# Sandpoint User's Manual

**6/9/99**

***Revision 1.01***

***Preliminary copy, subject to change without notice***

# 1 OVERVIEW

## 1.1 REVISION HISTORY

| Date | Revision | Distribution | Comments |
|---|---|---|---|
| 2/21/99 | 1.0 | General Release | For Sandpoint 1.0 |
| 6/9/99 | 1.01 | General Release | Correction on jumper setting description on S5 and S6. |

Please email your comments of this user's manual to:

RISC Hotline
Email: risc10@email.sps.mot.com

### TRADEMARKS

## 1.2 INTRODUCTION

This document describes the features of the "Sandpoint" Processor PCI Mezzanine Card (PPMC) host board. This board contains one PMC/PPMC – compatible slot, four PCI slots and complement of standard PC motherboard logic such as an ISA bridge, serial, parallel, keyboard/mouse, floppy and IDE disk controllers. Sandpoint is intended for hardware and software development and evaluation purpose only, and is not intended for operation in commercial environments.

## 1.3 PURPOSE

The Sandpoint PPMC host board design has various uses including, but not limited to:

- System suitable to showcase the 8240 PMC, 7XX PMC and the other future PPMC solution
- System for use by customers in benchmarking, compatibility testing, firmware development etc.
- Software debug platform for embedded application.
- Development platform for use by third-parties firmware/utility developers.

It should be noted that Sandpoint is not intended only for purposes such as that outlined above and is not intended to be sold as a Motorola product.

## 1.3 REFERENCE DOCUMENTS

### 1.3.1 Motorola Documents

- PowerPC Microprocessor Family: The Programming Environments manual
- PowerPC 603e User's manual
- PowerPC 740 User's manual
- PowerPC 750 User's manual
- PowerPC 106 Chipset Implementation Definition
- PowerPC 8240 User's manual
- Sandpoint Hardware Reference Manual

### 1.3.2 External Documents

- Peripheral Component Interconnect (PCI) Specification Rev 2.1
- Draft Standard Physical and Environmental layers for PCI Mezzanine Cards: PMC (IEEE P1386.1/Draft 2.0 04-Apr-1995)
- Draft Standard Physical and Environmental Layers for Processor PCI Mezzanine Cards: PPMC (XXXX P1386.X/Draft 0.1 15-Feb-1998)
- Draft Standard for a Common Mezzanine Card Family: CMC (IEEE P1386/Draft 2.0 04-Apr-1995)
- ATX Specification version 1.0

# 2 PRODUCT SUMMARY

The Sandpoint motherboard is a "host" board, which accepts a PMC or PPMC card as well as up to four PCI slots. The host board has the following features:

**PMC and PPMC support**

- One PMC slot with PPMC, 64-bit and 66MHz extensions
- Switch-selectable operating modes
- Four PCI slots: 2 5V/32-bit slots, 2 3.3V/64-bit slots
- PCI slots support 33 or 66 MHz operation
- Two standard 16650-compatible ESD-protected serial ports
- IEEE 1284 parallel port
- Floppy disk port
- Two IDE ports
- PS/2 Mouse and keyboard connectors
- NVRAM and real-time clock (RTC)
- Advanced Power Controller ("soft on/off)
- LED monitors for critical functions
- Automatic sense of PCI bus speed (33 or 66 MHz)
- Flash EPROM for boot firmware
- ATX chassis with ATX power supply
- DINK32 Debug Monitor Software in ROM

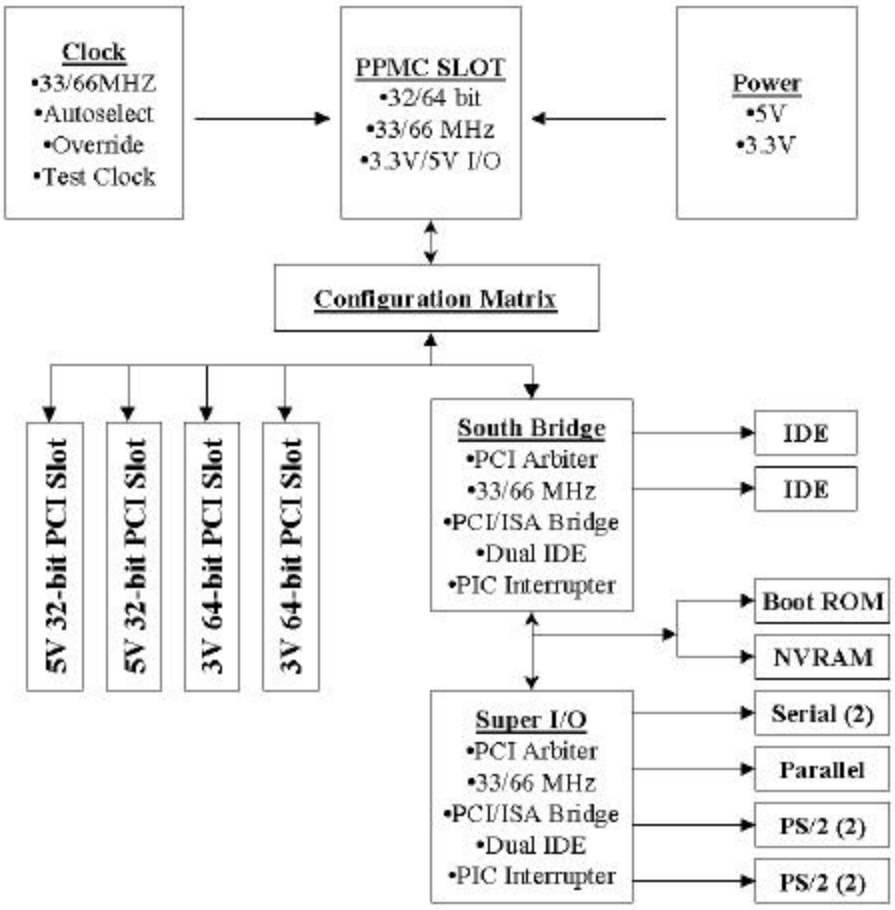
Notes: The I/O subsystem is identical to that of "EC"version of the Yellowknife development platform,

Current PowerPC evaluation system. When properly configured, software written for the Yellowknife platform should operate identically when executed on a Sandpoint.

# 3 SYSTEM CONFIGURATION

## 3.1 BLOCK DIAGRAM

The following is the block diagram of the Sandpoint:



# 4 CHASSIS

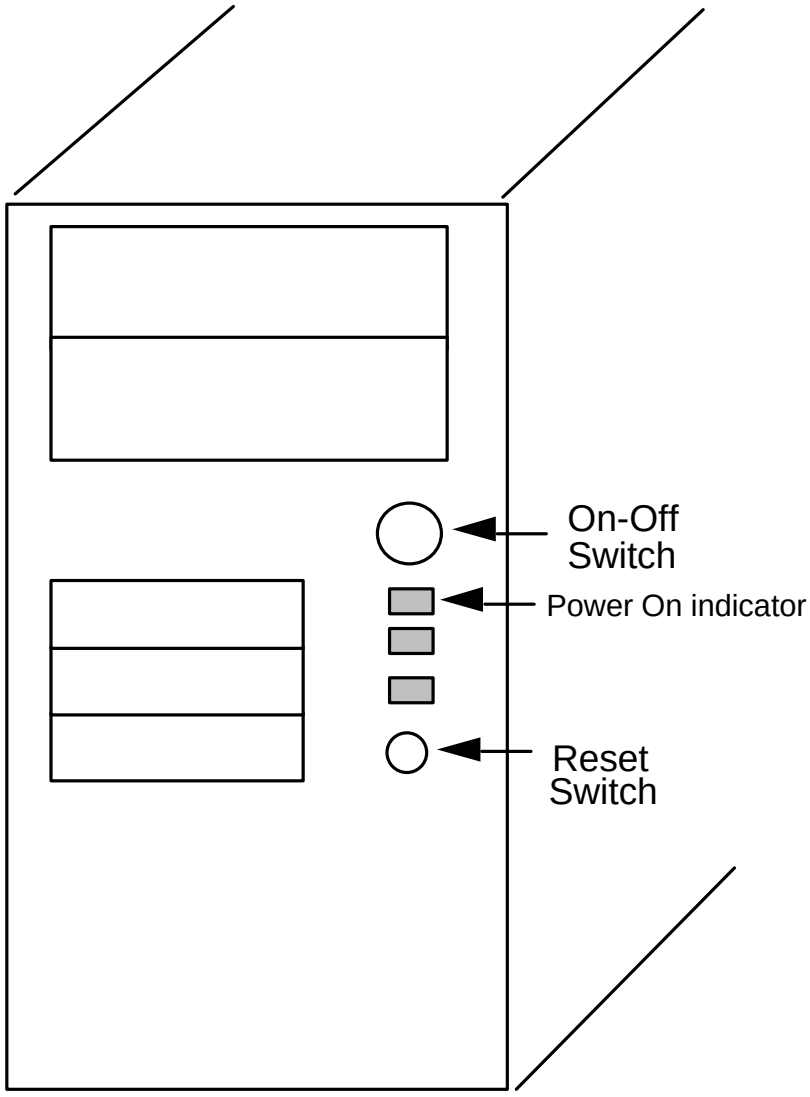
The Sandpoint use the ATX format chassis which had external drive bays for additional upgrade.

## 4.1 SLOTS

The Sandpoint chassis supports a total of four PCI slots for add-in cards. Two of the PCI slots are 32-bit and reminding two are 64-bit slots.

