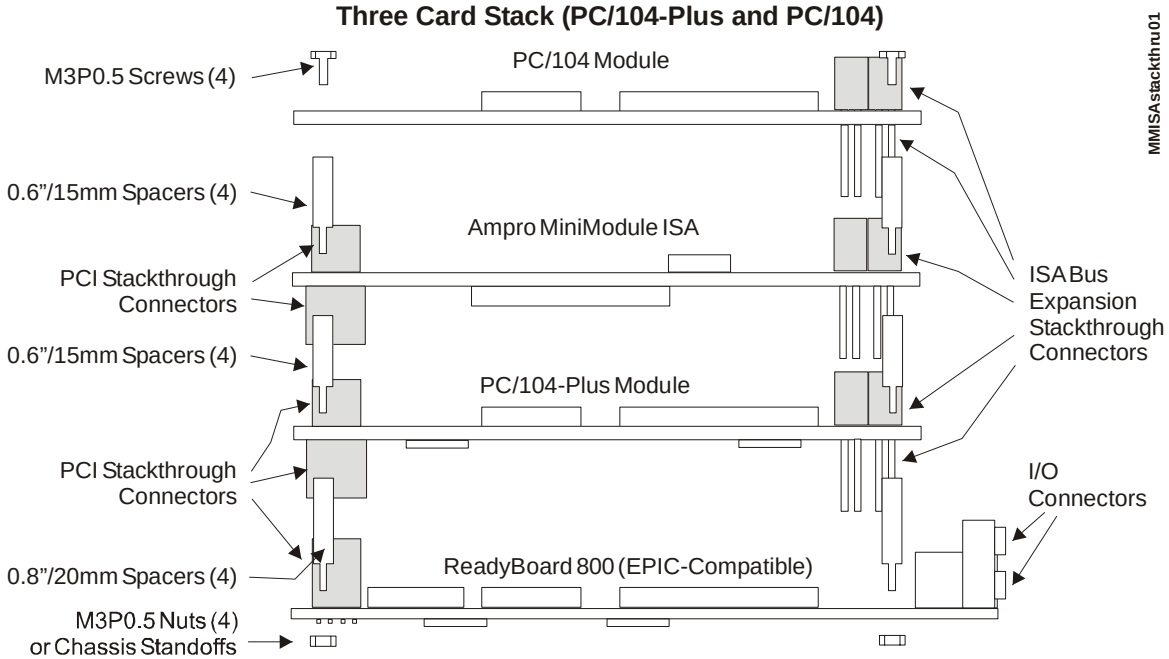


**Figure 4-3. MiniModule ISA in 3-Card Stack with ReadyBoard Product**

# Product Description

The MiniModule ISA is a bus bridge module providing PCI-to-ISA bridge conversion for PC/104 compatible expansion boards. The size and expansion bus connectors of the MiniModule ISA conform to the PC/104-Plus and PCI-104 standards and can be installed directly onto Ampro's LittleBoard, CoreModule, or ReadyBoard single board computer (SBCs) supporting the PCI-104 expansion bus. The necessary Serial IRQs signals are provided through the PCI-104 connector at pin-31 (B-1). The MiniModule ISA provides a 32-bit PCI host interface and only requires a single +5V power source.

In addition to ISA bridge functionally, the MiniModule ISA includes a Mini-PCI socket, a compact flash (CF) socket, and a 2 mm IDE ATA connector with common signals routed to the compact flash socket. Including the IDE connector and compact flash socket with common pins allows CoreModule products with no CF socket on board to use compact flash devices. An IDE cable connects the MiniModule ISA IDE connector and the IDE connector on the ReadyBoard or LittleBoard product.

## What is PCI-104?

PCI-104 is the terminology used for the PCI-only (32-bit PCI bus) specification within the PC/104 product family. PCI-104 eliminates the need for the ISA bus (PC/104 and its 104-pin connector), retaining only the 120-pin connector for PCI and PC/104-Plus. The MiniModule ISA expansion board provides the ISA support through the PCI-104 connector and the PCI-to-ISA bridge located on the board.

The MiniModule ISA is particularly well suited to either embedded or portable applications. Its flexibility makes system design quick and easy. It can be stacked with other Ampro MiniModules or other PC/104-Plus compliant expansion boards.

## Module Features

- Supports PC/104 Bus, PC/104-Plus, and PCI-104 Bus expansion interfaces
- Provides ISA bus signals through PC/104 connector
- Transparent to the Operating System
- Supports PC/104-Plus form factor 90 mm x 96 mm (3.6" x 3.8")

**PCI-to-ISA Bridge Controller:**

- PCI 2.2 compliant
- Full 24-bit ISA addressing
- 16-bit and 8-bit I/O and memory cycles
- Software transparent DMA
- ISA bus master supports (4) PC/104 cards
- Encodes all ISA IRQs
- Software
  - Supports Plug and Play operation with Plug and Play target board and operating system
  - Supports drivers for:
    - Windows XP/XP Embedded
    - Linux 2.6
  - Does not require BIOS support in any Ampro target module
- Power Supply voltages
  - +5.0VDC +/-5% @ 0.33A (provided through PCI bus)

## Block Diagram

Figure 4-4 shows the functional components of the module.

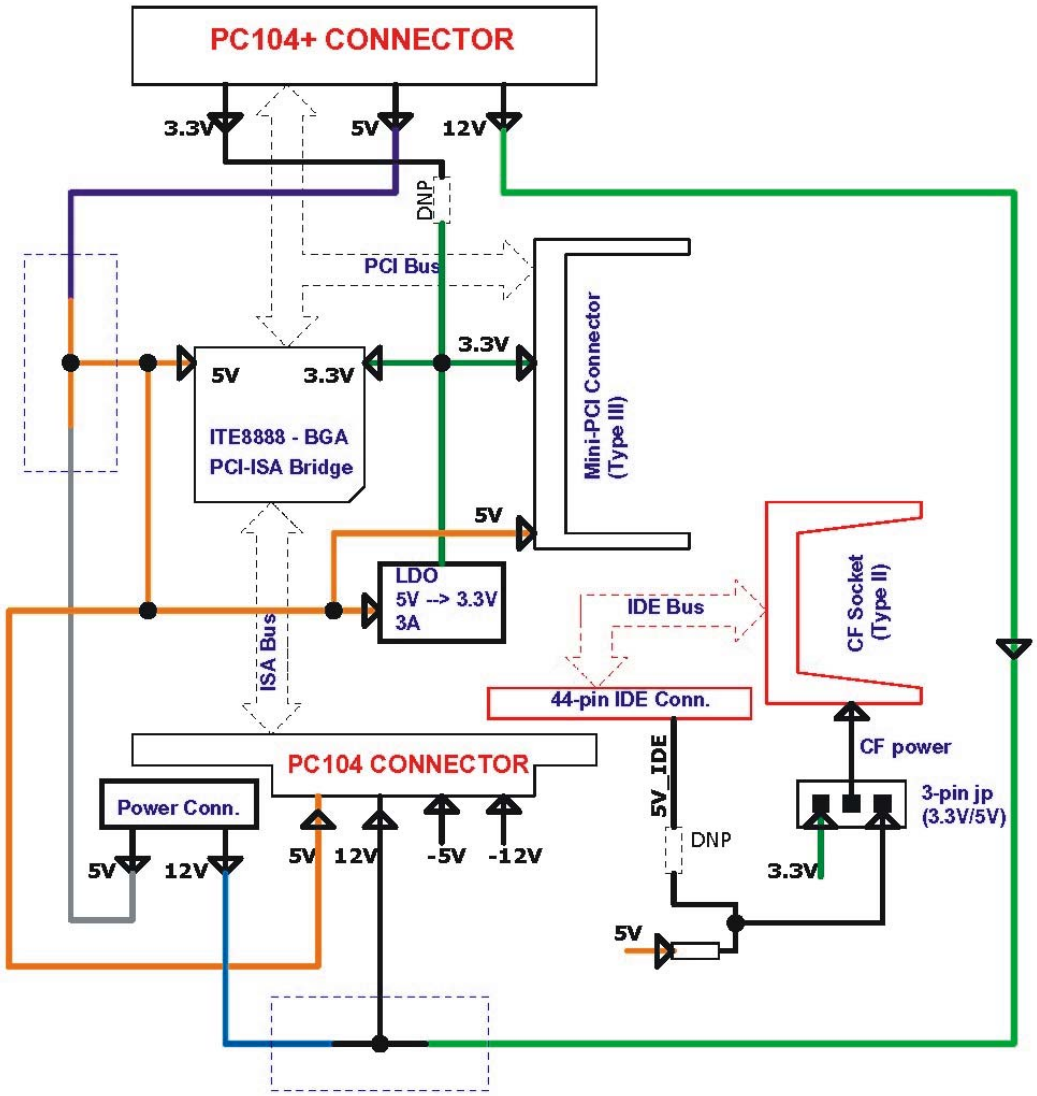


**Figure 4-4. MiniModule ISA Block Diagram**

## Major Integrated Circuits (ICs)

Table 4-1 lists the major integrated circuit, including a brief description, on the MiniModule ISA,// and Figure 4-5 shows the location of the major chips.

