



CoreModule™ ISA PC/104 Expansion Module QuickStart Guide and Reference Manual

P/N 5001814A Revision B

Notice Page

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REVISION HISTORY

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A, A	Initial Release	Oct/06
A, B	Removed JP2 from Table 4-3	Nov/08

Ampro Computers, Incorporated
5215 Hellyer Avenue
San Jose, CA 95138-1007
Tel. 408 360-0200
Fax 408 360-0222
www.ampro.com
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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

References

The following list of references may be helpful for you to complete your design successfully. Most of these references are also available on the InfoCenter of the Ampro web site. The InfoCenter 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.ite.com.tw>

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. • 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. • 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 Chapter 2 describes how to setup, install, and power up the MiniModule ISA board found in the QuickStart Kit.
	• MiniModule ISA Reference Material Chapters 4 and 5 of this manual describe the MiniModule ISA board in more detail and provide more reference information.

Setting Up the MiniModule ISA

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.

Use an anti-static wrist or ankle strap connected to a grounding mat.

Always touch a grounded, unpainted metal surface before touching the MiniModule ISA board or the target system board.

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

Setting Up the Target System

• 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 10. • See Figures 2-1 and 2-2 for examples of CoreModule and ReadyBoard 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.

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.

PCI-104 interface on
bottom of board.

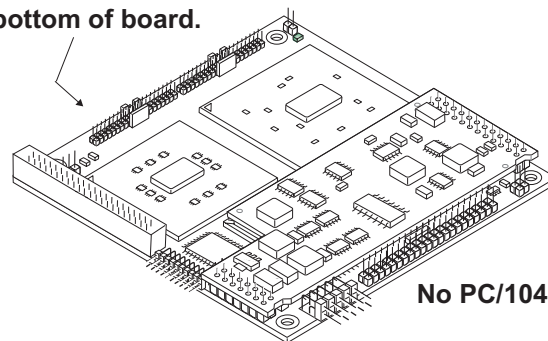


Figure 2-1. CoreModule Target System Example

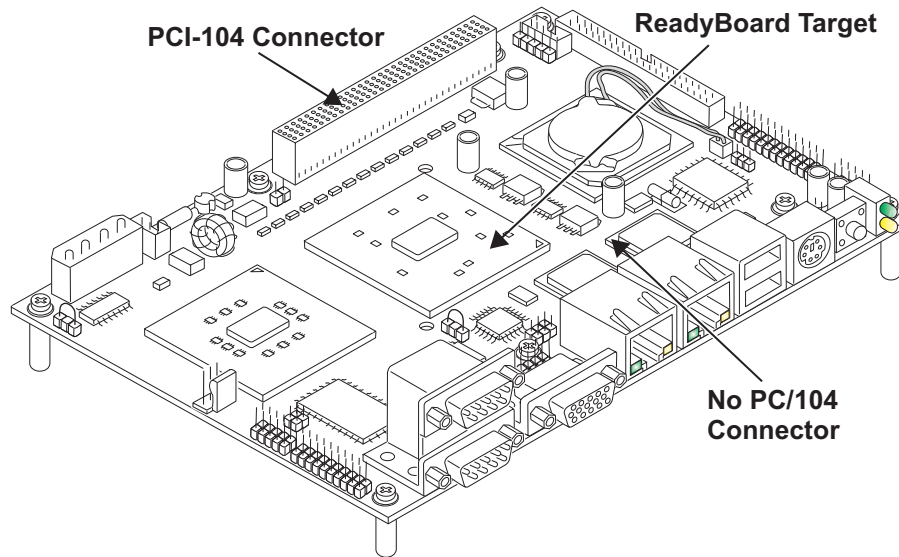


Figure 2-2. ReadyBoard Target System Example

Mounting the Module onto the Target System

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 Chapter 4, *Product Overview* later in this manual.

10. Install the spacers on the target board.	Install the threaded standoffs 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 2-4 to 2-5. 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.

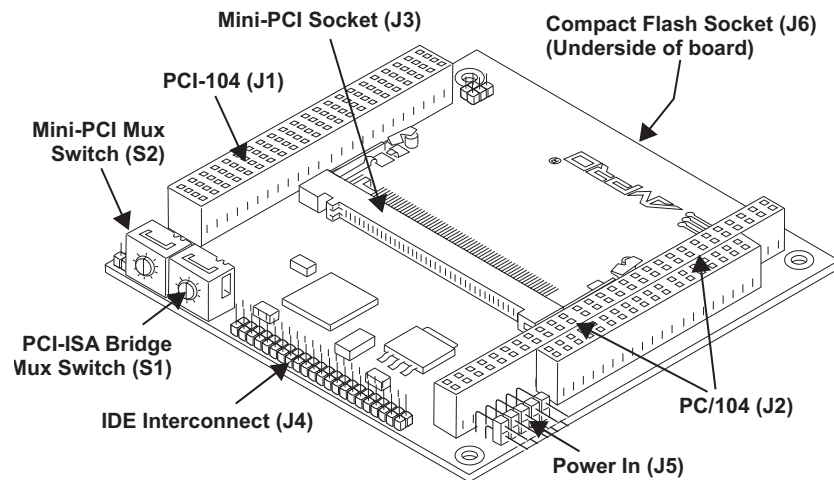


Figure 2-3. MiniModule ISA

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. - Gently insert the PCI-104 pins into the connector, ensuring each pin goes into the respective hole in the connector. If you have difficulty matching pins, do not try to force the pins in. Use a small flat blade screwdriver to help position the pins over the holes.
15. Slowly insert the MiniModule board into the connectors.	- Once the pins are aligned with the proper holes, slowly insert the MiniModule board into the connector. - Ensure the pins go all the way into the connector and are seated on the target board. There should just be enough space between the target board and the MiniModule ISA board to insert the threaded spacers and secure with screws.
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 on page 26 for more information.