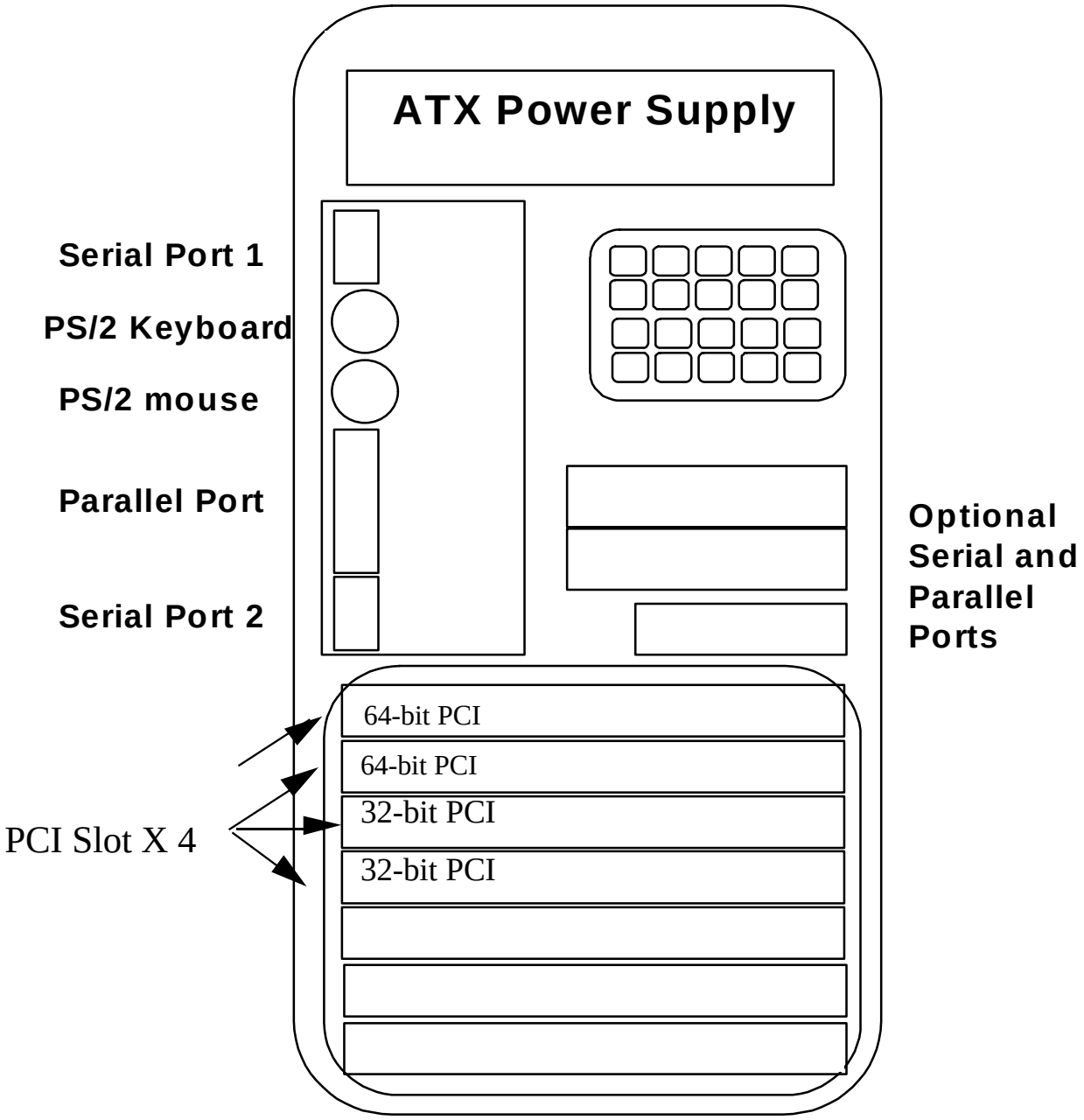
### 4.3 EXTERNAL CONTROLS & INDICATORS

The following diagram shows the front panel of the Sandpoint system:



### 4.4 EXTERNAL CONNECTORS

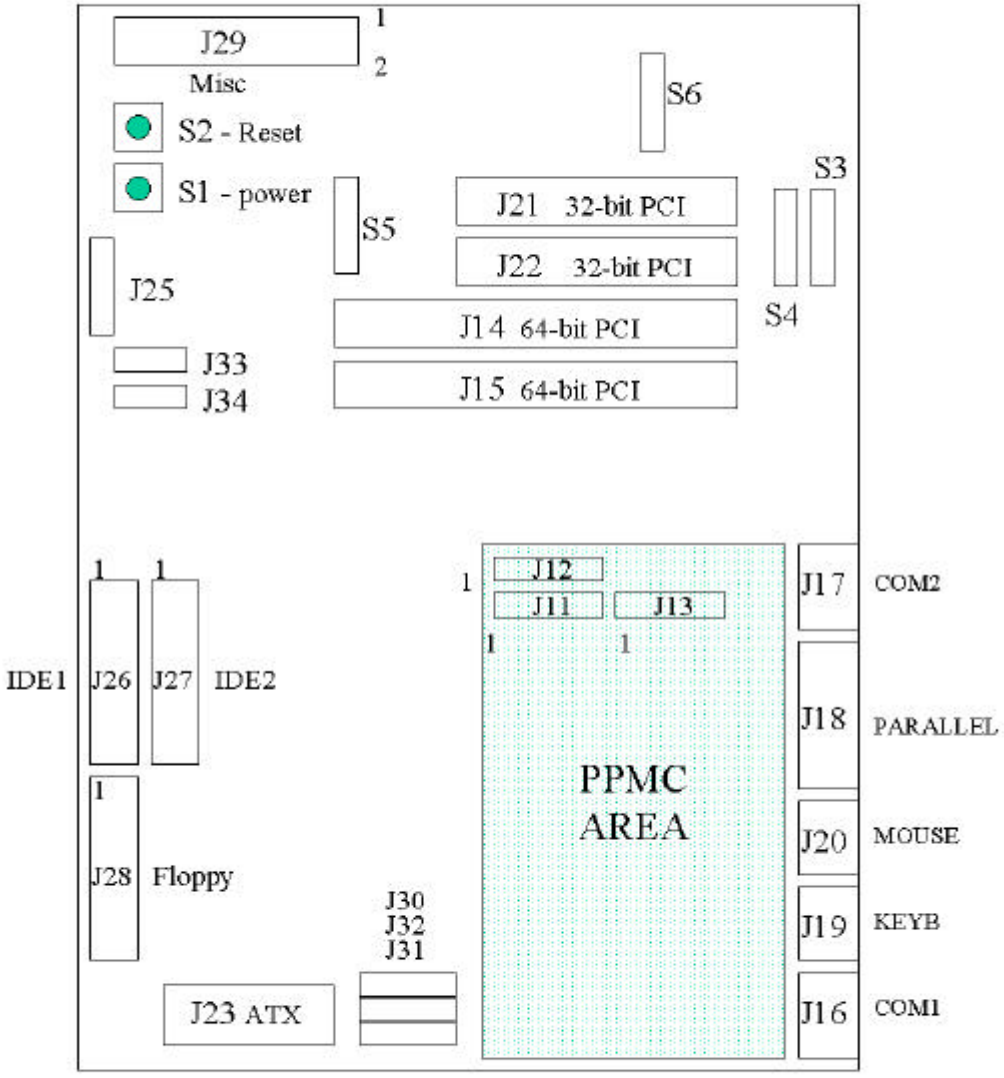
The following show the back panel on the ATX chassis:



# 5 INSTALLATION

## 5.1 MOTHERBOARD DIAGRAM

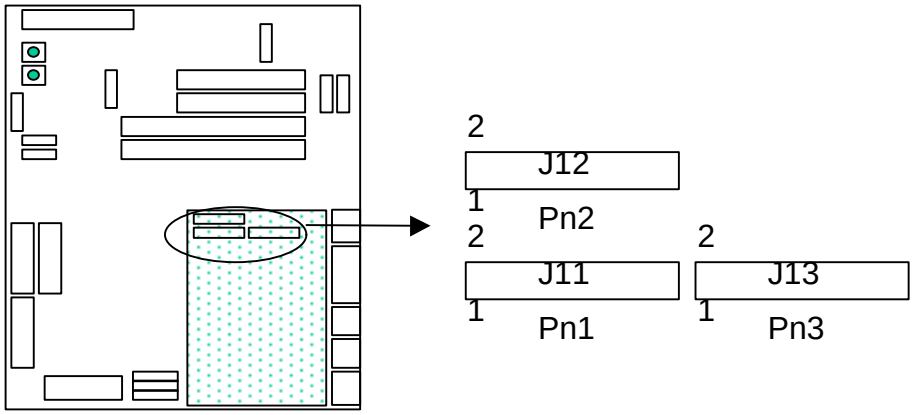
The following is the Sandpoint motherboard diagram:



## 5.2 JUMPERS AND CONNECTORS DESCRIPTION

| | | |
|---|---|---|
| 1) | J11 | PMC Connector 1 (64-pin) |
| 2) | J12 | PMC connector 2 (64-pin) |
| 3) | J13 | PMC connector 3 (64-pin) |
| 4) | J14 | 64-bit PCI slot |
| 5) | J15 | 64-bit PCI slot |
| 6) | J16 | COM1 port |
| 7) | J18 | Parallel Port |
| 8) | J19 | PS/2 Keyboard connector |
| 9) | J20 | PS/2 Mouse connector |
| 10) | J21 | 32-bit PCI slot |
| 11) | J22 | 32-bit PCI slot |
| 12) | J23 | ATX Connector |
| 13) | J25 | Battery connector |
| 14) | J26 | Primary IDE connector |
| 15) | J27 | Secondary IDE connector |
| 16) | J28 | Floppy Disk connector |
| 17) | J29 | Misc. connectors (Reset, PowerON, Speaker) |
| 18) | J30,31,32 | VIO selection jumpers |
| 19) | J33 | Test Clock Input |
| 20) | J34 | 66MHz PCI Disable |
| 21) | S1 | Power On/Off Switch |
| 22) | S2 | Reset Switch |
| 23) | S3,S4 | Mode Selection Switch |
| 24) | S5 | Interrupt Inversion Switch |
| 25) | S6 | Shared Interrupt Selection Switch |

### 5.2.1 J11, J12, J13 PPMC Connectors




Note: 8240 PMC uses only J11 and J12 connectors

**Pn1/J11 32 Bit PCI pin description**

| Pin # | Signal Name | Signal Name | Pin # |
|---|---|---|---|
| 1 | TCK | -12V | 2 |
| 3 | Ground | INTA# | 4 |
| 5 | INTB# | INTC# | 6 |
| 7 | PRESENT# | +5V | 8 |
| 9 | INTD# | PCI-RSVD | 10 |
| 11 | Ground | PCI-RSVD | 12 |
| 13 | PCICLK | Ground | 14 |
| 15 | Ground | GNT#/XREQ[0]# | 16 |
| 17 | REQ#/XGNT[0]# | +5V | 18 |
| 19 | V(I/O) | AD[31] | 20 |
| 21 | AD[28] | AD[27] | 22 |
| 23 | AD[25] | Ground | 24 |
| 25 | Ground | C/BE[3]# | 26 |
| 27 | AD[22] | AD[21] | 28 |
| 29 | AD[19] | +5V | 30 |
| 31 | V(I/O) | AD[17] | 32 |
| 33 | FRAME# | Ground | 34 |
| 35 | Ground | IRDY# | 36 |
| 37 | DEVSEL# | +5V | 38 |
| 39 | Ground | LOCK# | 40 |
| 41 | SDONE# | SBO# | 42 |
| 43 | PAR | Ground | 44 |
| 45 | V(I/O) | AD[15] | 46 |
| 47 | AD[12] | AD[11] | 48 |
| 49 | AD[09] | +5V | 50 |
| 51 | Ground | C/BE[0]# | 52 |
| 53 | AD[06] | AD[05] | 54 |
| 55 | AD[04] | Ground | 56 |
| 57 | V(I/O) | AD[03] | 58 |
| 59 | AD[02] | AD[01] | 60 |
| 61 | AD[00] | +5V | 62 |
| 63 | Ground | REQ64# | 64 |

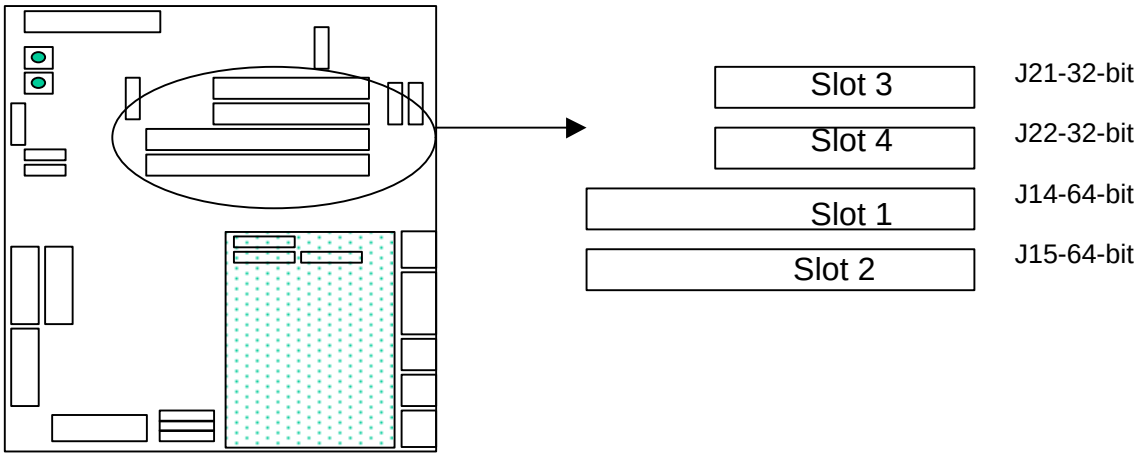
## Pn2/J12 32Bit PCI Pin Description

| Pin # | Signal Name | Signal Name | Pin # |
|---|---|---|---|
| 1 | +12V | TRST# | 2 |
| 3 | TMS | TDO | 4 |
| 5 | TDI | Ground | 6 |
| 7 | Ground | PCI-RSVD | 8 |
| 9 | PCI-RSVD | PCI-RSVD | 10 |
| 11 | XREQ[1]# | +3.3V | 12 |
| 13 | RST# | XREQ[2]# | 14 |
| 15 | +3.3V | XREQ[3]# | 16 |
| 17 | PCI-RSVD | Ground | 18 |
| 19 | AD[30] | AD[29] | 20 |
| 21 | Ground | AD[26] | 22 |
| 23 | AD[24] | +3.3V | 24 |
| 25 | IDSEL | AD[23] | 26 |
| 27 | +3.3V | AD[20] | 28 |
| 29 | AD[18] | Ground | 30 |
| 31 | AD[16] | C/BE[2]# | 32 |
| 33 | Ground | PMC-RSVD | 34 |
| 35 | TRDY# | +3.3V | 36 |
| 37 | Ground | STOP# | 38 |
| 39 | PERR# | Ground | 40 |
| 41 | +3.3V | SERR# | 42 |
| 43 | C/BE[1]# | Ground | 44 |
| 45 | AD[14] | AD[13] | 46 |
| 47 | M66EN | AD[10] | 48 |
| 49 | AD[08] | +3.3V | 50 |
| 51 | AD[07] | PMC-RSVD | 52 |
| 53 | +3.3V | PMC-RSVD | 54 |
| 55 | XGNT[1]# | Ground | 56 |
| 57 | XGNT[2]# | XGNT[3]# | 58 |
| 59 | Ground | PMC-RSVD | 60 |
| 61 | ACK64# | +3.3V | 62 |
| 63 | Ground | SYSCON# | 64 |

## Pn3/J13 64 Bit PCI Pin Description

| Pin # | Signal Name | Signal Name | Pin # |
|---|---|---|---|
| 1 | PCI-RSVD | Ground | 2 |
| 3 | Ground | C/BE[7]# | 4 |
| 5 | C/BE[6]# | C/BE[5]# | 6 |
| 7 | C/BE[4]# | Ground | 8 |
| 9 | V(I/O) | PAR64 | 10 |
| 11 | AD[63] | AD[62] | 12 |
| 13 | AD[61] | Ground | 14 |
| 15 | Ground | AD[60] | 16 |
| 17 | AD[59] | AD[58] | 18 |
| 19 | AD[57] | Ground | 20 |
| 21 | V(I/O) | AD[56] | 22 |
| 23 | AD[55] | AD[54] | 24 |
| 25 | AD[53] | Ground | 26 |
| 27 | Ground | AD[52] | 28 |
| 29 | AD[51] | AD[50] | 30 |
| 31 | AD[49] | Ground | 32 |
| 33 | Ground | AD[48] | 34 |
| 35 | AD[47] | AD[46] | 36 |
| 37 | AD[45] | Ground | 38 |
| 39 | V(I/O) | AD[44] | 40 |
| 41 | AD[43] | AD[42] | 42 |
| 43 | AD[41] | Ground | 44 |
| 45 | Ground | AD[40] | 46 |
| 47 | AD[39] | AD[38] | 48 |
| 49 | AD[37] | Ground | 50 |
| 51 | Ground | AD[36] | 52 |
| 53 | AD[35] | AD[34] | 54 |
| 55 | AD[33] | Ground | 56 |
| 57 | V(I/O) | AD[32] | 58 |
| 59 | PCI-RSVD | PCI-RSVD | 60 |
| 61 | PCI-RSVD | Ground | 62 |
| 63 | Ground | PCI-RSVD | 64 |

### 5.2.2 J13, J14, J21 and J22 32-bit and 64-bit PCI Slot




Sandpoint has three PCI slots (PCI 1, PCI 2 and PCI 3). The connectors, pin assignments, signal timings, loadings and mechanical dimensions all conform to the standard PCI specification. The pin assignment for the PCI connectors is as follows:

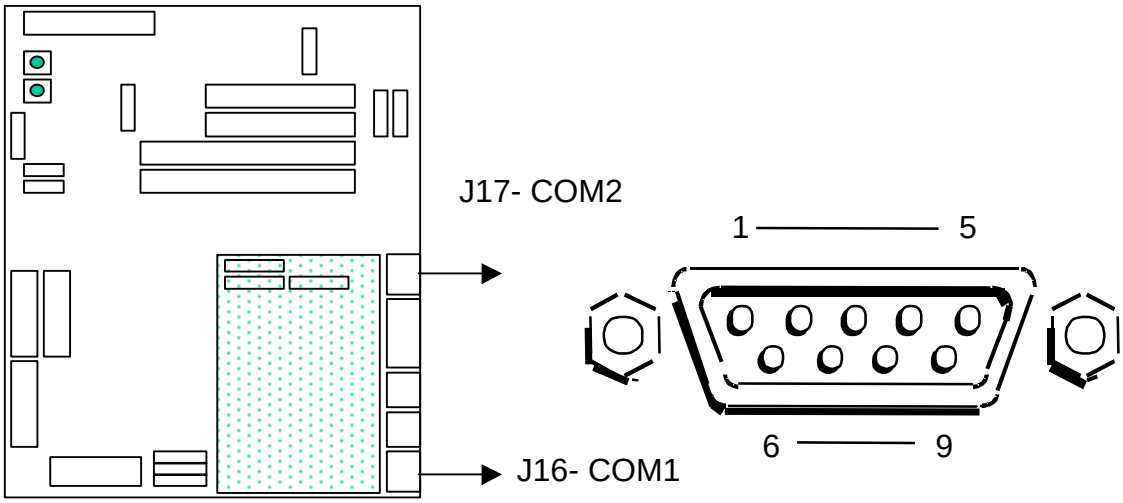
| Pin | Description | Pin | Description | Comment |
|---|---|---|---|---|
| B1 | -12V | A1 | TRST* | 32-bit connector starts |
| B2 | TCK | A2 | +12V | |
| B3 | GROUND | A3 | TMS | |
| B4 | TD0 | A4 | TDI | |
| B5 | +5V | A5 | +5V | |
| B6 | +5V | A6 | INTA* | |
| B7 | INTB* | A7 | INTC* | |
| B8 | INTD* | A8 | +5V | |
| B9 | PRSNT1* | A9 | RESERVED | |
| B10 | RESERVED | A10 | +5V | |
| B11 | PRSNT2* | A11 | RESERVED | |
| B12 | GROUND | A12 | GROUND | |
| B13 | GROUND | A13 | GROUND | |
| B14 | RESERVED | A14 | RESERVED | |
| B15 | GROUND | A15 | RST* | |
| B16 | CLK | A16 | +5V (I/O) | |
| B17 | GROUND | A17 | GNT* | |
| B18 | REQ* | A18 | GROUND | |
| B19 | +5V (I/O) | A19 | RESERVED | |
| B20 | AD31 | A20 | AD30 | |
| B21 | AD29 | A21 | +3.3V | |
| B22 | GROUND | A22 | AD28 | |
| B23 | AD27 | A23 | AD26 | |
| B24 | AD25 | A24 | GROUND | |
| B25 | +3.3V | A25 | AD24 | |
| B26 | C/BE*3 | A26 | IDSEL | |
| B27 | AD23 | A27 | +3.3V | |
| B28 | GROUND | A28 | AD22 | |
| B29 | AD21 | A29 | AD20 | |
| B30 | AD19 | A30 | GROUND | |
| B31 | +3.3V | A31 | AD18 | |
| B32 | AD17 | A32 | AD16 | |
| B33 | C/BE*2 | A33 | +3.3V | |
| B34 | GROUND | A34 | FRAME* | |
| B35 | IRDY* | A35 | GROUND | |
| B36 | +3.3V | A36 | TRDY* | |
| B37 | DEVSEL* | A37 | GROUND | |
| B38 | GROUND | A38 | STOP* | |
| B39 | LOCK* | A39 | +3.3V | |

| | | | | |
|---|---|---|---|---|
| B40 | PERR* | A40 | SDONE | 32-bit connectors continued |
| B41 | +3.3V | A41 | SBO* | |
| B42 | SERR* | A42 | GROUND | |
| B43 | +3.3V | A43 | PAR | |
| B44 | C/BE*1 | A44 | AD15 | |
| B45 | AD14 | A45 | +3.3V | |
| B46 | GROUND | A46 | AD13 | |
| B47 | AD12 | A47 | AD11 | |
| B48 | AD10 | A48 | GROUND | |
| B49 | GROUND | A49 | AD9 | |
| B50 | (KEY) | A50 | (KEY) | |
| B51 | (KEY) | A51 | (KEY) | |
| B52 | AD8 | A52 | C/BE*0 | |
| B53 | AD7 | A53 | +3.3V | |
| B54 | +3.3V | A54 | AD6 | |
| B55 | AD5 | A55 | AD4 | |
| B56 | AD3 | A56 | GROUND | |
| B57 | GROUND | A57 | AD2 | |
| B58 | AD1 | A58 | AD0 | |
| B59 | +5V (I/O) | A59 | +5V (I/O) | |
| B60 | ACK64* | A60 | REQ64* | |
| B61 | +5V | A61 | +5V | |
| B62 | +5V | A62 | +5V | |
| | Connector Key | | | 64-bit spacer |
| B63 | RESERVED | A63 | GROUND | 64-bit connector start |
| B64 | GROUND | A64 | C/BE[7]# | |
| B65 | C/BE[6]# | A65 | C/BE[5]# | |
| B66 | C/BE[4]# | A66 | +3.3V | |
| B67 | GROUND | A67 | PAR64 | |
| B68 | AD[63] | A68 | AD[62] | |
| B69 | AD[61] | A69 | GROUND | |
| B70 | +3.3V | A70 | AD[60] | |
| B71 | AD[59] | A71 | AD[58] | |
| B72 | AD[57] | A72 | GROUND | |
| B73 | GROUND | A73 | AD[56] | |
| B74 | AD[55] | A74 | AD[54] | |
| B75 | AD[53] | A75 | +3.3V | |
| B76 | GROUND | A76 | AD[52] | |
| B77 | AD[51] | A77 | AD[50] | |
| B78 | AD[49] | A78 | GROUND | |
| B79 | +3.3V | A79 | AD[48] | |
| B80 | AD[47] | A80 | AD[46] | |
| B81 | AD[45] | A81 | GROUND | |
| B82 | GROUND | A82 | AD[44] | |
| B83 | AD[43] | A83 | AD[42] | |
| B84 | AD[41] | A84 | +3.3V | |
| B85 | GROUND | A85 | AD[40] | |
| B86 | AD[39] | A86 | AD[38] | |
| B87 | AD[37] | A87 | GROUND | |
| B88 | +3.3V | A88 | AD[36] | |
| B89 | AD[35] | A89 | AD[34] | |
| B90 | AD[33] | A90 | GROUND | |
| B91 | GROUND | A91 | AD[32] | |
| B92 | RESERVED | A92 | RESERVED | |
| B93 | RESERVED | A93 | GROUND | |
| B94 | GROUND | A94 | RESERVED | 64-bit connector end |

### 5.2.3 J16, J17 COM Ports

Sandpoint has two 16550-compatible serial ports. PC serial connectors are located at the back panel.

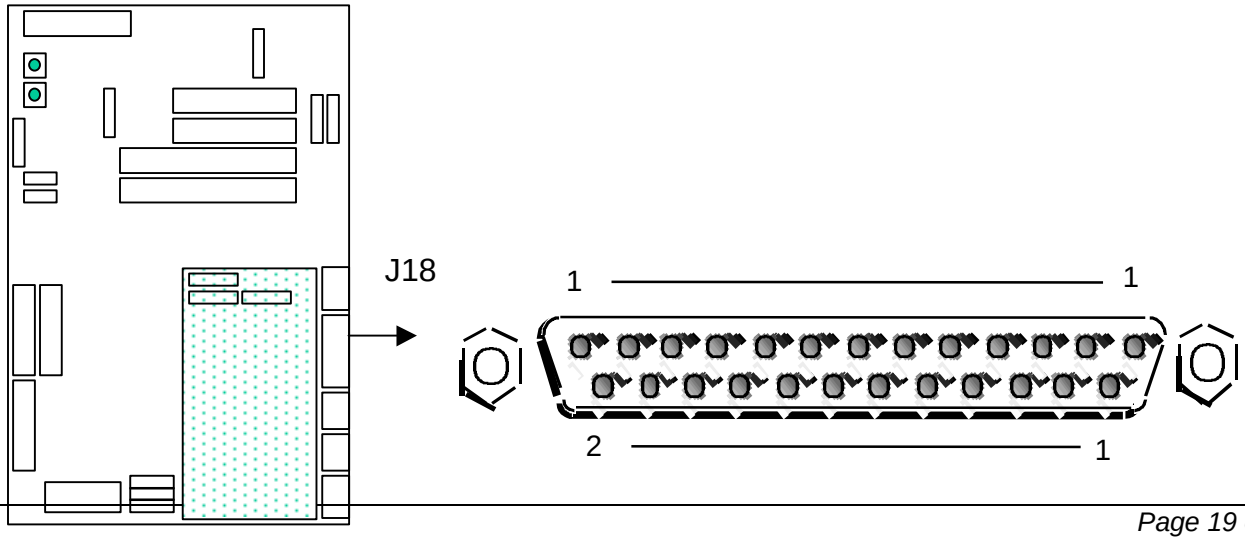
PC serial port pin assignment




| Pin | Signal | I/O | Definition |
|---|---|---|---|
| 1 | DCD | I | Data carrier detect |
| 2 | SIN | I | Serial input |
| 3 | SOUT | O | Serial output |
| 4 | DTR | O | Data terminal ready |
| 5 | GND | N/A | Signal GND |
| 6 | DSR | I | Data Set Ready |
| 7 | RTS | O | Request To Send |
| 8 | CTS | I | Clear To Send |
| 9 | RI | I | Ring Indicator |

### 5.2.4 J18 Parallel Port

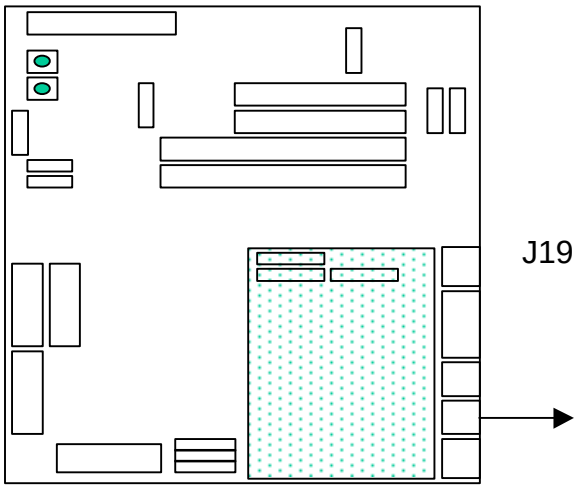
Sandpoint has one AT-compatible, bi-directional parallel port. This connector is located at the back panel.