**Table 4-1. Major Integrated Circuit Description and Function**

| Chip Type | Mfg. | Model | Description |
|---|---|---|---|
| PCI-to-ISA Bridge (U1) | ITE | IT8888F | Converts PCI to ISA signal for use on the legacy ISA connectors. |

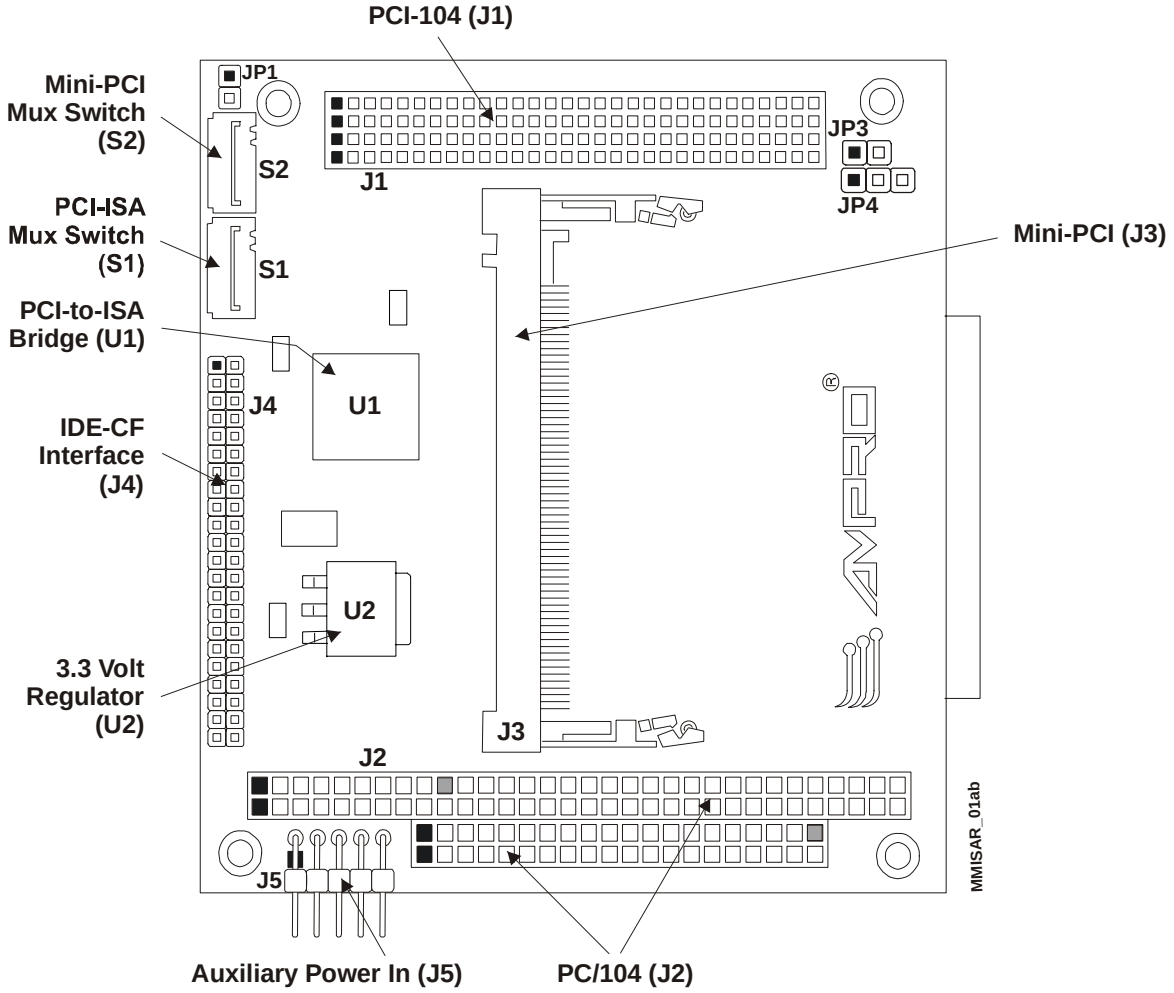


**Figure 4-5. MiniModule ISA (Top View)**

| NOTE | Pin-1 is shown as black pin (square or round) in connectors and jumpers in all illustrations. |
|---|---|

# Connectors

## Connector Definitions

Table 4-2 describes the connectors shown in Figures 4-6 and 4-7.

**Table 4-2. Module Connector Descriptions**

| Jack/Plug # | Board Access | Description |
|---|---|---|
| J1 – PCI-104 | Top/ Bottom | 120-pin, 2 mm |
| J2 – A, B, C, D PC/104 Bus | Top/ Bottom | 104-pin (64 & 40) |
| J3 – Mini-PCI | Top | 124-pin socket |
| J4 – IDE | Top | 44-pin, 2 mm |
| J5 – Power In | Top | 10-pin, used for external power connection |
| J6 – Compact Flash | Top | 50-pin, 127 mm, socket |

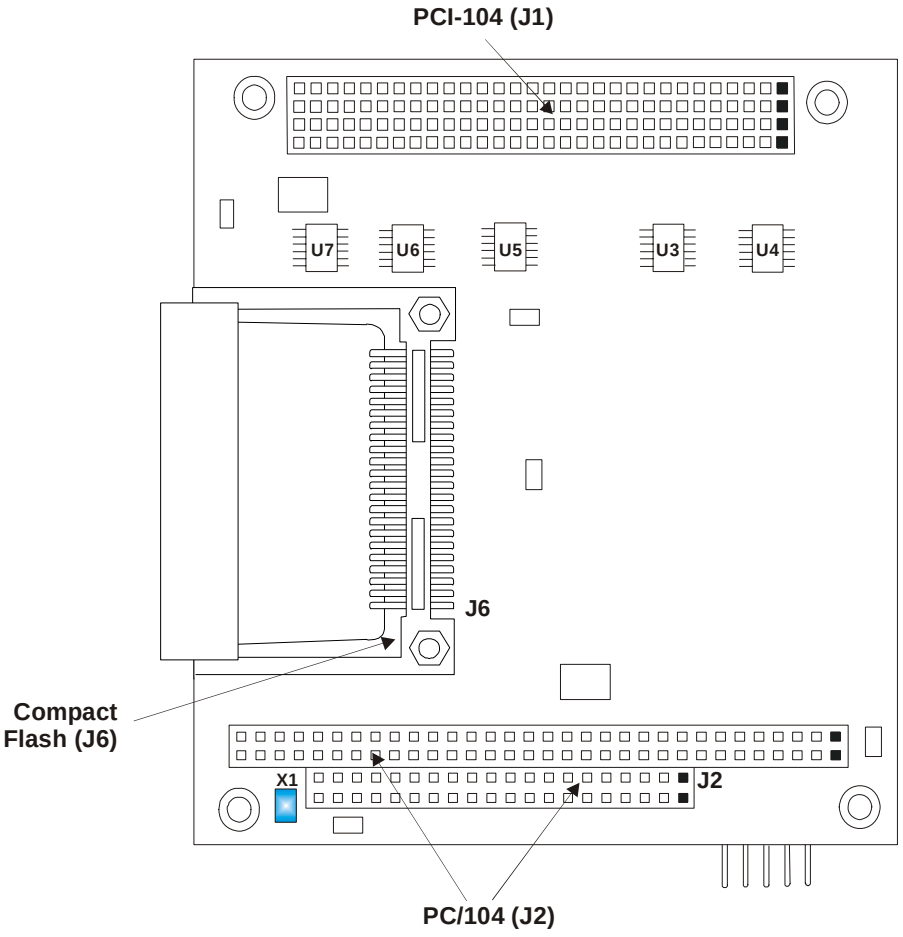


**Figure 4-6. Connector Locations (Bottom View)**

## Jumper Settings

Table 4-3 defines the jumper pins shown in Figure 4-7.

**Table 4-3. Jumper**

| Jumper # | Installed/Enabled | Removed/Enabled |
|---|---|---|
| JP1* – ISA IRQ (SerialIRQ) | Enabled (pins 1-2) **Default** | Disabled (removed) See Note |
| JP2 – ID Select | Intel chip set (pins 1-2) **Default** | Non-Intel chip set (pins 2-3) **Default** |
| JP3 – CF Master/Slave | Master (pins 1-2) | Slave (removed) **Default** |
| JP4 – CF Voltage Select | Enable +3.3V (pins 1-2) **Default** | Enable +5V (pins 2-3) |

**NOTE** ***** The ISA interrupts are required on pin 31 (B1) of J1 on the PCI-104 connector, when using the MiniModule ISA board. Use the ISA IRQ jumper (JP1) to enable the ISA interrupts. For full PCI-104 compatibility, the jumper should be removed (default setting).