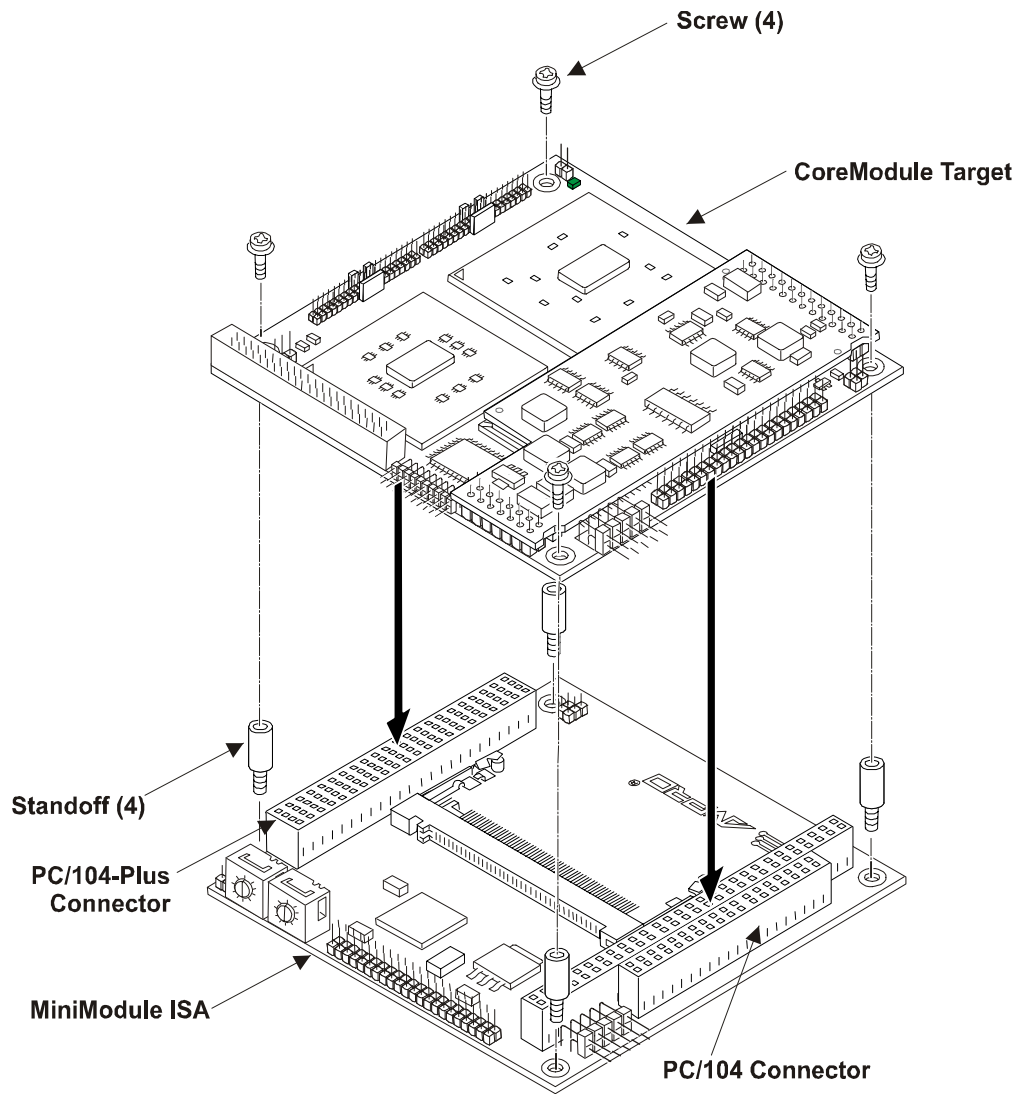


Figure 2-4. Installing a CoreModule Target on a MiniModule ISA

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

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

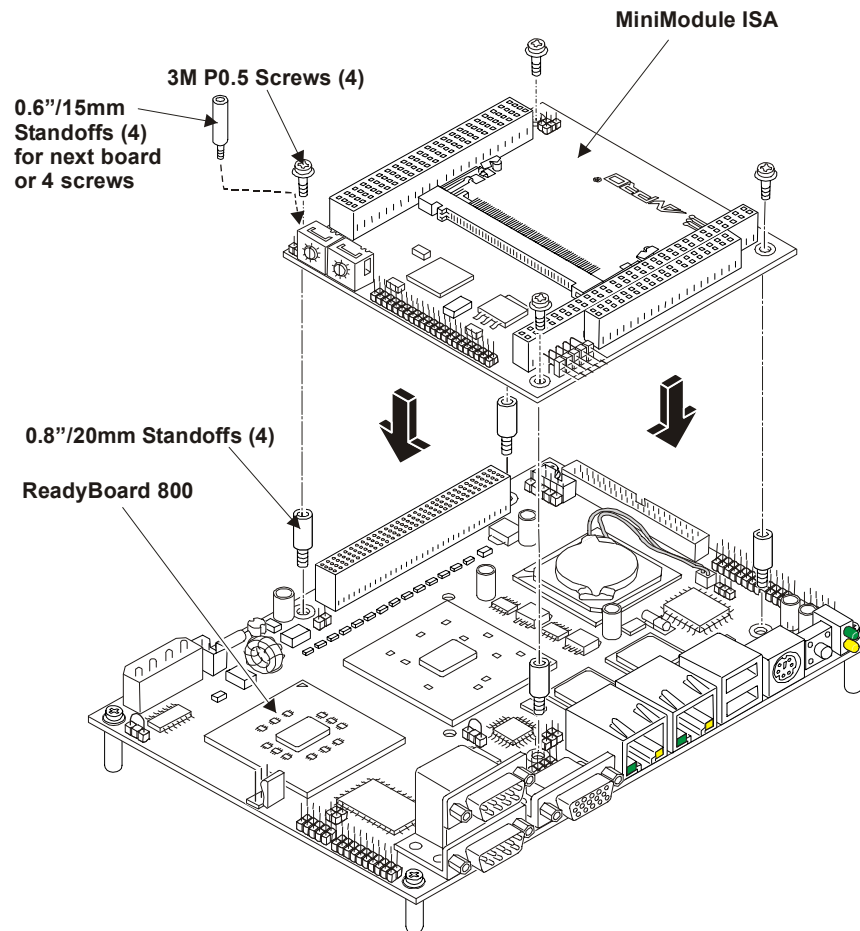


Figure 2-5. Installing MiniModule ISA on ReadyBoard Target

Applying Power to the Target System

18. Check/Set the Power Supply Input Voltage	• If the power supply uses auto-ranging operation at 50/60Hz, skip this step. • Check the input voltage switch on the power supply located on the rear of the supply just below the power connector. The input voltage switch typically has two positions: 115 or 230 volts – 115 volts is 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. • Plug the AT or ATX power supply's power cord into the AC outlet. • Turn the AT or ATX supply's power switch to On before continuing.
20. Verify the target system powers-up satisfactorily.	• Refer to Chapter 4 of the target system's Reference Manual to make changes to the boot settings.

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.
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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 Ask an Expert 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.
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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.
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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.

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 3-3](#).
 - ♦ 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.

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:

Use an anti-static wrist/ankle strap and a grounding mat connected to ground.