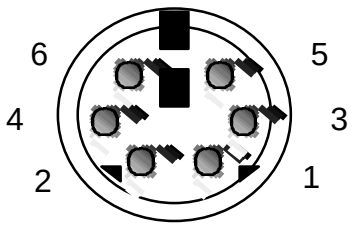
| Pin | Signal | I/O | Definition |
|---|---|---|---|
| 1 | STB# | I/O | Strobe |
| 2 | PD0 | I/O | Printer data bit o |
| 3 | PD1 | I/O | Printer data bit 1 |
| 4 | PD2 | I/O | Printer data bit 2 |
| 5 | PD3 | I/O | Printer data bit 3 |
| 6 | PD4 | I/O | Printer data bit 4 |
| 7 | PD5 | I/O | Printer data bit 5 |
| 8 | PD6 | I/O | Printer data bit 6 |
| 9 | PD7 | I/O | Printer data bit 7 |
| 10 | ACK# | I | Acknowledge |
| 11 | BUSY | I | Busy |
| 12 | PE | I | Paper end |
| 13 | SLCT | I | Select |
| 14 | AFD# | O | Automatic Feed |
| 15 | ERR# | I | Error |
| 16 | INIT# | O | Initialize printer |
| 17 | SLIN# | O | Select in |
| 18-25 | GND | N/A | Signal GND |

### 5.2.5 J19,J20 PS/2 Keyboard and Mouse Connector

Sandpoint supports both the AT-compatible keyboard interfaces. PS/2 keyboard connectors are located at the back panel.



J19 PS/2 Keyboard

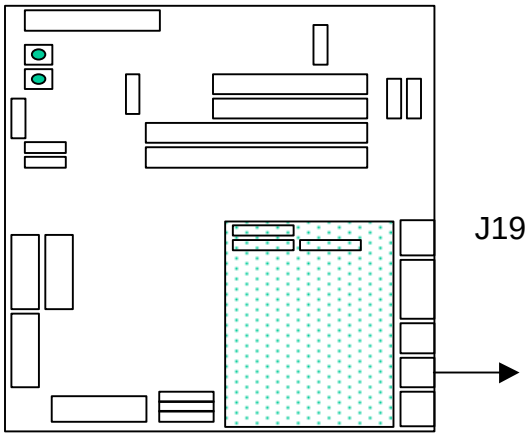



The following is the PS/2 Keyboard pin definition:

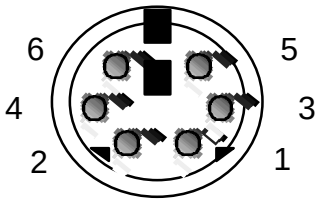
| Pin | Signal | I/O | Definition |
|---|---|---|---|
| 1 | KBDATA | I/O | Keyboard data |
| 2 | NC | N/A | No connection |
| 3 | GND | N/A | Signal GND |
| 4 | FVcc | N/A | Fused supply voltage |
| 5 | KBCLK | I/O | Keyboard clock |
| 6 | NC | N/A | No connection |

| | | | |
|---|---|---|---|
| Shell | N/A | N/A | Chassis GND |

Sandpoint supports both the PS/2 compatible mouse The PS/2 mouse is supported through the mouse port. PS/2 mouse connector is located at the back panel.
PS/2 mouse connector pin assignment



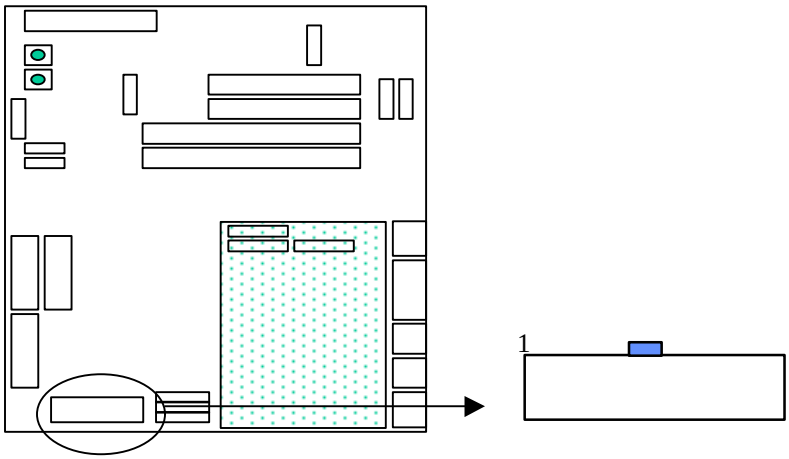
J19 PS/2 Mouse




| Pin | Signal | I/O | Definition |
|---|---|---|---|
| 1 | MFDATA | I/O | Mouse data |
| 2 | NC | N/A | No connection |
| 3 | GND | N/A | Signal GND |
| 4 | FVcc | N/A | Fused supply voltage |
| 5 | KBCLK | I/O | Mouse clock |
| 6 | NC | N/A | No connection |
| Shell | N/A | N/A | Chassis GND |

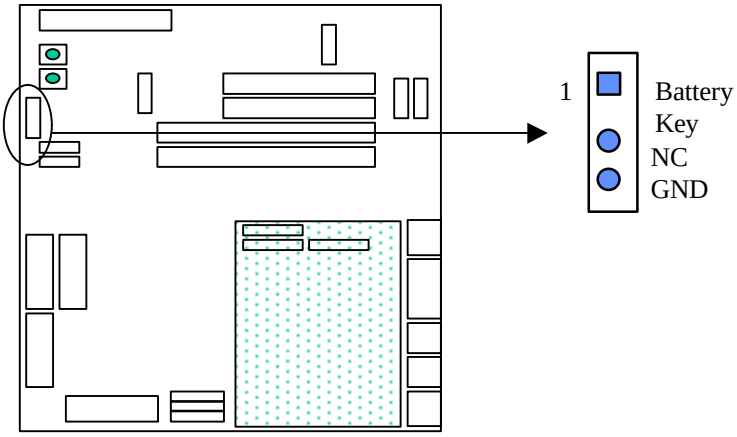
### 5.2.6 J23 ATX Power Connector

Sandpoint uses the standard ATX power supply, which provide the 5V and 3.3V to the motherboard. The following is the power connector pin assignment:



| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | +3.3V | 11 | +3.3V |
| 2 | +3.3V | 12 | -12V |
| 3 | GND | 13 | GND |
| 4 | VCC | 14 | PS_ON |
| 5 | GND | 15 | GND |
| 6 | VCC | 16 | GND |
| 7 | GND | 17 | GND |
| 8 | PWRGOOD | 18 | -5V |
| 9 | VSTDBY | 19 | VCC |
| 10 | +12V | 20 | VCC |

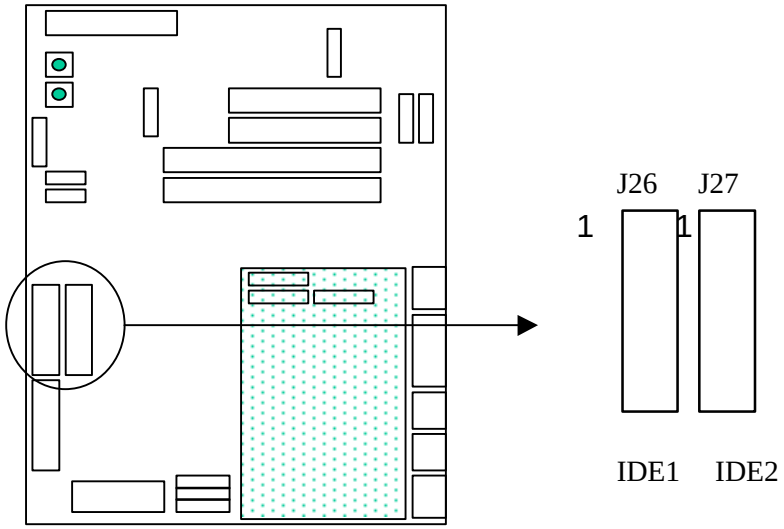
### 5.2.7 J25 CMOS Battery Connector




Connect the CMOS battery connector to either 1-4

### 5.2.8 J26, J27 IDE Connectors

The Enhanced IDE controller is built in the PCI-ISA bridge, two IDE connectors are on the motherboard to support both the enhanced IDE hard drives and the IDE CD-ROM. The IDE controller is part of the Winbond 553. See the Winbond 553 data book for additional information on the IDE controller.