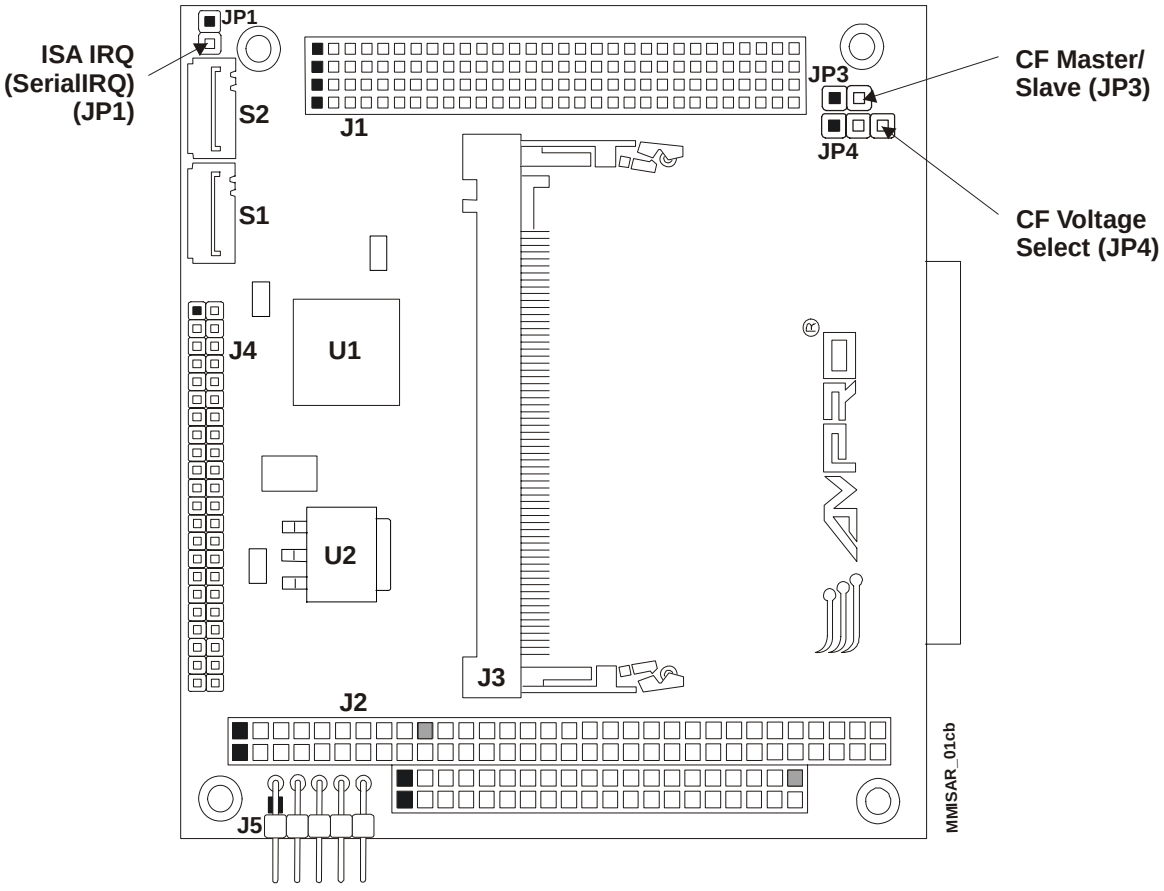


**Figure 4-7. Jumper Locations (Top View)**

## Switch Settings

The two 10-position rotary switches (S1 and S2) are used to configure the PCI position of the PCI-ISA Bridge and the Mini-PCI Socket in the board stack, respectively. Every PCI card must have a unique address. Tables 4-4 and 4-5 provide the switch settings shown in Figure 4-8.

**Table 4-4. PCI-ISA Bridge Mux Selection Switch (S1)**

| Switch Position | Target Module |
|---|---|
| 4 | ReadyBoard 800 |
| 4 | CoreModule 800 (Final version) |

**Table 4-5. Mini-PCI Socket Mux Selection Switch (S2)**

| 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# |

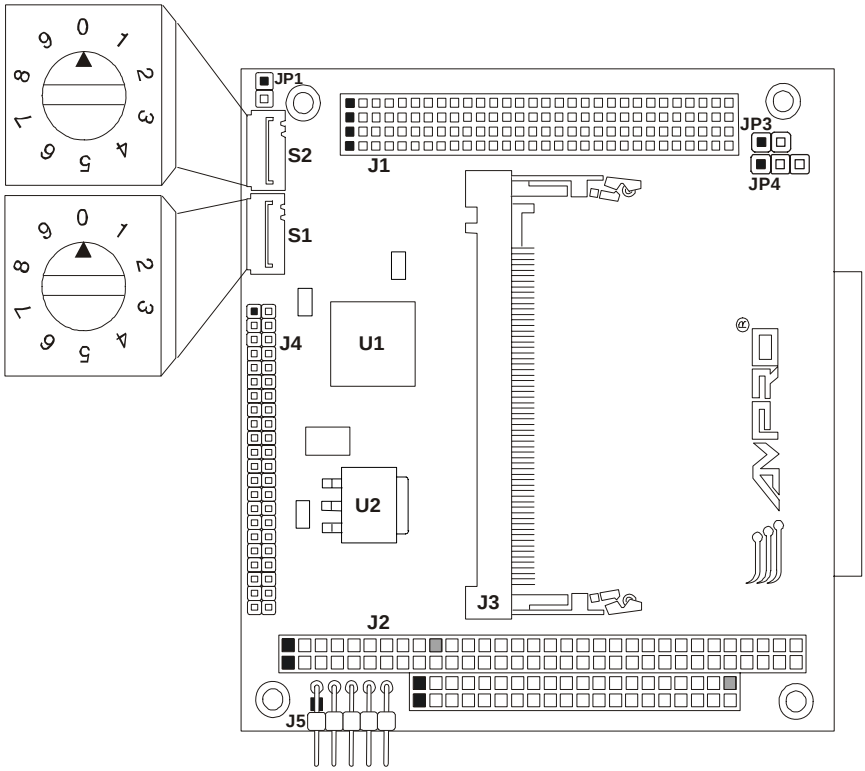


**Figure 4-8. Switch Locations (Top View)**

# Specifications

## Physical Specifications

Table 4-6 gives the physical dimensions of the module, and Figure 4-9 gives the mounting dimensions.

**Table 4-6. Weight and Footprint Dimensions**

| Item | Dimension |
|---|---|
| Weight | 0.369kg. (0.168lbs.) |
| Height (overall) | 23.49 mm (0.925 inches) |
| Width | 90.2 mm (3.6 inches) |
| Length | 95.9 mm (3.8 inches ) |

## Mechanical Specifications

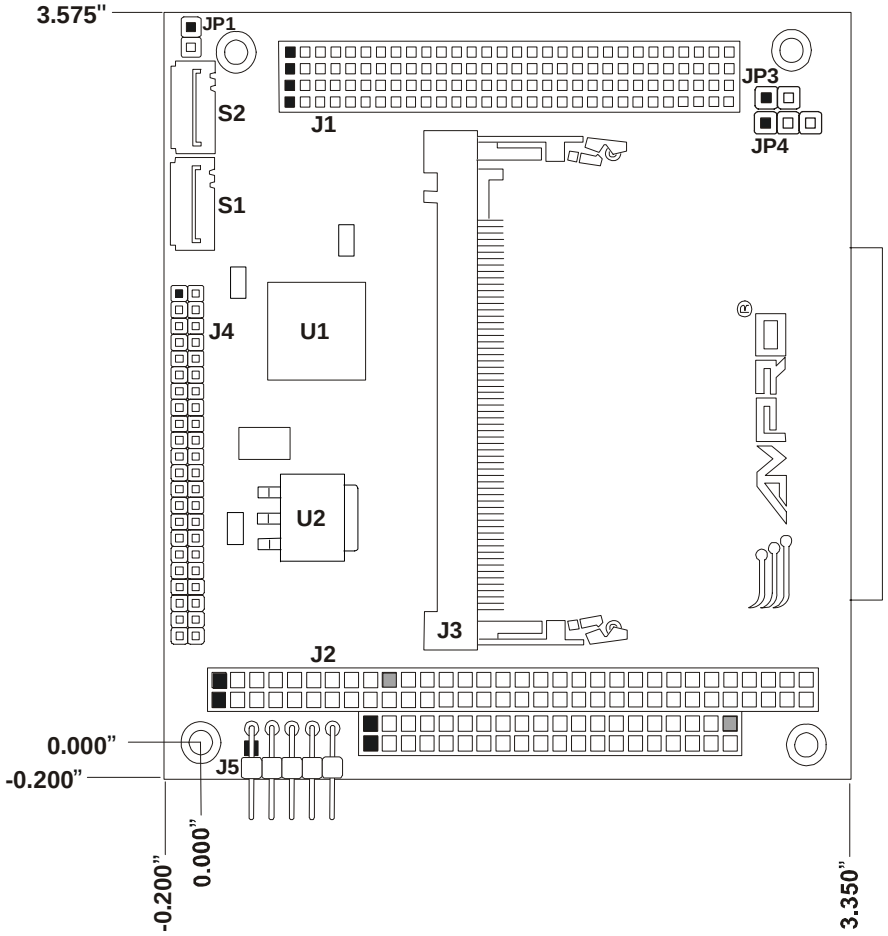


**Figure 4-9. Mechanical Dimensions (Top View)**

| NOTE | All dimensions are given in inches. Pin-1 is shown as a black pin (square or round) in connectors and jumpers in all illustrations. |
|---|---|

## Power Specifications

Table 4-7 gives the power requirements.

**Table 4-7. Power Supply Requirements**

| Parameter | Characteristics |
|---|---|
| Input Type | Regulated DC voltage |
| Input Power Requirements | +5 VDC +/- 5% @ 0.33 Amps |
| Operating Power | 1.65 W Continuous |

## Environmental Specifications

Table 4-8 provides the operating and storage condition ranges required for this module.

**Table 4-8. Environmental Requirements**

| Parameter | Conditions |
|---|---|
| **Temperature** | |
| Operating | –20° to +70° C (–4° to +158° F) |
| Extended (Optional) | –40° to +85° C (–40° F to +185° F) |
| Storage | –55° to +85° C (–67° F to +185° F) |
| **Humidity** | |
| Operating | 5% to 90% relative humidity, non-condensing |
| Non-operating | 5% to 95% relative humidity, non-condensing |

## Thermal/Cooling Requirements

The PCI-to-ISA bridge controller (U1), +3.3V regulator (U2), and crystal (X1) draw the power on the board and none of these devices require a heatsink.

# Chapter 5 Hardware

## Overview

This chapter discusses the chips and connectors of the module in the following order:

- PC/104-Plus (J1)
- Mini-PCI (J3)
- PC/104 (J2A, B, C, D)
- IDE ATA (J4)
- Compact Flash Socket (J6)
- Power In (J5)

| **NOTE** | Ampro Computers, Inc. supports only the features/options tested and listed in this manual. The integrated circuits used in the MiniModule ISA may provide more features or options than are listed for the MiniModule ISA, but some of these features/options are not supported on the module and will not function as specified. |
|---|---|

## PCI-104 Interface (J1)

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

Table 5-1 provides the signals and descriptions for each of the PCI-104 bus pin-outs.