Leave the Compact Flash in the anti-static bag until you are ready to install it.

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.

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](#).

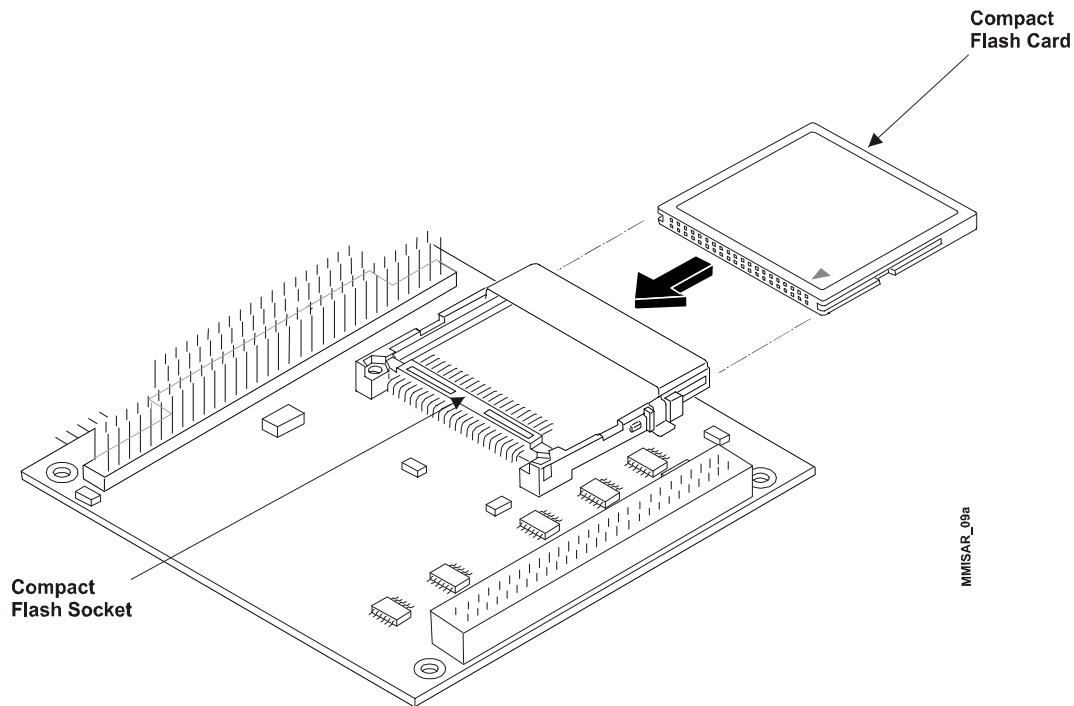


Figure 3-1. Installing the Compact Flash Card

NOTE

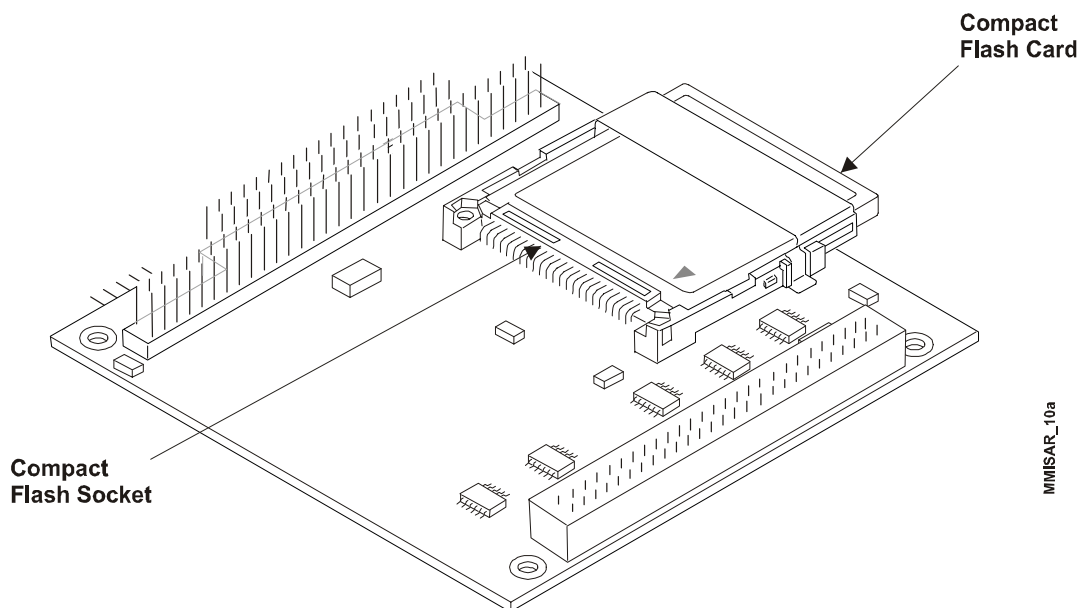
The Compact Flash card edges and the socket are keyed to install in only one orientation.

8. Push the Compact Flash card into the socket until it firmly mates with the pins.
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 the drive and boot settings.

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

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.

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:

Use an anti-static wrist/ankle strap and a grounding mat connected to ground.

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 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.

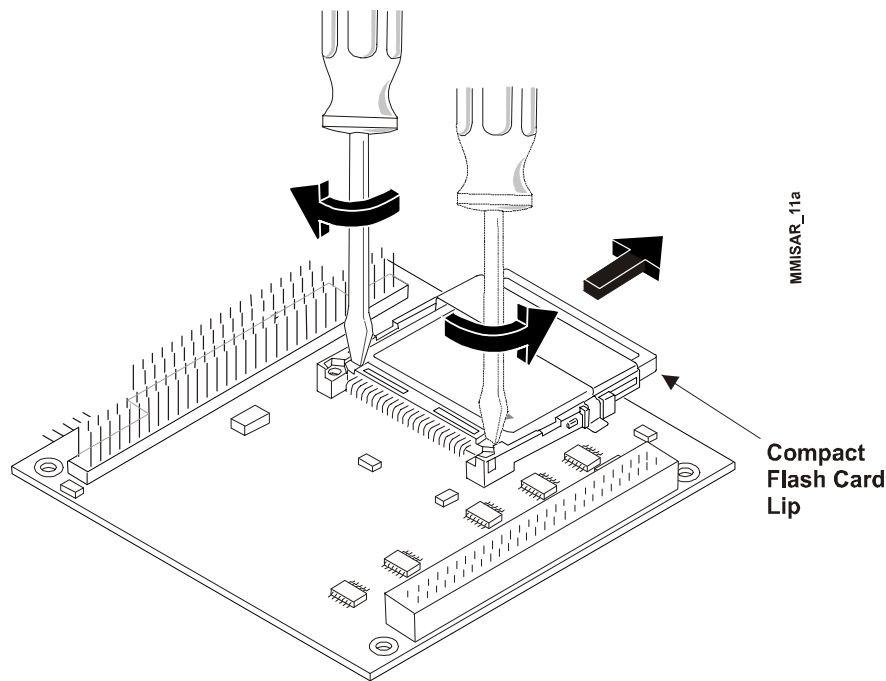


Figure 3-3. Removing the Compact Flash Card

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.
9. Restore power by plugging in the AC power to 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: Use an anti-static wrist/ankle strap and a grounding mat connected to ground. Leave the Mini-PCI card in the anti-static bag until you are ready to install it. Before you touch the Mini-PCI card, touch a grounded, unpainted metal surface to discharge any static electricity.
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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 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.