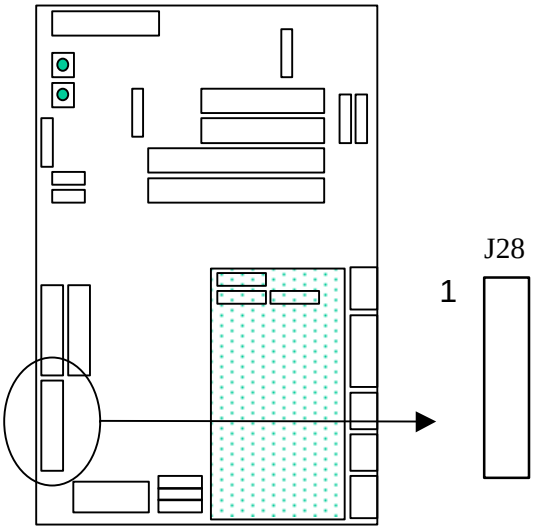



IDE connector pin assignment

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | IDERESET# | 2 | GND |
| 3 | IDED7 | 4 | IDED8 |
| 5 | IDED6 | 6 | IDED9 |
| 7 | IDED5 | 8 | IDED10 |
| 9 | IDED4 | 10 | IDED11 |
| 11 | IDED3 | 12 | IDED12 |
| 13 | IDED2 | 14 | IDED13 |
| 15 | IDED1 | 16 | IDED14 |
| 17 | IDED0 | 18 | IDED15 |
| 19 | GROUND | 20 | N.C. |
| 21 | IDEDRQ# | 22 | GND |
| 23 | IDEIOW# | 24 | GND |
| 25 | IDEIOR# | 26 | GND |
| 27 | N/C | 28 | IDEBALE |
| 29 | IDEACK# | 30 | GND |
| 31 | IDEIRQ | 32 | IDEIOCS16# |
| 33 | IDESA1 | 34 | N.C. |
| 35 | IDESA0 | 36 | IDESA2 |
| 37 | IDECS0# | 38 | IDECS1# |
| 39 | DISKLED# | 40 | GND |

### 5.2.9 J28 Floppy Disk Connector

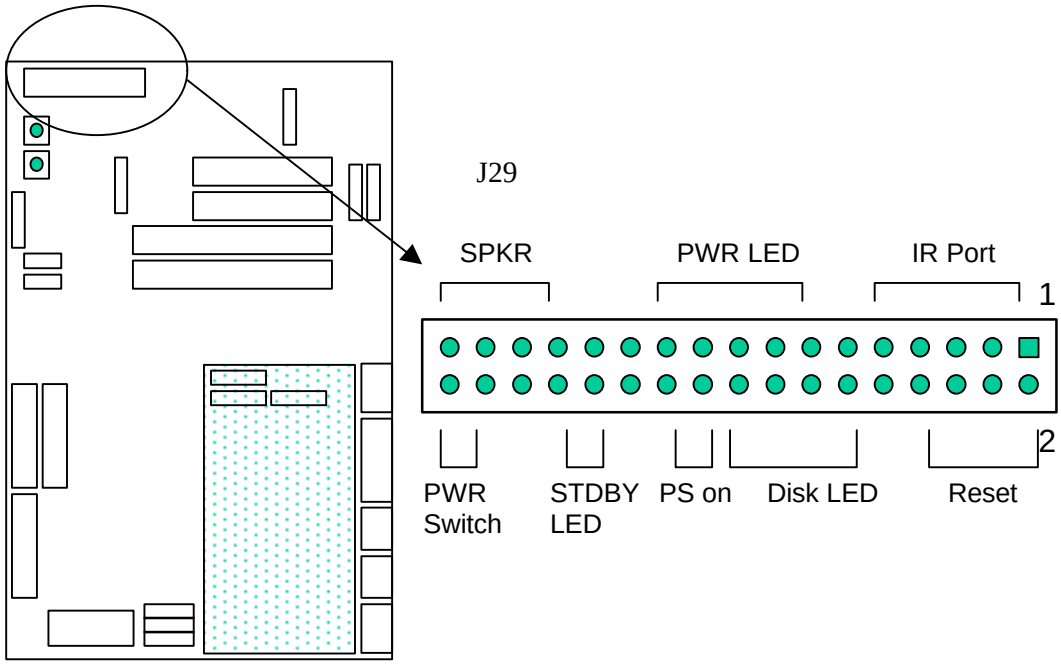
Sandpoint incorporates a 34-pin Floppy disk connector to support the floppy disk drive. The floppy controller is in the National 308 Super I/O chip. See National 308 data book for additional information.




The pin assignment of the PC standard floppy disk drive is as follows:

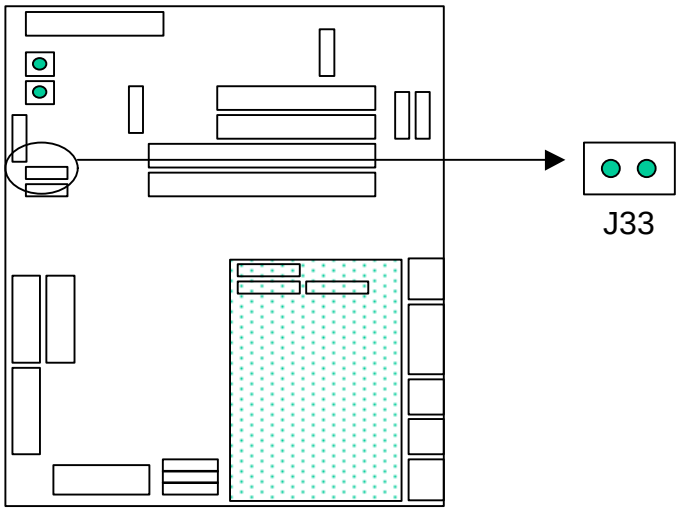
| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | Gnd | 2 | DENSEL |
| 3 | Gnd | 4 | NC |
| 5 | Gnd | 6 | NC |
| 7 | NC | 8 | INDEX# |
| 9 | Gnd | 10 | MTR0# |
| 11 | Gnd | 12 | DRVSEL1# |
| 13 | Gnd | 14 | DRVSEL0# |
| 15 | Gnd | 16 | MTR1# |
| 17 | MSEN1 | 18 | DIR# |
| 19 | Gnd | 20 | STEP# |
| 21 | Gnd | 22 | WDATA# |
| 23 | Gnd | 24 | WGATE# |
| 25 | Gnd | 26 | TRK0# |
| 27 | MSEN0 | 28 | WRTPRT# |
| 29 | Gnd | 30 | RDATA# |
| 31 | Gnd | 32 | HDSEL# |
| 33 | Gnd | 34 | DSKCHG# |

### 5.2.10 J29 Misc. Connectors




| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | VCC | 2 | GND |
| 3 | NC | 4 | RSTHDR# |
| 5 | IRRX | 6 | GND |
| 7 | GND | 8 | NC |
| 9 | IRTX | 10 | NC |
| 11 | NC | 12 | VCC |
| 13 | VCC | 14 | DISKLED# |
| 15 | NC | 16 | DISKLED# |
| 17 | GND | 18 | VCC |
| 19 | NC | 20 | PS_ON# |
| 21 | GND | 22 | GND |
| 23 | NC | 24 | NC |
| 25 | NC | 26 | VSTDBY |
| 27 | PCSPKR | 28 | GND |
| 29 | NC | 30 | NC |
| 31 | GND | 32 | PWR_A |
| 33 | VCC | 34 | PWR_B |

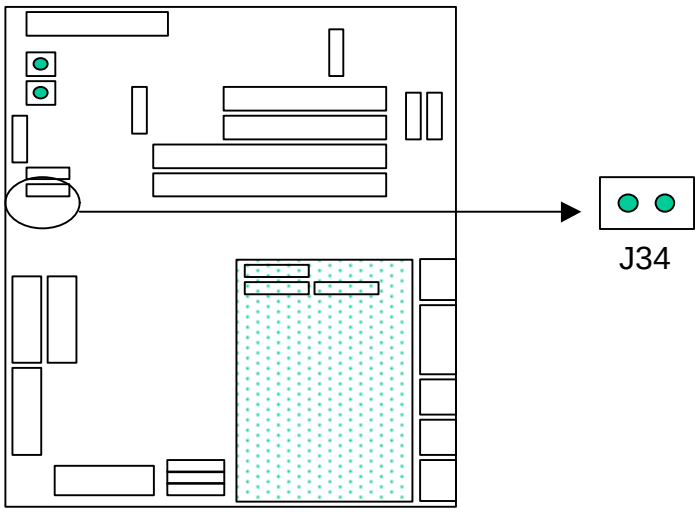
### 5.2.11 J33 Test Clock Input




If jumper J33 is installed, the on-board 66MHz oscillator is disabled and an external clock source is used to drive the PCI bus. The signal provided must be 3.3V LVTTL logic levels into a 50 ohms Load. The input clock is supplied as-is, or divided by two, depending upon the state of the M66EN (66MHz PCI) status and the 66MHz PCI Disable jumper.