**Table 5-1. PCI-104 Interface Pin/Signal Descriptions (J1)**

| 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 | PCI Address and Data Bus Line 5 – There are 32 signal lines (address and data) and the signals on these lines are multiplexed. A bus transaction consists of an address followed by one or more data cycles. |
| 4 (A4) | C/BE0* | T/S | PCI Bus Command/Byte Enable 0 – This signal line is one of four signal lines. These signal lines are multiplexed, so that 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 | PCI Address and Data Bus Line 11 – Refer to Pin 3 for more information. |
| 7 (A7) | AD14 | T/S | PCI Address and Data Bus Line 14 – Refer to Pin 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. |

| Pin # | Signal | Input/ Output | Description |
|---|---|---|---|
| 10 (A10) | GND | | Digital Ground |
| 11 (A11) | STOP* | S/T/S | Stop – This signal indicates the current selected device is requesting the master to stop the current transaction. |
| 12 (A12) | +3.3V | | +3.3 volts ±5% power supply |
| 13 (A13) | FRAME* | S/T/S | PCI bus Frame access – This signal is driven by the current master to indicate the start of a transaction and will remain active until the final data cycle |
| 14 (A14) | GND | | Digital Ground |
| 15 (A15) | AD18 | T/S | PCI Address and Data Bus Line 18 – Refer to Pin 3 for more information. |
| 16 (A16) | AD21 | T/S | PCI Address and Data Bus Line 21 – Refer to Pin 3 for more information. |
| 17 (A17) | +3.3V | | +3.3 volts ±5% power supply |
| 18 (A18) | IDSEL0 | In | Initialization Device Select 0 – This signal line is one of four signal lines. These signals are used as the chip-select signals during configuration. |
| 19 (A19) | AD24 | T/S | PCI Address and Data Bus Line 24 – Refer to Pin 3 for more information. |
| 20 (A20) | GND | | Digital Ground |
| 21 (A21) | AD29 | T/S | PCI Address and Data Bus Line 29 – Refer to Pin 3 for more information. |
| 22 (A22) | +5V | | +5 volts ±5% power supply |
| 23 (A23) | REQ0* | T/S | Bus Request 0 – This signal line is one of four signal lines. These signals indicate the device desires use of the bus to the arbitrator. |
| 24 (A24) | GND | | Digital Ground |
| 25 (A25) | GNT1* | T/S | Grant 1 – This signal line is one of four signal lines. These signal lines 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 signal line is one of four signal lines. These clock signals provide the timing outputs for four external PCI devices and the 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 | PCI Address and Data Bus Line 2 – Refer to Pin 3 for more information. |
| 33 (B3) | GND | | Digital Ground |
| 34 (B4) | AD07 | T/S | PCI Address and Data Bus Line 7 – Refer to Pin 3 for more information. |
| 35 (B5) | AD09 | T/S | PCI Address and Data Bus Line 9 – Refer to Pin 3 for more information. |
| 36 (B6) | VI/O | | +5 volts ±5% power supply |

| Pin # | Signal | Input/ Output | Description |
|---|---|---|---|
| 37 (B7) | AD13 | T/S | PCI Address and Data Bus Lines 13 – Refer to Pin 3 for more information. |
| 38 (B8) | C/BE1* | T/S | PCI Bus Command/Byte Enable 1 – Refer to Pin 4 for more information. |
| 39 (B9) | GND | | Digital Ground |
| 40 (B10) | PERR* | | Parity Error – This signal is for reporting 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 cycle of transaction. Both IRDY* and TRDY* must be asserted to terminate a data cycle. |
| 43 (B13) | GND | | Digital Ground |
| 44 (B14) | AD16 | T/S | PCI Address and Data Bus Line 16 – Refer to Pin 3 for more information. |
| 45 (B15) | +3.3V | | +3.3 volts ±5% power supply |
| 46 (B16) | AD20 | T/S | PCI Address and Data Bus Lines 20 – Refer to Pin 3 for more information. |
| 47 (B17) | AD23 | T/S | PCI Address and Data Bus Line 23 – Refer to Pin 3 for more information. |
| 48 (B18) | GND | | Digital Ground |
| 49 (B19) | C/BE3* | T/S | PCI Bus Command/Byte Enable 3 – Refer to Pin 4 for more information. |
| 50 (B20) | AD26 | T/S | PCI Address and Data Bus Line 26 – Refer to Pin 3 for more information. |
| 51 (B21) | +5V | | +5 volts ±5% power supply |
| 52 (B22) | AD30 | T/S | PCI Address and Data Bus Line 30 – Refer to Pin 3 for more information. |
| 53 (B23) | GND | | Digital Ground |
| 54 (B24) | REQ2* | T/S | Bus Request 2 – Refer to Pin 23 for more information. |
| 55 (B25) | VI/O | | +5 volts ±5% power supply |
| 56 (B26) | CLK0 | In | PCI clock 0– Refer to Pin 27 for more information. |
| 57 (B27) | +5V | | +5 volts ±5% power supply |
| 58 (B28) | INTD* | O/D | Interrupt D – This signal is used to request interrupts only 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 23 for more information. |
| 61 (C1) | +5 | | +5 volts ±5% power supply |
| 62 (C2) | AD01 | T/S | PCI Address and Data Bus Line 1 – Refer to Pin 3 for more information. |
| 63 (C3) | AD04 | T/S | PCI Address and Data Bus Lines 4 – Refer to Pin 3 for more information. |
| 64 (C4) | GND | | Digital Ground |
| 65 (C5) | AD08 | T/S | PCI Address and Data Bus Line 8 – Refer to Pin 3 for more information. |

| Pin # | Signal | Input/ Output | Description |
|---|---|---|---|
| 66 (C6) | AD10 | T/S | PCI Address and Data Bus Line 10 – Refer to Pin 3 for more information. |
| 67 (C7) | GND | | Digital Ground |
| 68 (C8) | AD15 | T/S | PCI Address and Data Bus Line 15 – Refer to Pin 3 for more information. |
| 69 (C9) | NC | | Not connected (SB0* - Snoop Backoff) |
| 70 (C10) | +3.3V | | +3.3 volts ±5% power supply |
| 71 (C11) | NC | S/T/S | Not connected (Lock*) |
| 72 (C12) | GND | | Digital Ground |
| 73 (C13) | IRDY* | S/T/S | Initiator Ready – This signal indicates the master's ability to complete the current data cycle of the transaction. |
| 74 (C14) | +3.3V | | +3.3 volts ±5% power supply |
| 75 (C15) | AD17 | T/S | PCI Address and Data Bus Line 17 – Refer to Pin 3 for more information. |
| 76 (C16) | GND | | Digital Ground |
| 77 (C17) | AD22 | T/S | PCI Address and Data Bus Line 22 – Refer to Pin 3 for more information. |
| 78 (C18) | IDSEL1 | | Initialization Device Select 1 – Refer to Pin 18 for more information. |
| 79 (C19) | VI/O | NC | (+5V) Not connected |
| 80 (C20) | AD25 | T/S | PCI Address and Data Bus Line 25 – Refer to Pin 3 for more information. |
| 81 (C21) | AD28 | T/S | PCI Address and Data Bus Line 28 – Refer to Pin 3 for more information. |
| 82 (C22) | GND | | Digital Ground |
| 83 (C23) | REQ1* | T/S | Bus Request 1 – Refer to Pin 23 for more information. |
| 84 (C24) | +5V | | +5 volts ±5% power supply |
| 85 (C25) | GNT2* | T/S | Grant 2 – Refer to Pin 25 for more information. |
| 86 (C26) | GND | | Digital Ground |
| 87 (C27) | CLK3 | In | PCI clock 3 – Refer to Pin 27 for more information. |
| 88 (C28) | +5V | | +5 volts ±5% power supply |
| 89 (C29) | INTB* | O/D | Interrupt B – This signal is used to request interrupts only for multi-function devices. |
| 90 (C30) | GNT3* | T/S | Grant 3 – Refer to Pin 25 for more information. |
| 91 (D1) | AD00 | T/S | PCI Address and Data Bus Line 0 – Refer to Pin 3 for more information. |
| 92 (D2) | +5V | | +5 volts ±5% power supply |
| 93 (D3) | AD03 | T/S | PCI Address and Data Bus Lines 3 – Refer to Pin 3 for more information. |
| 94 (D4) | AD06 | T/S | PCI Address and Data Bus Lines 6 – Refer to Pin 3 for more information. |
| 95 (D5) | GND | | Digital Ground |
| 96 (D6) | NC | | Not connected (M66EN - 66MHz device enable) |

| Pin # | Signal | Input/ Output | Description |
|---|---|---|---|
| 97 (D7) | AD12 | T/S | PCI Address and Data Bus Line 12 – Refer to Pin 3 for more information. |
| 98 (D8) | +3.3V | | +3.3 volts ±5% power supply |
| 99 (D9) | PAR | T/S | PCI bus Parity bit – This signal is the even parity bit on AD[31:0] and C/BE[3:0]* |
| 100 (D10) | 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* | | PCI Bus Command/Byte Enable 2 – Refer to Pin 4 for more information. |
| 105 (D15) | GND | | Digital Ground |
| 106 (D16) | AD19 | T/S | PCI Address and Data Bus Line 19 – Refer to Pin 3 for more information. |
| 107 (D17) | +3.3V | | +3.3 volts ±5% power supply |
| 108 (D18) | IDSEL2 | | Initialization Device Select 2 – Refer to Pin 18 for more information. |
| 109 (D19) | IDSEL3 | | Initialization Device Select 3 – Refer to Pin 18 for more information. |
| 110 (D20) | GND | | Digital Ground |
| 111 (D21) | AD27 | T/S | PCI Address and Data Bus Line 27 – Refer to Pin 3 for more information. |
| 112 (D22) | AD31 | T/S | PCI Address and Data Bus Line 31 – Refer to Pin 3 for more information. |
| 113 (D23) | VI/O | | +5 volts ±5% power supply |
| 114 (D24) | GNT0* | T/S | Grant 0 – Refer to Pin 25 for more information. |
| 115 (D25) | GND | | Digital Ground |
| 116 (D26) | CLK1 | In | PCI clock 1 – Refer to Pin 27 for more information. |
| 117 (D27) | GND | | Digital Ground |
| 118 (D28) | RST* | In | PCI bus reset – This signal is an output signal to reset the entire PCI Bus. This signal will be asserted during system reset. |
| 119 (D29) | INTC* | O/D | Interrupt C – This signal is used to request interrupts only 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/T/S – 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.