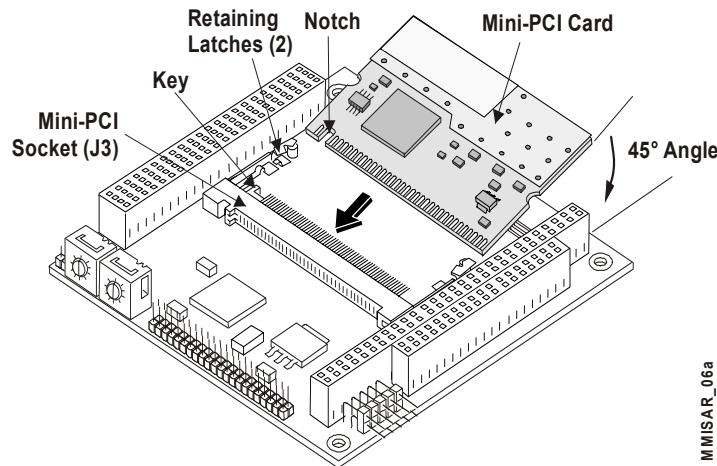


Figure 3-4. Installing Mini-PCI Card into Socket

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.

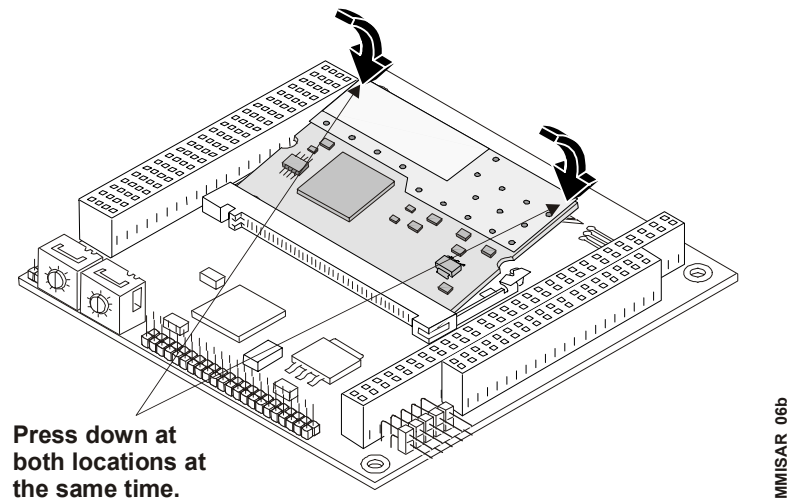


Figure 3-5. Pressing down on the Mini-PCI Card

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 the 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:

Use an anti-static wrist/ankle strap and a grounding mat.

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](#).

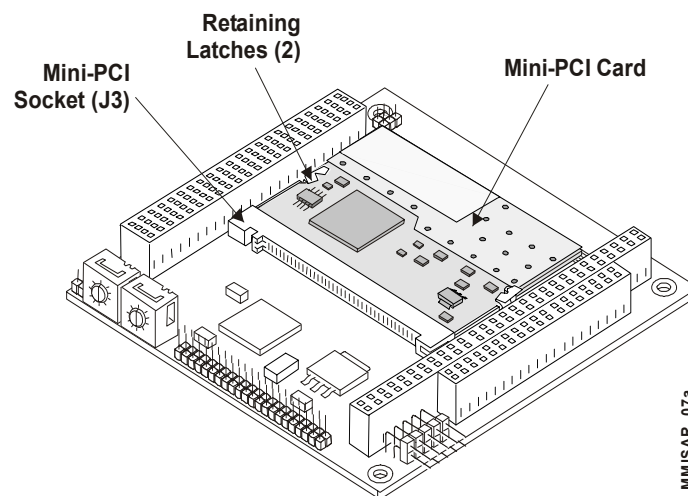


Figure 3-6. Mini-PCI Card Location (Top view)

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. Lift the Mini-PCI card by its edges and completely remove it from the socket. See [Figure 3-7](#).
8. Place the Mini-PCI card on an anti-static surface or in an anti-static bag.

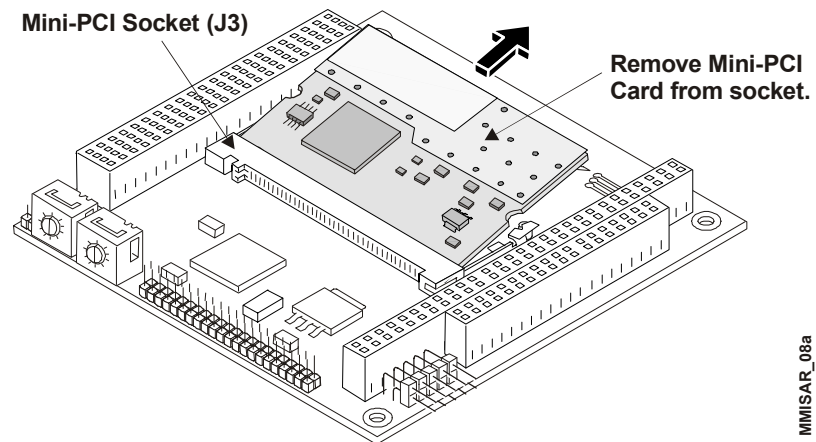


Figure 3-7. Removing Mini-PCI Card from Socket

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 Amprom 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](#).