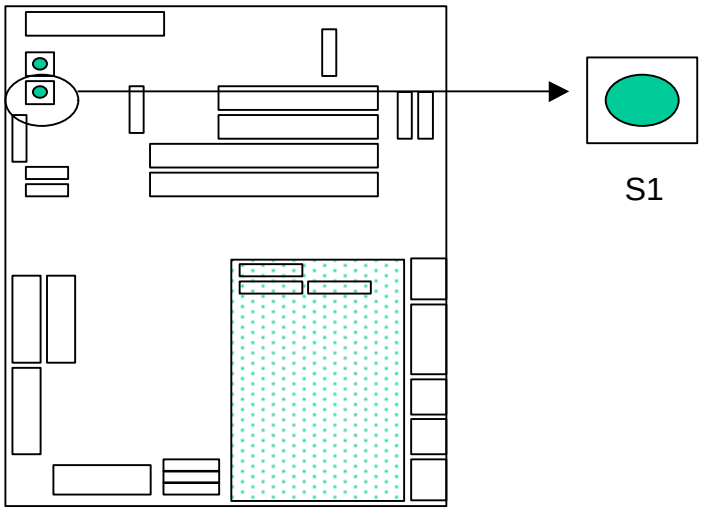
Care must be used that the devices receiving the clock are capable of and are configured to operate at the new clock speed. In particular, PowerPC devices have internal PLLs, which require a minimum clock input to operate properly.

### 5.2.12 J34 66MHZ PCI Disable



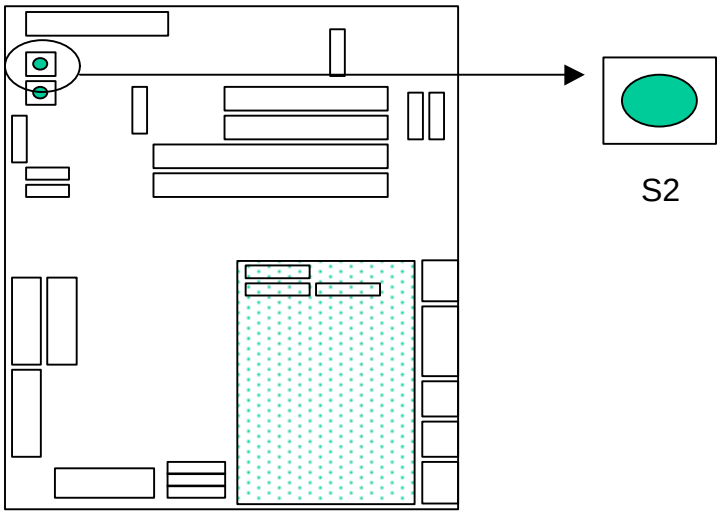

If jumper 34 is installed, the PCI bus will operate at 33MHz regardless of the status of the M66EN signal. The PCI bus ordinarily selects 66 MHz operation if (and only if) all PPMC and PCI devices installed support 66 MHz clock rates; otherwise, the slower 33MHz rate is used. However, for testing purposes, this jumper may be used to evaluate slower bus clock rates. In addition, it may be needed for systems using 66MHz-capable cards which also wish to use the Winbond or on-board I/O. Since these devices operate at 33MHz only, yet do not have an M66EN pin to control clock selection, jumper J34 is required to force the PCI bus to operate at 33MHz.

### 5.2.13 S1 Power ON/OFF Switch



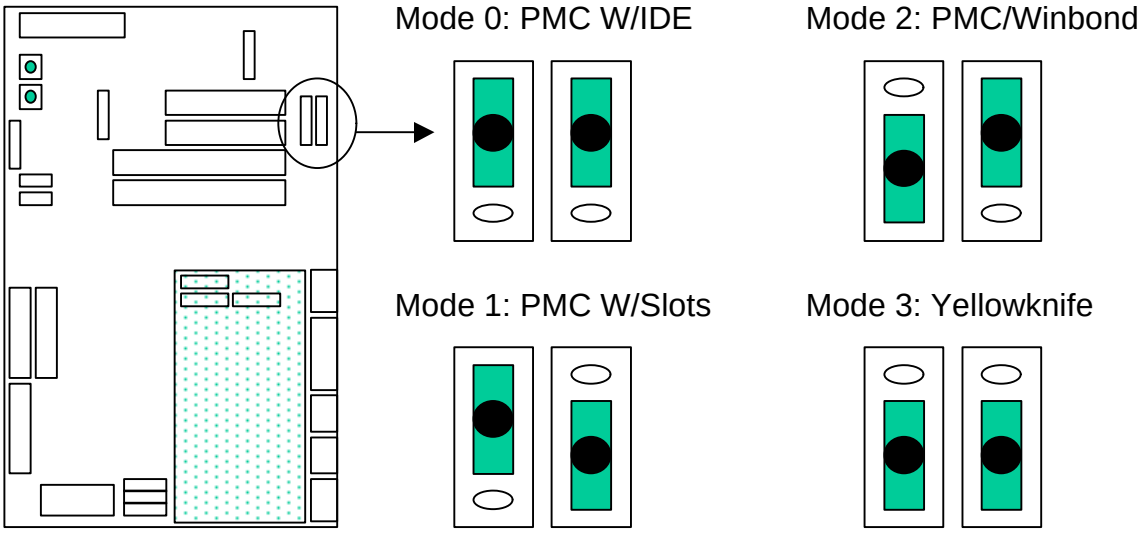

Press once to power up the system. Press again to power off the system.
SEE ERRATA

### 5.2.14 S2 Reset Switch




Press once to reset the system

### 5.2.15 S3, S4 Mode Selection Switch




To support existing Yellowknife/PPMC software environment, as well as the new Sandpoint/PPMC environment, Sandpoint supports four different modes, which are selectable via a pair of switches. The following table describes the modes.

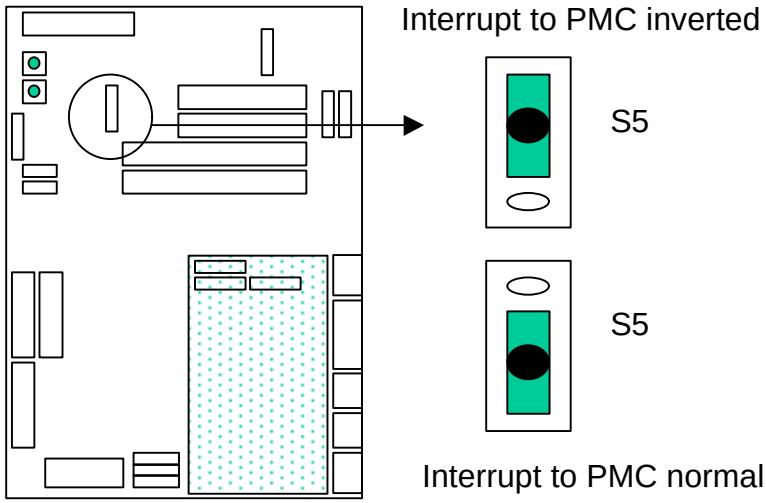
| Mode | | Name | Description |
|---|---|---|---|
| Default | 0 | PPMC Host With IDE | **PPMC Host Mode W/IDE support**: The PPMC slot is the system controller and provides arbitration and interrupt control. The Winbond IDE disk controllers replace slots 1 and 2 (3.3V PCI slots). The 5V PCI slots 3 and 4 are available. The on-board I/O shares interrupts with slots 2 or 3 |
| | 1 | PPMC Host with Slots | **PPMC Host Mode W/Four slot support**: The PPMC slot is the system controller and provides arbitration and interrupt control. The Winbond IDE disk controllers are unavailable. All slots are available. The on-board I/O shares interrupts with slots 2 or 3 |
| | 2 | PPMC/Winbond | **PPMC/Winbond Mode**: The PMC slot is an agent, and the Winbond provides arbitration and interrupt control. The Winbond interrupt output drives the INTA# pin of the PPMC slot. |
| | 3 | Yellowknife | **Yellowknife Mode**: The PPMC slot is an agent, and the Winbond provides arbitration and interrupt control. The Winbond interrupt output drives the INTA# pin of the forth PCI slot. |

Which mode should be selected? The first two modes are the principal modes, which will be used for new development, and can be selected between by deciding whether four PCI slots are needed or IDE is needed.

The Latter two modes are intended as transitional settings, and may be used to aid conversion from a modified Yellowknife platform, where a PPMC is connected through a PMC->PCI adapter card. This Yellowknife system is identical to a Sandpoint operating in mode 3. Mode 2 is architecturally similar except that the adapter card may be eliminated. Mode 2 is also useful for early PPMC cards such as the PPMC750, which do not include a PCI arbiter, since the Winbond provides this feature.

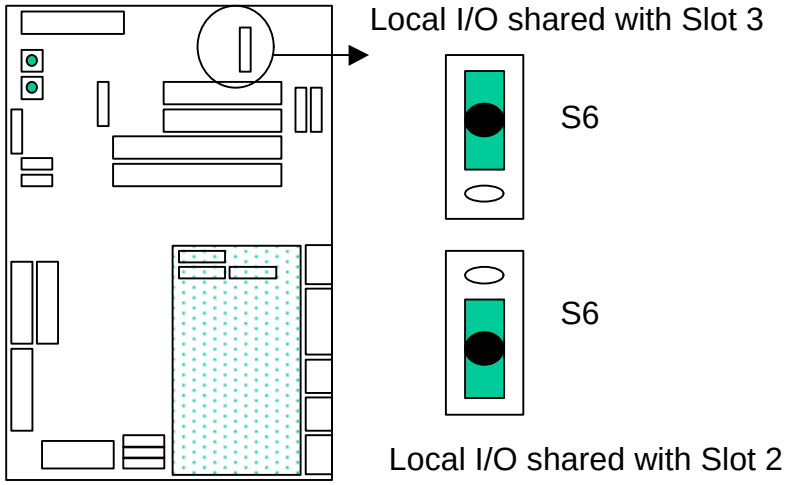
The Sandpoint board uses switches to select one of the four configuration choices. Logic on the Sandpoint host board switches the connections of the PCI request/grant signals, the PCI interrupt signals, and the component configuration mode (SYSCON#, ARBDIS#, etc) to provide the required environment. Appendix A shows how the different signals on the motherboard are interconnected.