# Mini-PCI Interface (J3)

The Mini-PCI interface uses the standard Mini-PCI, 32-bit, 124-pin (62x2) socket interface. This Mini-PCI socket carries all of the appropriate PCI signals operating at clock speeds up to 33 MHz.

Table 5-2 provides the signals and descriptions for the Mini-PCI bus pin-outs for the 124-pin, 2 rows, odd/even (A1, B1) connector.

**Table 5-2. Mini-PCI Bus Slot Pin/Signal Definitions (J3)**

| Pin # | Signal | Input/ Output | Description |
|---|---|---|---|
| 1 (A1) | NC | | Not Connected (TIP) |
| 2 (A2) | NC | | Not Connected (Ring) |
| 3 (A3) | NC | | Not Connected (8PMJ_3) |
| 4 (A4) | NC | | Not Connected (8PMJ_1) |
| 5 (A5) | NC | | Not Connected (8PMJ_6) |
| 6 (A6) | NC | | Not Connected (8PMJ_2) |
| 7 (A7) | NC | | Not Connected (8PMJ_7) |
| 8 (A8) | NC | | Not Connected (8PMJ_4) |
| 9 (A9) | NC | | Not Connected (8PMJ_9) |
| 10 (A10) | NC | | Not Connected (8PMJ_5) |
| 11 (A11) | NC | | Not Connected (LED1_CRNP) |
| 12 (A12) | NC | | Not Connected (LED2_YELP) |
| 13 (A13) | NC | | Not Connected (LED1_CRNN) |
| 14 (A14) | NC | | Not Connected (LED1_YELN) |
| 15 (A15) | CHSGND | | Chassis Ground |
| 16 (A16) | NC | | Not Connected (Reserved 1) |
| 17 (A17) | INTB* | O/D | Interrupt B – This signal is used to request an interrupt and only has meaning on a multi-function device. |
| 18 (A18) | 5V_1 | | +5 volt power +/- 5% |
| 19 (A19) | +3.3V_5 | | +3.3 volt power +/- 5% |
| 20 (A20) | INTA* | | Interrupt A – This signal is used to request an interrupt. |
| 21 (A21) | NC | | Not Connected (Reserved 5) |
| 22 (A22) | NC | | Not Connected (Reserved 2) |
| 23 (A23) | GND1 | | Ground |
| 24 (A24) | 3.3VAUX | | +3.3 Volt Auxiliary – This voltage is an optional power source that delivers power to the PCI add-in card for generation of power management events when the main power to the card has been turned off by software. A system or add-in card that does not support PCI bus power management must treat the 3.3Vaux pin as reserved. |
| 25 (A25) | CLK | In | Clock – This signal provides timing for all transactions on the PCI bus and is an input to every PCI device. |
| 26 (A26) | RST* | | Reset – This signal is used to bring PCI-specific registers, sequencers, and signals to a consistent state. Anytime Reset is asserted, all PCI output signals must be driven to the benign state. |
| 27 (A27) | GND2 | | Ground |

| Pin # | Signal | Input/ Output | Description |
|---|---|---|---|
| 28 (A28) | +3.3V_1 | | +3.3 volt power +/- 5% |
| 29 (A29) | REQ* | T/S | Request – This is a point-to-point signal and indicates to the arbiter that this agent desires use of the bus. Every master has its own Request, which must be tri-stated, while Reset is asserted. |
| 30 (A30) | GNT* | | Grant – This is a point-to-point signal and indicates to the agent that access to the bus has been granted. Every master has its own GNT, which must be ignored while RST is asserted. |
| 31 (A31) | +3.3V_6 | | +3.3 volt power +/- 5% |
| 32 (A32) | GND3 | | Ground |
| 33 (A33) | AD31 | | Address/Data bus 30 – These signals (AD31 – AD0) are multiplexed on the same PCI connector pins. During the address phase of a PCI cycle, AD31–AD0 contain a 32-bit address or other destination information. During the data phase, AD31 – AD0 contain data. |
| 34 (A34) | NC | | Not Connected (PME* – Power Management Event) |
| 35 (A35) | AD29 | | Address/Data bus 29 – Refer to pin-33 (A33) for more information. |
| 36 (A36) | NC | | Not Connected (Reserved 3) |
| 37 (A37) | GND4 | | Ground |
| 38 (A38) | AD30 | | Address/Data bus 30 – Refer to pin-33 (A33) for more information. |
| 39 (A39) | AD27 | | Address/Data bus 27 – Refer to pin-33 (A33) for more information. |
| 40 (A40) | 3.3V_2 | | +3.3 volt power +/- 5% |
| 41 (A41) | AD25 | | Address/Data bus 25 – Refer to pin-33 (A33) for more information. |
| 42 (A42) | AD28 | | Address/Data bus 28 – Refer to pin-33 (A33) for more information. |
| 43 (A43) | NC | | Not Connected (Reserved 6) |
| 44 (A44) | AD26 | | Address/Data bus 26 – Refer to pin-33 (A33) for more information. |
| 45 (A45) | C/BE[3]* | T/S | Command/Byte Enable 3 – These signals (C/BE 0-3) are line multiplexed, so that during the address cycle, the command is defined and during the data cycle, the byte enable is defined. |
| 46 (A46) | AD24 | | Address/Data bus 24 – Refer to pin-33 (A33) for more information. |
| 47 (A47) | AD23 | | Address/Data bus 23 – Refer to pin-33 (A33) for more information. |
| 48 (A48) | IDSEL | | Initialization Device Select – This signal is used as a chip select during configuration read and write transactions. |
| 49 (A49) | GND5 | | Ground |
| 50 (A50) | GND6 | | Ground |
| 51 (A51) | AD21 | | Address/Data bus 21 – Refer to pin-33 (A33) for more information. |
| 52 (A52) | AD22 | | Address/Data bus 22 – Refer to pin-33 (A33) for more information. |
| 53 (A53) | AD19 | | Address/Data bus 19 – Refer to pin-33 (A33) for more information. |
| 54 (A54) | AD20 | | Address/Data bus 20 – Refer to pin-33 (A33) for more information. |
| 55 (A55) | GND7 | | Ground |
| 56 (A56) | PAR | T/S | Bus Parity bit – This signal is the even parity bit on AD[31:0] and C/BE[3:0]* |
| 57 (A57) | AD17 | | Address/Data bus 17 – Refer to pin-33 (A33) for more information. |
| 58 (A58) | AD18 | | Address/Data bus 18 – Refer to pin-33 (A33) for more information. |

| Pin # | Signal | Input/ Output | Description |
|---|---|---|---|
| 59 (A59) | C/BE[2]* | | Command/Byte Enable 2 – Refer to Pin-45 (A45) for more information. |
| 60 (A60) | AD16 | | Address/Data bus 16 – Refer to pin-33 (A33) for more information. |
| 61 (A61) | IRDY* | S/T/S | Initiator Ready – This signal indicates the master's ability to complete the current data cycle of the transaction. |
| 62 (A62) | GND8 | | Ground |
| 63 (B1) | 3.3V_7 | | +3.3 volt power +/- 5% |
| 64 (B2) | FRAME* | S/T/S | Frame access – This signal is driven by the current master to indicate the start of a transaction and will remain active until the final data cycle. |
| 65 (B3) | CLKRUN* | | Clock Run |
| 66 (B4) | TRDY* | S/T/S | Target Ready – This signal indicates the selected device's ability to complete the current cycle of transaction. Both IRDY* and TRDY* must be asserted to terminate a data cycle. |
| 67 (B5) | SERR* | O/D | System Error – This signal is for reporting address parity errors. |
| 68 (B6) | STOP* | S/T/S | Stop – This signal is driven by the current PCI target requesting the master stop the current transaction. |
| 69 (B7) | GND9 | | Ground |
| 70 (B8) | 3.3V_3 | | +3.3 volt power +/- 5% |
| 71 (B9) | PERR* | | Parity Error – This signal is driven by the PCI target during a write to indicate a data parity error has been detected. |
| 72 (B10) | DEVSEL* | S/T/S | Device Select – This signal is driven by the target device when its address is decoded. |
| 73 (B11) | C/BE[1]* | | Command/Byte Enable 1 – Refer to Pin-45 (A45) for more information. |
| 74 (B12) | GND10 | | Ground |
| 75 (B13) | AD14 | | Address/Data bus 14 – Refer to pin-33 (A33) for more information. |
| 76 (B14) | AD15 | | Address/Data bus 15 – Refer to pin-33 (A33) for more information. |
| 77 (B15) | GND11 | | Ground |
| 78 (B16) | AD13 | | Address/Data bus 13 – Refer to pin-33 (A33) for more information. |
| 79 (B17) | AD12 | | Address/Data bus 12 – Refer to pin-33 (A33) for more information. |
| 80 (B18) | AD11 | | Address/Data bus 11 – Refer to pin-33 (A33) for more information. |
| 81 (B19) | AD10 | | Address/Data bus 10 – Refer to pin-33 (A33) for more information. |
| 82 (B20) | GND12 | | Ground |
| 83 (B21) | GND13 | | Ground |
| 84 (B22) | AD9 | | Address/Data bus 9 – Refer to pin-33 (A33) for more information. |
| 85 (B23) | AD8 | | Address/Data bus 8 – Refer to pin-33 (A33) for more information. |
| 86 (B24) | C/BE[0]* | | Command/Byte Enable 0 – Refer to Pin-45 (A45) for more information. |
| 87 (B25) | AD7 | | Address/Data bus 7 – Refer to pin-33 (A33) for more information. |
| 88 (B26) | 3.3V_4 | | +3.3 volt power +/- 5% |
| 89 (B27) | 3.3V_8 | | +3.3 volt power +/- 5% |
| 90 (B28) | AD6 | | Address/Data bus 6 – Refer to pin-33 (A33) for more information. |