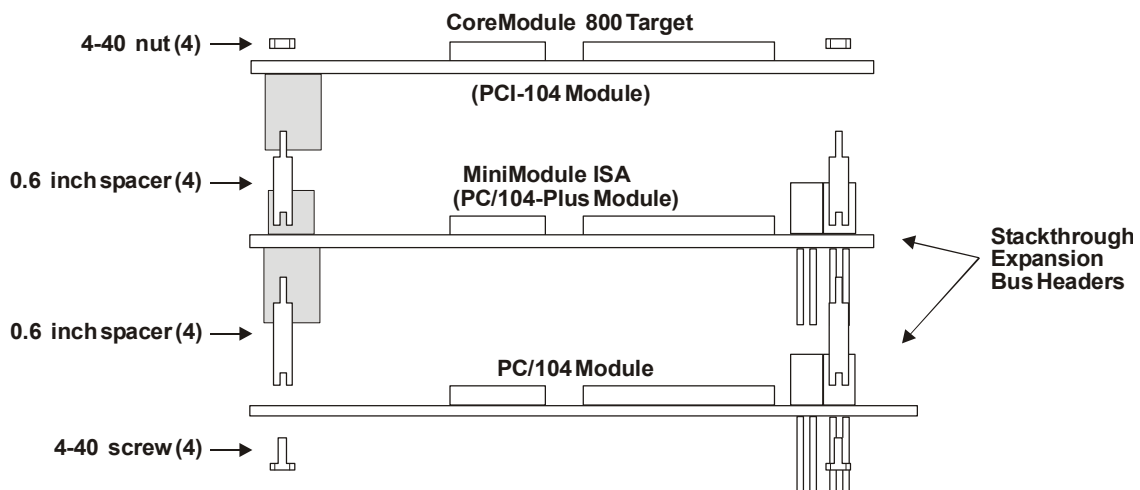


Figure 4-1. Stacking the MiniModule ISA with CoreModule Product

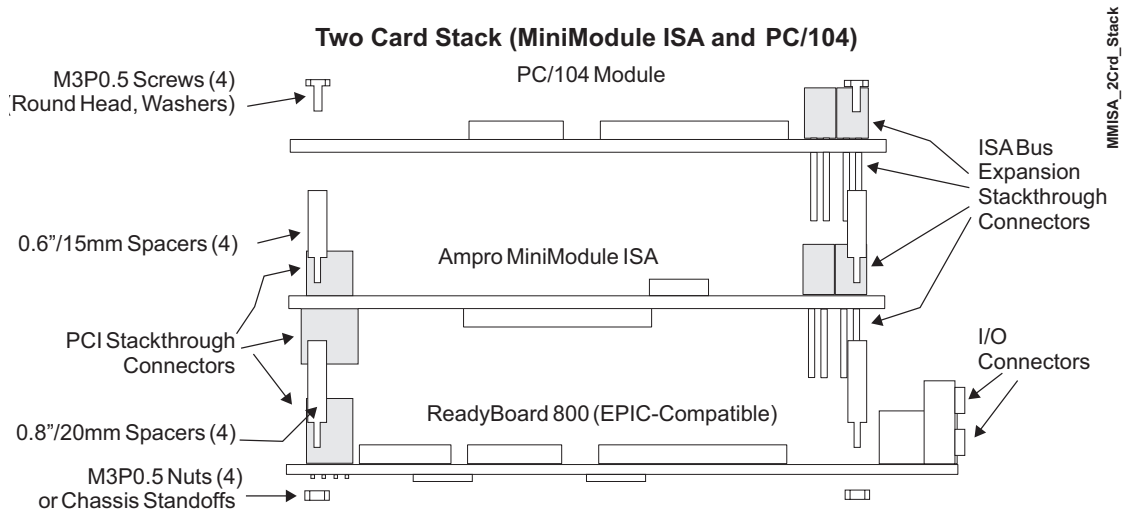


Figure 4-2. MiniModule ISA in 2-Card Stack with ReadyBoard Product

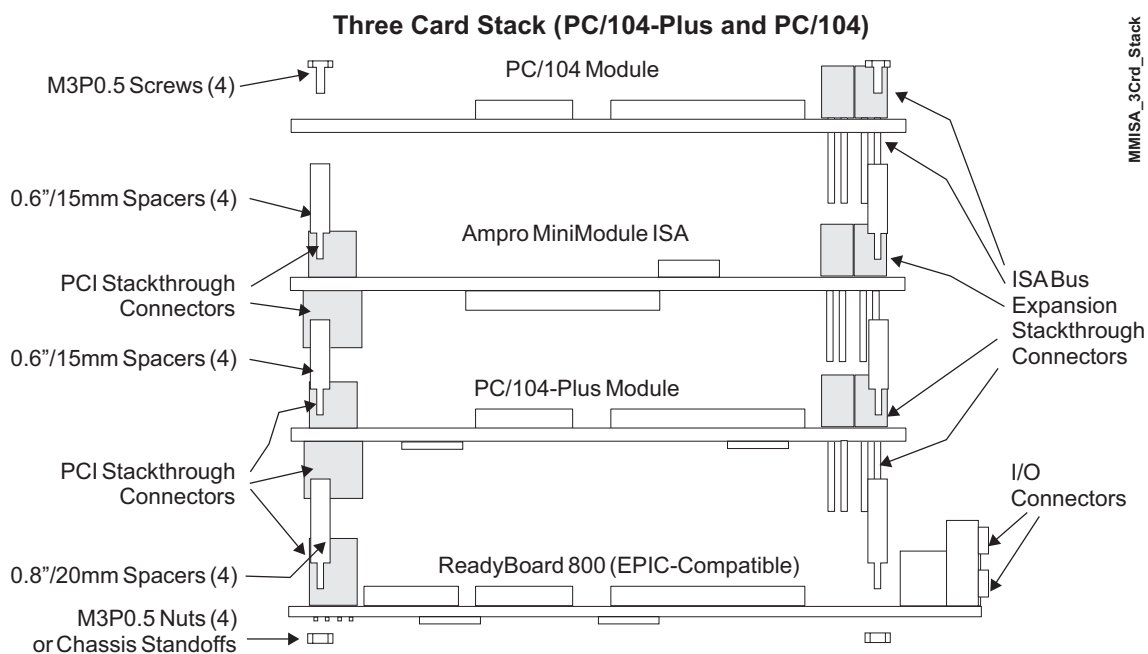


Figure 4-3. MiniModule ISA in 3-Card Stack with ReadyBoard Product

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 IRQ 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 functionality, 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.

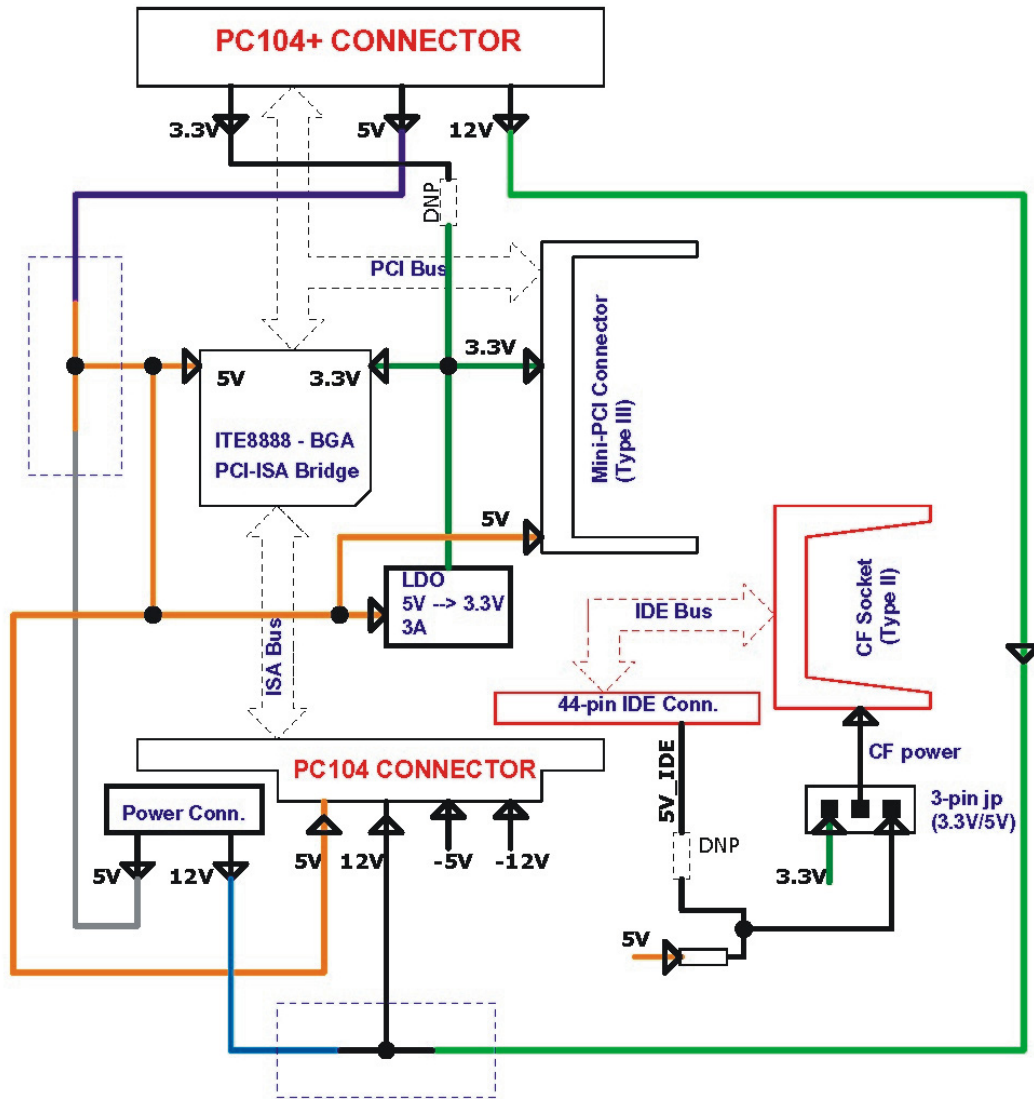


Figure 4-4. MiniModule ISA Block Diagram

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 locations of the major ICs.

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.

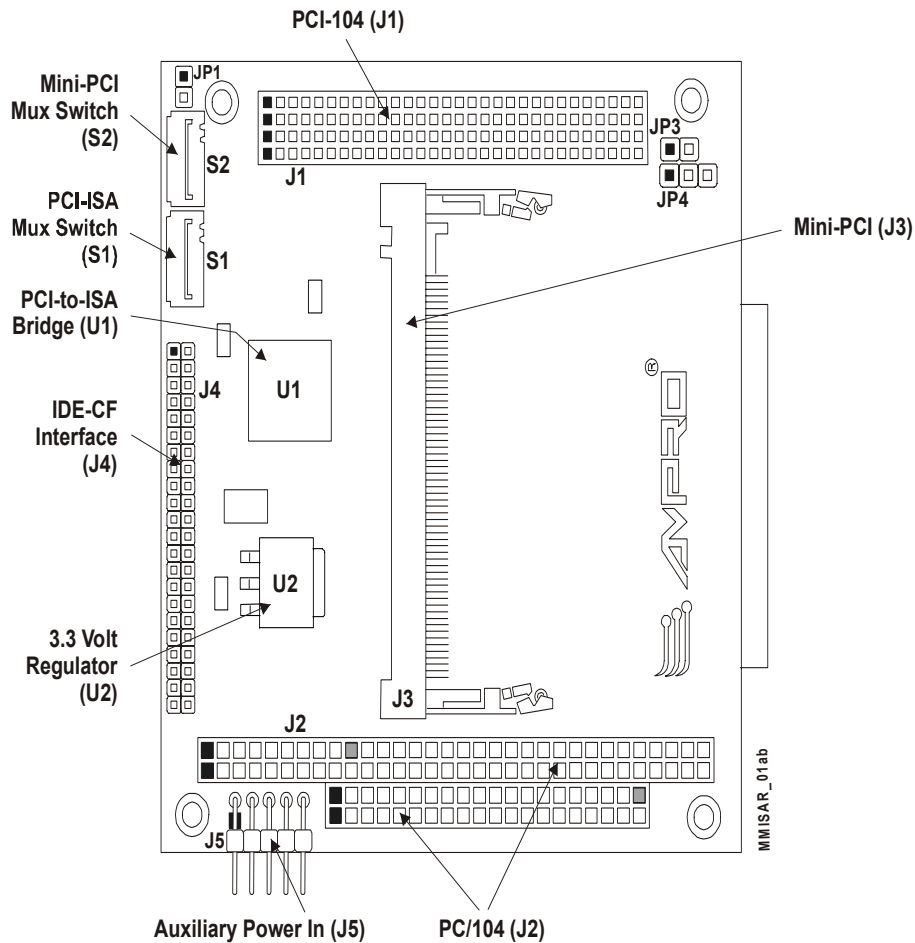


Figure 4-5. MiniModule ISA (Top View)