| Pin # | Signal | Input/ Output | Description |
|---|---|---|---|
| 91 (B29) | AD5 | | Address/Data bus 5 – Refer to pin-33 (A33) for more information. |
| 92 (B30) | AD4 | | Address/Data bus 4 – Refer to pin-33 (A33) for more information. |
| 93 (B31) | NC | | Not Connected (Reserved 7) |
| 94 (B32) | AD2 | | Address/Data bus 2 – Refer to pin-33 (A33) for more information. |
| 95 (B33) | AD3 | | Address/Data bus 3 – Refer to pin-33 (A33) for more information. |
| 96 (B34) | AD0 | | Address/Data bus 0 – Refer to pin-33 (A33) for more information. |
| 97 (B35) | 5V_2 | | +5 volt power +/- 5% |
| 98 (B36) | NC | | Not Connected (RSV_WIP1) |
| 99 (B37) | AD1 | | Address/Data bus 29 – Refer to pin-33 (A33) for more information. |
| 100 (B38) | NC | | Not Connected (RSV_WIP2) |
| 101 (B39) | GND14 | | Ground |
| 102 (B40) | GND15 | | Ground |
| 103 (B41) | NC | | Not Connected (AC_SYNC) |
| 104 (B42) | M66EN | | Tied to ground |
| 105 (B43) | NC | | Not Connected (AC_SDATA_IN) |
| 106 (B44) | NC | | Not Connected (AC_SDATA_OUT) |
| 107 (B45) | NC | | Not Connected (AC_BIT_CLK) |
| 108 (B46) | NC | | Not Connected (AC_CODEC_ID0#) |
| 109 (B47) | NC | | Not Connected (AC_CODEC_ID1#) |
| 111 (B49) | NC | | Not Connected (MOD_AUDIO_MON) |
| 112 (B50) | NC | | Not Connected (Reserved 4) |
| 113 (B51) | NC | | Not Connected (AUDIO_GND) |
| 114 (B52) | GND16 | | Ground |
| 115 (B53) | NC | | Not Connected (SYS_AUDIO_OUT) |
| 116 (B54) | NC | | Not Connected (SYS_AUDIO_IN) |
| 117 (B55) | NC | | Not Connected (SYS_AUDIO_OUT_GND) |
| 118 (B56) | NC | | Not Connected (SYS_AUDIO_IN_GND) |
| 119 (B57) | NC | | Not Connected (AUDIO_GND2) |
| 120 (B58) | NC | | Not Connected (AUDIO_GND1) |
| 121 (B59) | NC | | Not Connected (RESERVED8) |
| 122 (B60) | NC | | Not Connected (MPVISCT#) |
| 123 (B61) | NC | | Not Connected (VCC5VA) |
| 124 (B62) | 3.3AUX2 | | +3.3 Volt Auxiliary – Refer to pin-24 (A24) for more information. |

**Notes:** The shaded area denotes power or ground. The signals marked with * indicate signal inversions.

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/T/S – 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 (J2A,B,C,D)

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

**Table 5-3. PC/104 Bus Interface Pin/Signal Descriptions (J2A)**

| Pin # | Signal | Description (P1 Row A) |
|---|---|---|
| 1 (A1) | IOCHCHK* | I/O Channel Check – This signal may be activated by ISA boards to request that a non-maskable interrupt (NMI) be generated to the system processor. It is driven active to indicate an uncorrectable error has been detected. |
| 2 (A2) | SD7 | System Data 7 – This signal (0 to 19) provides a system data bit. |
| 3 (A3) | SD6 | System Data 6 – Refer to SD7, pin-A2, for more information. |
| 4 (A4) | SD5 | System Data 5 – Refer to SD7, pin-A2, for more information. |
| 5 (A5) | SD4 | System Data 4 – Refer to SD7, pin-A2, for more information. |
| 6 (A6) | SD3 | System Data 3 – Refer to SD7, pin-A2, for more information. |
| 7 (A7) | SD2 | System Data 2 – Refer to SD7, pin-A2, for more information. |
| 8 (A8) | SD1 | System Data 1 – Refer to SD7, pin-A2, for more information. |
| 9 (A9) | SD0 | System Data 0 – Refer to SD7, pin-A2, for more information. |
| 10 (A10) | IOCHRDY | I/O Channel Ready – This signal allows slower ISA boards to lengthen I/O or memory cycles by inserting wait states. This signal's normal state is active high (ready). ISA boards drive the signal inactive low (not ready) to insert wait states. Devices using this signal to insert wait states should drive it low immediately after detecting a valid address decode and an active read, or write command. The signal is released high when the device is ready to complete the cycle. |
| 11 (A11) | AEN | Address Enable – This signal is used to degate the system processor and other devices from the bus during DMA transfers. When this signal is active, the system DMA controller has control of the address, data, and read/write signals. This signal should be included as part of ISA board select decodes to prevent incorrect board selects during DMA cycles. |
| 12 (A12) | SA19 | System Address 19 – This signal (0 to 19) provides a system address bit. |
| 13 (A13) | SA18 | System Address 18 – Refer to SA19, pin-A12, for more information. |
| 14 (A14) | SA17 | System Address 17 – Refer to SA19, pin-A12, for more information. |
| 15 (A15) | SA16 | System Address 16 – Refer to SA19, pin-A12, for more information. |
| 16 (A16) | SA15 | System Address 15 – Refer to SA19, pin-A12, for more information. |
| 17 (A17) | SA14 | System Address 14 – Refer to SA19, pin-A12, for more information. |
| 18 (A18) | SA13 | System Address 13 – Refer to SA19, pin-A12, for more information. |
| 19 (A19) | SA12 | System Address 12– Refer to SA19, pin-A12, for more information. |
| 20 (A20) | SA11 | System Address 11 – Refer to SA19, pin-A12, for more information. |
| 21 (A21) | SA10 | System Address 10 – Refer to SA19, pin-A12, for more information. |
| 22 (A22) | SA9 | System Address 9 – Refer to SA19, pin-A12, for more information. |
| 23 (A23) | SA8 | System Address 8 – Refer to SA19, pin-A12, for more information. |
| 24 (A24) | SA7 | System Address 7 – Refer to SA19, pin-A12, for more information. |
| 25 (A25) | SA6 | System Address 6 – Refer to SA19, pin-A12, for more information. |

| Pin # | Signal | Description (P1 Row A) |
|---|---|---|
| 26 (A26) | SA5 | System Address 5 – Refer to SA19, pin-A12, for more information. |
| 27 (A27) | SA4 | System Address 4 – Refer to SA19, pin-A12, for more information. |
| 28 (A28) | SA3 | System Address 3 – Refer to SA19, pin-A12, for more information. |
| 29 (A29) | SA2 | System Address 2 – Refer to SA19, pin-A12, for more information. |
| 30 (A30) | SA1 | System Address 1 – Refer to SA19, pin-A12, for more information. |
| 31 (A31) | SA0 | System Address 0 – Refer to SA19, pin-A12, for more information. |
| 32 (A32) | GND | Ground |

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

**Table 5-4. PC/104 Interface Pin/Signal Descriptions (J2B)**

| Pin # | Signal | Description (J2 Row B) |
|---|---|---|
| 33 (B1) | GND | Ground |
| 34 (B2) | RESETDRV | Reset Drive – This signal is used to reset or initialize system logic on power up or subsequent system reset. |
| 35 (B3) | +5V | +5 volt power ±10% |
| 36 (B4) | IRQ9 | Interrupt request 9 – Asserted by a device when it has pending interrupt request. Only one device at a time may use the request line. |
| 37 (B5) | NC | Not Connected (-5 volts) |
| 38 (B6) | DRQ2 | DMA Request 2 – Used by I/O resources to request DMA service, or to request ownership of the bus as a bus master device. Must be held high until associated DACK2 line is active. |
| 39 (B7) | NC | Not Connected (-12 volts) |
| 40 (B8) | SRDY** | Zero Wait State – This signal is driven low by a bus slave device to indicate it is capable of performing a bus cycle without inserting any additional wait states. To perform a 16-bit memory cycle without wait states, this signal is derived from an address decode. |
| 41 (B9) | +12V | +12 Volts |
| 42 (B10) | NC/Key | Not Connected/Key Plug |
| 43 (B11) | SMEMW* | System Memory Write – This signal is used by bus owner to request a memory device to store data currently on the data bus and only active for the lower 1MB. Used for legacy compatibility with 8-bit cards. |
| 44 (B12) | SMEMR* | System Memory Read – This signal is used by bus owner to request a memory device to drive data onto the data bus and only active for lower 1MB. Used for legacy compatibility with 8-bit cards. |
| 45 (B13) | IOW* | I/O Write – This strobe signal is driven by the owner of the bus (ISA bus master or DMA controller) and instructs the selected I/O device to capture the write data on the data bus. |
| 46 (B14) | IOR* | I/O Read – This strobe signal is driven by the owner of the bus (ISA bus master or DMA controller) and instructs the selected I/O device to drive read data onto the data bus. |
| 47 (B15) | DACK3* | DMA Acknowledge 3 – Used by DMA controller to select the I/O resource requesting the bus, or to request ownership of the bus as a bus master device. Can also be used by the ISA bus master to gain control of the bus from the DMA controller. |
| 48 (B16) | DRQ3 | DMA Request 3 – Used by I/O resources to request DMA service. Must be held high until associated DACK3 line is active. |
| 49 (B17) | DACK1* | DMA Acknowledge 1 – Used by DMA controller to select the I/O |