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

Connectors

Connector Definitions

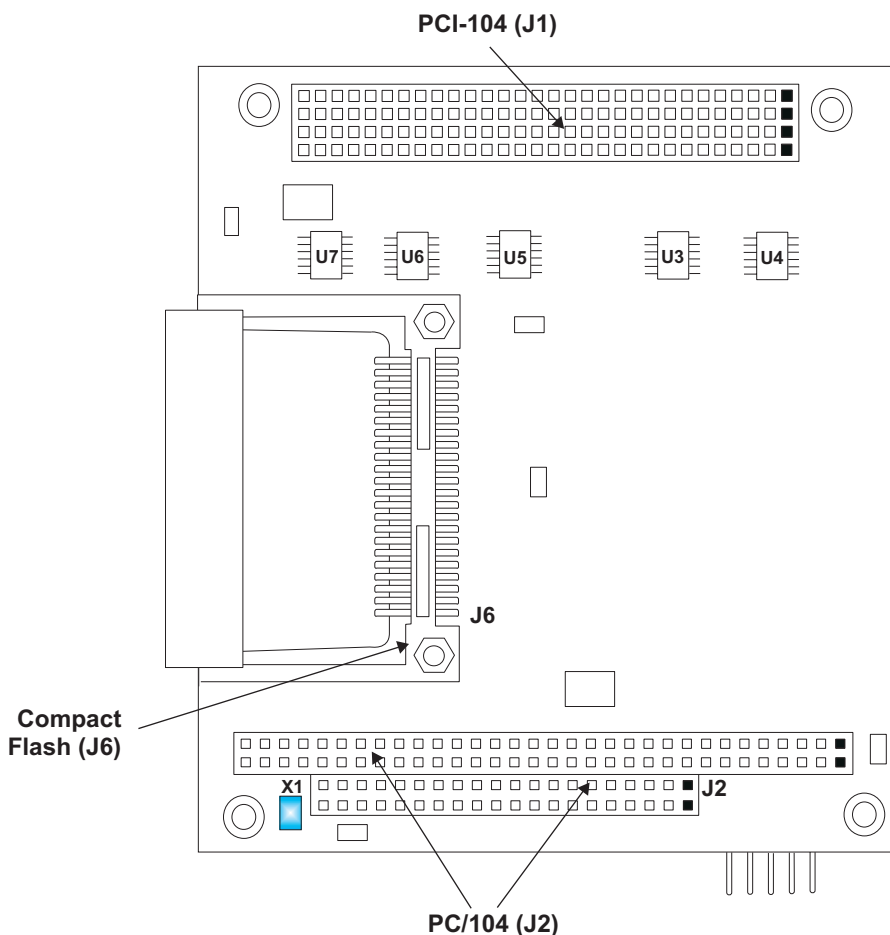
Table 4-2 describes the connectors shown in Figures 4-6 and 4-7.

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

Table 4-2. Module Connector Descriptions (Continued)

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 Pin Definitions

Jumper #	Installed/Enabled	Removed/Enabled
JP1* – ISA IRQ (SerialIRQ)	Enabled (pins 1-2) Default	Disabled (removed) See Note.
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).

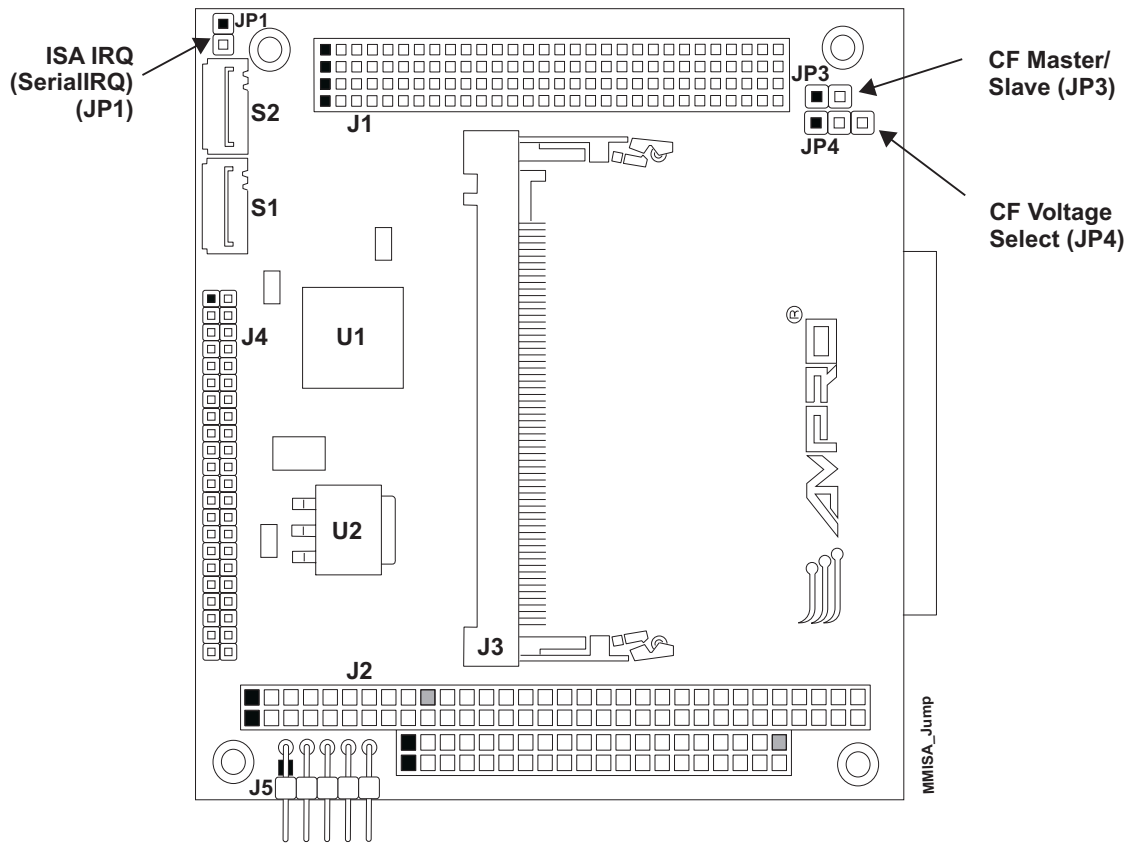


Figure 4-7. Jumper Locations (Top View)