| Pin # | Signal | Description (J2 Row B) |
|---|---|---|
| | | resource requesting the bus, or to request ownership of the bus as a bus master device. Can also be used by the ISA bus master to gain control of the bus from the DMA controller. |
| 50 (B18) | DRQ1 | DMA Request 1 – Used by I/O resources to request DMA service. Must be held high until associated DACK1 line is active. |
| 51 (B19) | REFRESH* | Memory Refresh – This signal is driven low to indicate a memory refresh cycle is in progress. Memory is refreshed every 15.6 usec. |
| 52 (B20) | BCLK | System Clock – This is a free running clock typically in the 8MHz to 10MHz range, although its exact frequency is not guaranteed. |
| 53 (B21) | IRQ7 | Interrupt Request 7 – Asserted by a device when it has pending interrupt request. Only one device may use the request line at a time. |
| 54 (B22) | IRQ6 | Interrupt Request 6 – Asserted by a device when it has pending interrupt request. Only one device may use the request line at a time. |
| 55 (B23) | IRQ5 | Interrupt Request 5 – Asserted by a device when it has pending interrupt request. Only one device may use the request line at a time. |
| 56 (B24) | IRQ4 | Interrupt Request 4 – Asserted by a device when it has pending interrupt request. Only one device may use the request line at a time. |
| 57 (B25) | IRQ3 | Interrupt Request 3 – Asserted by a device when it has pending interrupt request. Only one device may use the request line at a time. |
| 58 (B26) | DACK2* | DMA Acknowledge 2 – Used by DMA controller to select the I/O resource requesting the bus, or to request ownership of the bus as a bus master device. Can also be used by the ISA bus master to gain control of the bus from the DMA controller. |
| 59 (B27) | TC | Terminal Count – This signal is a pulse to indicate a terminal count has been reached on a DMA channel operation. |
| 60 (B28) | BALE | Buffered Address Latch Enable – This signal is used to latch the LA23 to LA17 signals or decodes of these signals. Addresses are latched on the falling edge of BALE. It is forced high during DMA cycles. When used with AENx, it indicates a valid processor or DMA address. |
| 61 (B29) | +5V | +5 volt power ±10% |
| 62 (B30) | OSC | Oscillator – This clock signal operates at 14.3MHz. This signal is not synchronous with the system clock (SYSCLK). |
| 63 (B31) | GND | Ground |
| 64 (B32) | GND | Ground |

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

**Table 5-5. PC/104 Bus Interface Pin/Signal Descriptions (J2C)**

| Pin # | Signal | Description (J2 Row C) |
|---|---|---|
| 1 (C0) | GND | Ground |
| 2 (C1) | SBHE* | System Byte High Enable – This signal is driven low to indicate a transfer of data on the high half of the data bus (D15 to D8). |
| 3 (C2) | LA23 | Latchable Address 23 – This signal must be latched by the resource if the line is required for the entire data cycle. |
| 4 (C3) | LA22 | Latchable Address 22 – Refer to LA23, pin-C2, for more information. |
| | | |
| 5 (C4) | LA21 | Latchable Address 21 – Refer to LA23, pin-C2, for more information. |
| 6 (C5) | LA20 | Latchable Address 20 – Refer to LA23, pin-C2, for more information. |

| Pin # | Signal | Description (J2 Row C) |
|---|---|---|
| 7 (C6) | LA19 | Latchable Address 19 – Refer to LA23, pin-C2, for more information. |
| 8 (C7) | LA18 | Latchable Address 18 – Refer to LA23, pin-C2, for more information. |
| 9 (C8) | LA17 | Latchable Address 17 – Refer to LA23, pin-C2, for more information. |
| 10 (C9) | MEMR* | Memory Read – This signal instructs a selected memory device to drive data onto the data bus. It is active on all memory read cycles. |
| 11 (C10) | MEMW* | Memory Write – This signal instructs a selected memory device to store data currently on the data bus. It is active on all memory write cycles. |
| 12 (C11) | SD8 | System Data 8 – Refer to SD7, pin-A2, for more information. |
| 13 (C12) | SD9 | System Data 9 – Refer to SD7, pin-A2, for more information. |
| 14 (C13) | SD10 | System Data 10 – Refer to SD7, pin-A2, for more information. |
| 15 (C14) | SD11 | System Data 11 – Refer to SD7, pin-A2, for more information. |
| 16 (C15) | SD12 | System Data 12 – Refer to SD7, pin-A2, for more information. |
| 17 (C16) | SD13 | System Data 13 – Refer to SD7, pin-A2, for more information. |
| 18 (C17) | SD14 | System Data 14 – Refer to SD7, pin-A2, for more information. |
| 19 (C18) | SD15 | System Data 15 – Refer to SD7, pin-A2, for more information. |
| 20 (C19) | NC/Key | Not Connected/Key Plug |

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

**Table 5-6. PC/104 Bus Interface Pin/Signal Descriptions (J2D)**

| Pin # | Signal | Description (J2 Row D) |
|---|---|---|
| 21 (D0) | GND | Ground |
| 22 (D1) | MEMCS16* | Memory Chip Select 16 – This signal is driven low by a memory slave device to indicate it is capable of performing a 16-bit memory data transfer. This signal is driven from a decode of the LA23 to LA17 address lines. |
| 23 (D2) | IOCS16* | I/O Chip Select 16 – This signal is driven low by an I/O slave device to indicate it is capable of performing a 16-bit I/O data transfer. This signal is driven from a decode of the SA15 to SA0 address lines. |
| 24 (D3) | IRQ10 | Interrupt Request 10 – Asserted by a device when it has pending interrupt request. Only one device at a time may use the request line. |
| 25 (D4) | IRQ11 | Interrupt Request 11 – Asserted by a device when it has pending interrupt request. Only one device at a time may use the request line. |
| 26 (D5) | IRQ12 | Interrupt Request 12 – Asserted by a device when it has pending interrupt request. Only one device at a time may use the request line. |
| 27 (D6) | IRQ15 | Interrupt Request 15 – Asserted by a device when it has pending interrupt request. Only one device at a time may use the request line. |
| 28 (D7) | IRQ14 | Interrupt Request 14 – Asserted by a device when it has pending interrupt request. Only one device at a time may use the request line. |
| 29 (D8) | DACK0* | DMA Acknowledge 0 – Used by DMA controller to select the I/O resource requesting the bus, or to request ownership of the bus as a bus master device. Can also be used by the ISA bus master to gain control of the bus from the DMA controller. |
| 30 (D9) | DRQ0 | DMA Request 0 – Used by I/O resources to request DMA service. Must be held high until associated DACK0 line is active. |
| 31 (D10) | DACK5* | DMA Acknowledge 5 – Used by DMA controller to select the I/O resource requesting the bus, or to request ownership of the bus as a bus master device. Can also be used by the ISA bus master to gain control of |

| Pin # | Signal | Description (J2 Row D) |
|---|---|---|
| | | the bus from the DMA controller. |
| 32 (D11) | DRQ5 | DMA Request 5 – Used by I/O resources to request DMA service. Must be held high until associated DACK5 line is active. |
| 33 (D12) | DACK6* | DMA Acknowledge 6 – Used by DMA controller to select the I/O resource requesting the bus, or to request ownership of the bus as a bus master device. Can also be used by the ISA bus master to gain control of the bus from the DMA controller. |
| 34 (D13) | DRQ6 | DMA Request 6 – Used by I/O resources to request DMA service. Must be held high until associated DACK6 line is active. |
| 35 (D14) | DACK7* | DMA Acknowledge 7 – Used by DMA controller to select the I/O resource requesting the bus, or to request ownership of the bus as a bus master device. Can also be used by the ISA bus master to gain control of the bus from the DMA controller. |
| 36 (D15) | DRQ7 | DMA Request 7 – Used by I/O resources to request DMA service. Must be held high until associated DACK7 line is active. |
| 37 (D16) | +5V | +5 volt power ±10% |
| 38 (D17) | MASTER* | Bus Master Assert – This signal is used by an ISA board along with a DRQ line to gain ownership of the ISA bus. Upon receiving a -DACK a device can pull -MASTER low which will allow it to control the system address, data, and control lines. After -MASTER is low, the device should wait one CLK period before driving the address and data lines, and two clock periods before issuing a read or write command. |
| 39 (D18) | GND | Ground |
| 40 (D19) | GND | Ground |