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#

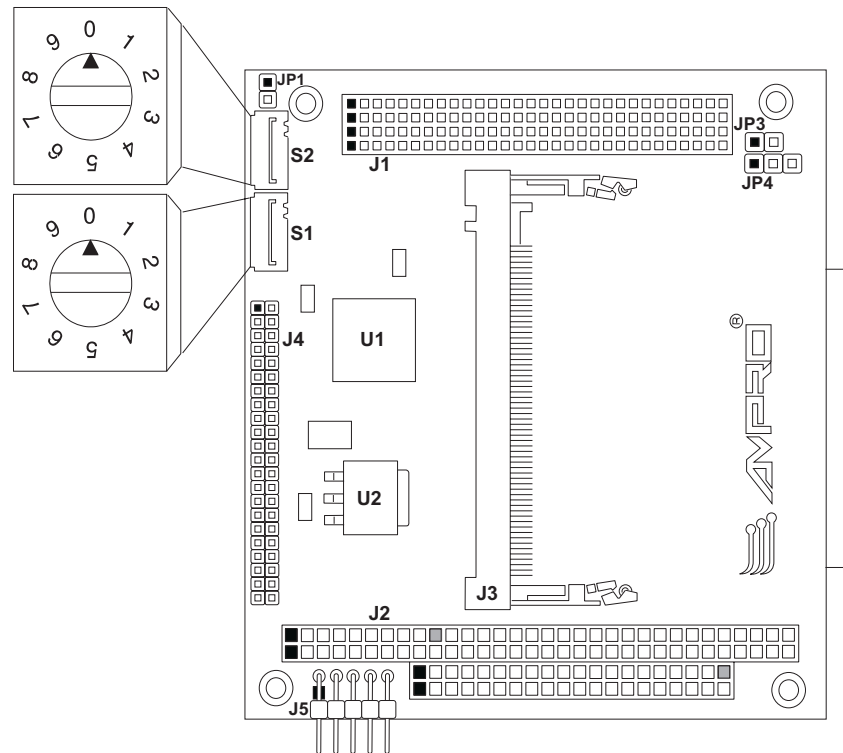


Figure 4-8. Switch Locations (Top View)

Specifications

Physical Specifications

Table 4-6 shows 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

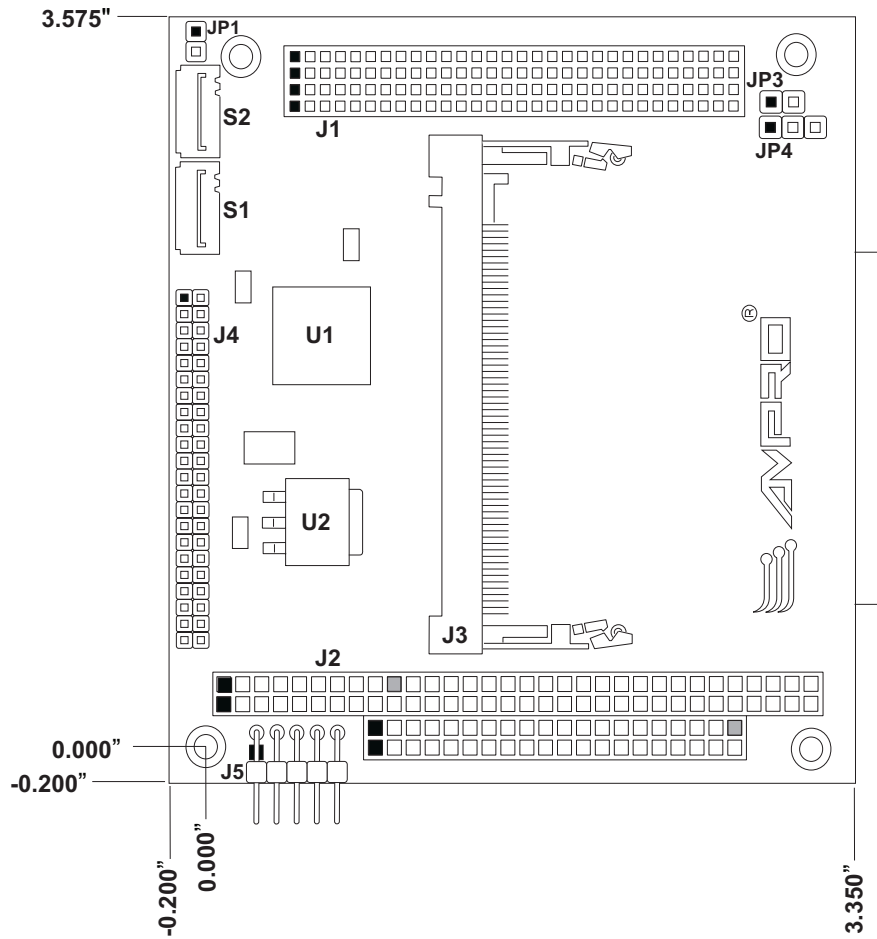


Figure 4-9. Mechanical Dimensions (Top View)

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 $\pm 5\%$ 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 $\pm 5\%$ power supply
9 (A9)	SERR*	O/D	System Error – This signal is for reporting address parity errors.

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

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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ power supply

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

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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ power supply
56 (B26)	CLK0	In	PCI clock 0– Refer to Pin 27 for more information.
57 (B27)	+5V		+5 volts $\pm 5\%$ 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 $\pm 5\%$ 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.

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

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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ 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)

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

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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ 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 $\pm 5\%$ 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

Note: 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.

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

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
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.

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

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.
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

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

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.
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

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

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.

Note: 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.

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

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.
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

Note: 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 $\pm 10\%$
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.

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

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 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 $\pm 10\%$
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

Note: 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

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

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.
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

Note: 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.

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

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 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 $\pm 10\%$
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

Note: 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.

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

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).
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.

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

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 $\pm 10\%$
42	+5V	+5 volt power $\pm 10\%$
43	GND	Digital Ground
44	NC	Not connected

Note: 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. Compact Flash 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 $\pm 5\%$
14, 15	NC	Not connected
16, 17	NC	Not connected
17	NC	Not connected

Table 5-8. Compact Flash Interface Pin/Signal Descriptions (J6) (Continued)

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.
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 Compact Flash 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 Compact Flash 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 Compact Flash 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%

Table 5-8. Compact Flash Interface Pin/Signal Descriptions (J6) (Continued)

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 Compact Flash 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

Note: 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 in the [Table A-1](#) below. Requests for support through the Ask an Expert are given the highest priority, and usually will be addressed within one working day.

- **Ampro Ask an Expert** – 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 an Ask an Expert 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 My Stuff area where you can check status, update your request, and access other features.
- **InfoCenter** – 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 InfoCenter was created as a resource for embedded system developers to share Ampro's knowledge, insight, and expertise. This page contains links to White Papers, Specifications, and additional technical information.

Table A-1. Technical Support Contact Information

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

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