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

**Table 5-7. IDE Interface Pin/Signal Descriptions (J4)**

| Pin # | Signal | Description |
|---|---|---|
| 1 | RESET* | Reset – Low active hardware reset (RSTDRV inverted) |
| 2 | GND | Digital Ground |
| 3 | DD7 | Disk Data 7 – These signals (0 to 15) provide the disk data signals. |
| 4 | DD8 | Disk Data 8 – These signals (0 to 15) provide the disk data signals. |
| 5 | DD6 | Disk Data 6 – These signals (0 to 15) provide the disk data signals. |
| 6 | DD9 | Disk Data 9 – These signals (0 to 15) provide the disk data signals. |
| 7 | DD5 | Disk Data 5 – These signals (0 to 15) provide the disk data signals. |
| 8 | DD10 | Disk Data 10 – These signals (0 to 15) provide the disk data signals. |
| 9 | DD4 | Disk Data 4 – These signals (0 to 15) provide the disk data signals. |
| 10 | DD11 | Disk Data 11 – These signals (0 to 15) provide the disk data signals. |
| 11 | DD3 | Disk Data 3 – These signals (0 to 15) provide the disk data signals. |
| 12 | DD12 | Disk Data 12 – These signals (0 to 15) provide the disk data signals. |
| 13 | DD2 | Disk Data 2 – These signals (0 to 15) provide the disk data signals. |
| 14 | DD13 | Disk Data 13 – These signals (0 to 15) provide the disk data signals. |
| 15 | DD1 | Disk Data 1 – These signals (0 to 15) provide the disk data signals. |
| 16 | DD14 | Disk Data 14 – These signals (0 to 15) provide the disk data signals. |
| 17 | DD0 | Disk Data 0 – These signals (0 to 15) provide the disk data signals. |
| 18 | DD15 | Disk Data 15 – These signals (0 to 15) provide the disk data signals. |
| 19 | GND | Digital Ground |
| 20 | NC-Key | Not Connected - Key pin plug |
| 21 | DDREQ | Device DMA Channel Request – Used for DMA transfers between host and drive (direction of transfer controlled by DIOR* and DIOW*). Also used in an asynchronous mode with DMACK*. Drive asserts IDRQ0 when ready to transfer or receive data. |
| 22 | GND | Digital Ground |
| 23 | DIOW* | Device I/O Read/Write Strobe – Strobe signal for write functions. Negative edge enables data from a register or data port of the drive onto the host data bus. Positive edge latches data at the host. |
| 24 | GND | Digital Ground |
| 25 | DIOR* | I/O Read/Write Strobe – Strobe signal for read functions. Negative edge enables data from a register or data port of the drive onto the host data bus. Positive edge latches data at the host. |
| 26 | GND | Digital Ground |
| 27 | DIORDY | I/O Channel Ready – When negated extends the host transfer cycle of any host register access when the drive is not ready to respond to a data transfer request. High impedance if asserted. |
| 28 | DCSEL | Cable Select – Used to configure IDE drives as device 0 or device 1 using a special cable. |
| 29 | DDACK* | DMA Channel Acknowledge – Used by the host to acknowledge data has been accepted or data is available. Used in response to DMARQ asserted. |
| 30 | GND | Digital Ground |
| 31 | IRQ14 | Interrupt Request 14 – Asserted by drive when it has pending interrupt (PIO transfer of data to or from the drive to the host). |

| Pin # | Signal | Description |
|---|---|---|
| 32 | NC | Not connected (IOCS16*) |
| 33 | DA1 | IDE ATA Disk Address (0 to 2). Used to indicate which byte in the ATA command block or control block is being accessed. |
| 34 | D33/66 | UDMA 33/66 Sense – Senses which DMA mode to use for IDE devices. |
| 35 | DA0 | IDE ATA Disk Address (0 to 2). Used to indicate which byte in the ATA command block or control block is being accessed. |
| 36 | DA2 | IDE ATA Disk Address (0 to 2). Used to indicate which byte in the ATA command block or control block is being accessed. |
| 37 | DCS1* | Slave/Master Chip Select 1 – Used to select the host-accessible Command Block Register. |
| 38 | DCS3* | Slave/Master Chip Select 3 – Used to select the host-accessible Command Block Register. |
| 39 | IDE LED1 | IDE Activity –Indicates IDE drive activity to yellow IDE LED (D4) on card edge. |
| 40 | GND | Digital Ground |
| 41 | +5V | +5 volt power ±10% |
| 42 | +5V | +5 volt power ±10% |
| 43 | GND | Digital Ground |
| 44 | NC | Not connected |

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

# Compact Flash Socket (J6)

The board provides a Type I or II Compact Flash Card socket, which allows for the insertion of a compact flash card. The compact flash card acts as a standard IDE Drive and is connected to the Secondary IDE bus. If a compact flash card is installed, it is the only device using the secondary IDE bus. Jumpers are used to select the Master/Slave mode and voltage of the compact flash card. Refer to Table 4-3, Jumper Settings, for more information.

**Table 5-8. CompactFlash Interface Pin/Signal Descriptions (J6)**

| Pin # | Signal | Description |
|---|---|---|
| 1 | GND | Digital Ground |
| 2 | DD3 | Disk Data 3 –These signals (D0-D15) carry the Data, Commands, and Status between the host and the controller. D0 is the LSB of the even Byte of the Word. D8 is the LSB of the Odd Byte of the Word. All Task File operations occur in byte mode on the low order bus D0-D7, while all data transfers are 16 bit using D0-D15 to provide the disk data signals. |
| 3 | DD4 | Disk Data 4 – Refer to SDD3 on pin-2 for more information. |
| 4 | DD5 | Disk Data 5 – Refer to SDD3 on pin-2 for more information. |
| 5 | DD6 | Disk Data 6 – Refer to SDD3 on pin-2 for more information. |
| 6 | DD7 | Disk Data 7 – Refer to SDD3 on pin-2 for more information. |
| 7 | DCS1* | Chip Select 1 – This signal, along with CE2*, is used to select the card and indicate to the card when a byte or word operation is being performed. This signal accesses the even byte or odd byte of the word depending on A0 and CE2*. |
| 8, 10 | NC | Not connected |
| 9 | GND | Digital Ground |
| 11, 12 | NC | Not connected |
| 13 | VCC | +5 volts +/-5% |
| 14, 15 | NC | Not connected |
| 16, 17 | NC | Not connected |
| 17 | NC | Not connected |
| 18 | DA2 | Address select 2 – One of three signals (0 – 2) used to select one of eight registers in the Task File. The host grounds all remaining address lines. |
| 19 | DA1 | Address select 1 – Refer to A2 on pin-18 for more information. |
| 20 | DA0 | Address select 0 – Refer to A2 on pin-18 for more information. |
| 21 | DD0 | Disk Data 0 – Refer to SDD3 on pin-2 for more information. |
| 22 | DD1 | Disk Data 1 – Refer to SDD3 on pin-2 for more information. |
| 23 | DD2 | Disk Data 2 – Refer to SDD3 on pin-2 for more information. |
| 24 | NC | Not connected (IOCS16*) |
| 25 | CFD2 | Connected through 4.7k ohm resistor to ground |
| 26 | CFD1 | Connected through 4.7k ohm resistor to ground |
| 27 | DD11 | Disk Data 11 – Refer to SDD3 on pin-2 for more information. |
| 28 | DD12 | Disk Data 12 – Refer to SDD3 on pin-2 for more information. |
| 29 | DD13 | Disk Data 13 – Refer to SDD3 on pin-2 for more information. |

| Pin # | Signal | Description |
|---|---|---|
| 30 | DD14 | Disk Data 14 – Refer to SDD3 on pin-2 for more information. |
| 31 | DD15 | Disk Data 15 – Refer to SDD3 on pin-2 for more information. |
| 32 | DCS3* | Slave/Master Chip Select – This signal, along with CE1*, is used to select the CompactFlash card and indicate to the card when a byte or word operation is being performed. This signal always accesses the odd byte of word. |
| 33 | NC | Not Connected (VS1*) |
| 34 | DIOR* | Device I/O Read/Write Strobe – This signal is generated by the host and gates the I/O data onto the bus from the CompactFlash card when the card is configured to use the I/O interface. |
| 35 | DIOW* | Device I/O Read/Write Strobe – This signal is generated by the host and clocks the I/O data on the Card Data bus into the CompactFlash card controller registers when the card is configured to use the I/O interface. The clock occurs on the negative to positive edge of the signal (trailing edge). |
| 36 | VCC | +5 volts +/-5% |
| 37 | IRQ15 | Interrupt Request 15 – IRQ 15 is asserted by drive (CF) when it has a pending interrupt (PIO transfer of data to or from the drive to the host). |
| 38 | VCC | +5 volts +/-5% |
| 39 | MASTER* | Master/Slave – This signal is determined by jumper JP3 and is used to configure this device as a Master or a Slave. When this pin is grounded (jumper inserted), this device is configured as Master. When this pin is open (jumper removed), this device is configured as Slave (**Default**). |
| 40 | NC | Not Connected (VS2*) |
| 41 | RSTIDE* | IDE Reset – This input signal is the active low hardware reset from the host. If this pin goes high, it is used as the reset signal. This pin is driven high at power-up, causing a reset, and if left high will cause another reset. |
| 42 | DIORDY | Device I/O-DMA Channel Ready – When negated, extends the host transfer cycle of any host register access when the drive is not ready to respond to a data transfer request. High impedance if asserted. |
| 43 | NC | Not Connected (InpAck) |
| 44 | VCC | +5 volts +/-5% |
| 45 | IDE LED2 | IDE Activity – Indicates CF activity to yellow IDE LED (D4) oncard edge. |
| 46 | SD33-66 | SD33/66 Sense –Senses which DMA mode to use for the CompactFlash card. |
| 47 | DD8 | Disk Data 8 – Refer to SDD3 on pin-2 for more information. |
| 48 | DD9 | Disk Data 9 – Refer to SDD3 on pin-2 for more information. |
| 49 | DD10 | Disk Data 10 – Refer to SDD3 on pin-2 for more information. |
| 50 | GND | Digital Ground |

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

# Auxiliary Power Interface (J5)

The MiniModule draws its power from the PC/104-Plus bus connector and requires +3.3 and +5 volt input power. If +12V power is required, it is provided by the Auxiliary Power connector (J5). The Auxiliary power connector uses a 10-pin header with 0.100" spacing. Though not recommended for use when the target board is powered directly, the Auxiliary Power connector (J5) supplies the following voltage directly to the module for external use:

Table 5-9 gives the signals for Power supply pin outs and Table 5-10 provides the pin arrangement.

**Table 5-9. Auxiliary Power Interface Pins/Signals Descriptions (J5)**

| Pin # | Signal | Description |
|---|---|---|
| 1 | GND | Ground |
| 2 | +5 | +5 Volts +/- 5% |
| 3 | Key | Key pin |
| 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 5-10. Auxiliary Power Interface 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

Ampro Computers, Inc. provides a number of methods for contacting Technical Support listed below in Table A-1. 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 register online if you wish to use the "Ask a Question" feature.
- Personal Assistance – You may also request personal assistance by creating a Virtual Technical account and then going to the "Ask a Question" feature. 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 must log in to go to the "My Stuff" area where you can 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 up online before you can login 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. Technical Support Contact Information**

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

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