### 5.2.16 S5 Interrupt Inversion Switch




Some PPMC cards, such as the PPMC8240, are configured with active-high interrupt input when operated in the default configuration, which conflicts with PCI requirements. This is one example in which the MPC8240 is not quite identical to an MPC603+MPC106, so software moved as-is from the Yellowknife to the PPMC8240 will find interrupts are not working. The short term work-around is to configure Sandpoint to invert the PMC interrupt signal; since this violates the specs, it is intended only for a short term assistance; the correct solution is to program the EPIC of the MPC8240 to accept the correct polarity.

### 5.2.17 S6 Shared interrupt Selection Switch




PPMC cards support up to four interrupt sources. When operating in modes 0 or 1, there are a total of five possible interrupt sources (four slots and the winbond PIC (handling the local I/O resources such as serial ports)). When on-board I/O is needed, it must be shared with or replace PCI devices in slot 2 or slot 3. Software must poll multiple sources to determine the interrupt source if both the slot and local I/O are needed; otherwise, the slot can be left unused or used with non-interrupting devices such as graphics cards.

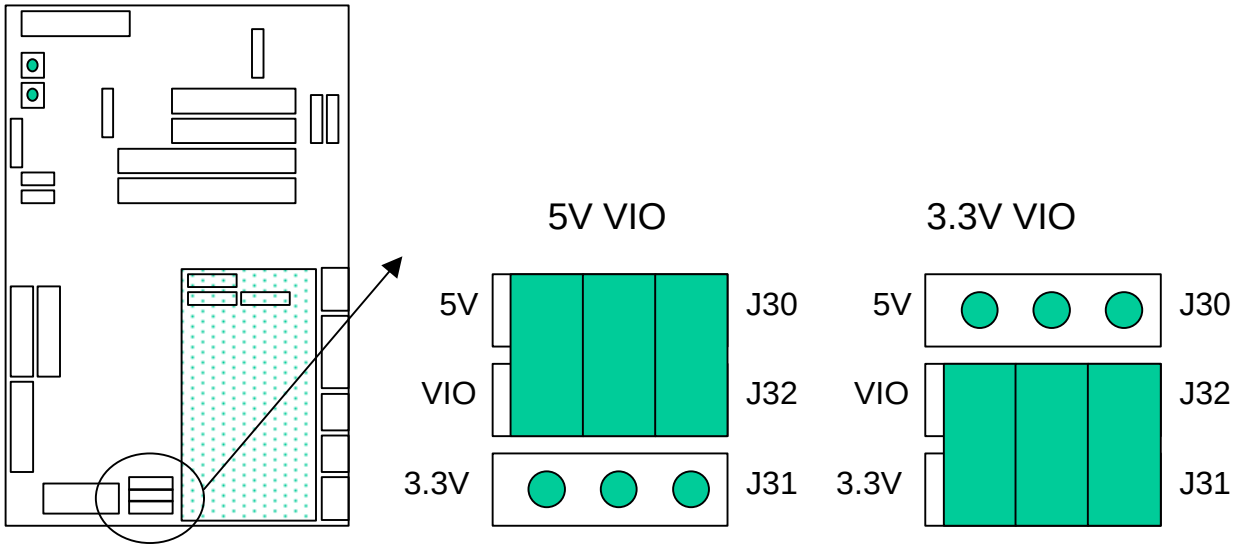
To select which slot replaces/shares interrupts with the Sandpoint local I/O, set the switch as shown above. This switch setting is ignored when the board is configured in modes 2 or 3.

### 5.2.18 J30, J31 and J32 VIO Selection

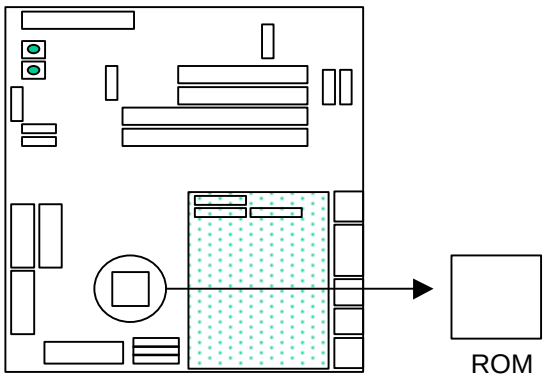
Jumpers J30, J31 and J32 are used to set the I/O voltage signaling level for the PPMC card. As with PCI slots, the PPMC slot provides the ability to provide I/O power on certain pins, and compatibility is maintained using keying methods (for PCI slots, a key is present in the slot, while for PPMC slots, a keying pin protrudes from the motherboard into the PPMC card). For flexibility in testing purposes, Sandpoint allows any types of VIO-Keyed board to be installed, with the proper VIO selected by jumper J30-J32.

NOTE: This flexibility requires that the Sandpoint be configured to match the PPMC card before powering up.

**NOTE: All three jumpers must be set in an identical fashion; if any are different, the power supply will short and the board can be damaged or destroyed.**



## 5.3 BOOT ROM




Sandpoint incorporates a boot ROM which is implemented as a 4Mb (512Kbx8) flash EPROM. The BootROM contains the DINK32 boot code to support basic debug function. See the DINK32 user's manual for more information.

The boot ROM is physically located on the ISA bus.

## 5.4 RTC AND NVRAM

Sandpoint incorporates an 8 KB battery-backed SRAM, which is organized as 8Kbx8 and is used for the storage of system configuration information such as:

- Passwords
- Boot record
- Global environment parameters
- Language data

## 5.5 DISPLAY

Sandpoint communicate with the terminal through serial port 1, the terminal needs to be VT-100 compatible.

## 5.6 IDE DRIVE (S)

Sandpoint includes logic for a PCI bus Master IDE Interface. Two connectors are located on the motherboard to support the primary and secondary interface.

## 5.7 HARD DRIVE ACTIVITY INDICATOR

The Sandpoint chassis incorporates a hard disk drive activity indicator that is ON when data is being transferred to/from any internal IDE drive.

## 5.8 FLOPPY DRIVE(S)

Sandpoint supports 3.5" standard PC floppy disk drive.

## 5.9 SPEAKER

A PC-type 2.5"--diameter speaker is mounted on the inside of the chassis.

## 5.10 POWER SUPPLY

Sandpoint incorporates a ATX format 250W PC-type power supply capable of supplying sufficient power at all required voltages to meet the needs of the supported motherboard, drives and add-in cards.

The power supply is switchable externally between 100V/60Hz and 220V/50Hz operations.

# 6 KEY COMPONENTS

The following table summarizes the key components used in the Sandpoint system:

| | |
|---|---|
| PCI-ISA Bridge | Winbond 83C553 |
| I/O Controller | National Semi PC87308VUL |
| Enhanced IDE controller | Built in the Winbond 83C553 |
| NVRAM (RTC) | Built in PC87308VUL |

## 6.1 WINBOND 83C553

The Sandpoint system uses the Winbond 83C553 PCI-ISA controller as a bridge to the ISA bus. This bridge provides the following functions:

- 100% PCI and ISA compatible
- Incorporates two 8237 DMA controllers
- High performance PCI arbiter
- Incorporates two 8259 interrupt controllers
- One 82C54 16-bit counter/timer
- Bus master IDE support for 4 IDE devices

For more information on the Winbond chip, please refer to their user's manual.

## 6.2 NATIONAL SEMICONDUCTOR PC87308

The PC87308 is a single chip super I/O controller. It incorporates in one fully Plug and Play compatible chip, a Floppy Disk controller, a Keyboard and mouse controller, a Real-time clock. two full function UARTs, infrared support, a full IEEE 1284 parallel port, three general purpose chip select signals, and support for power management functions.
PC87308 also provide interface to the external SRAMs to provide the NVRAM functions.

# 7 DINK32 DEBUG MONITOR

.

Sandpoint is shipped with DINK32 boot firmware. DINK32 is a flexible software tool enabling evaluation and debugging of the PowerPC 32-bit microprocessor. DINK32 is designed to be both a hardware and software-debugging tool. DINK32 was written in ANSI C and built with modular routines around a central core. Only a few necessary functions were written in PowerPC assembly.

The DINK32 provides the following functions:

- Modification and display of general purpose, floating point, and special purpose registers
- Assembly and disassembly of PowerPC instructions for modification and display of code
- Single-step race and continued execution from a specified address
- Modification, display, and movement of system memory
- Setting, displaying and removing breakpoints
- Automatic decompression of compressed s-record files while downloading
- Extensive on-line help
- Ability to execute user-assembled and/or download software in a controlled environment
- Logging function for generating a transcript of a debugging session
- Two command sets for novice and experienced users

Please refer to http://www.mot.com/SPS/PowerPC/teksupport/tools/DINK32/index.html for more information.

# 8 INTERRUPT CONFIGURATION

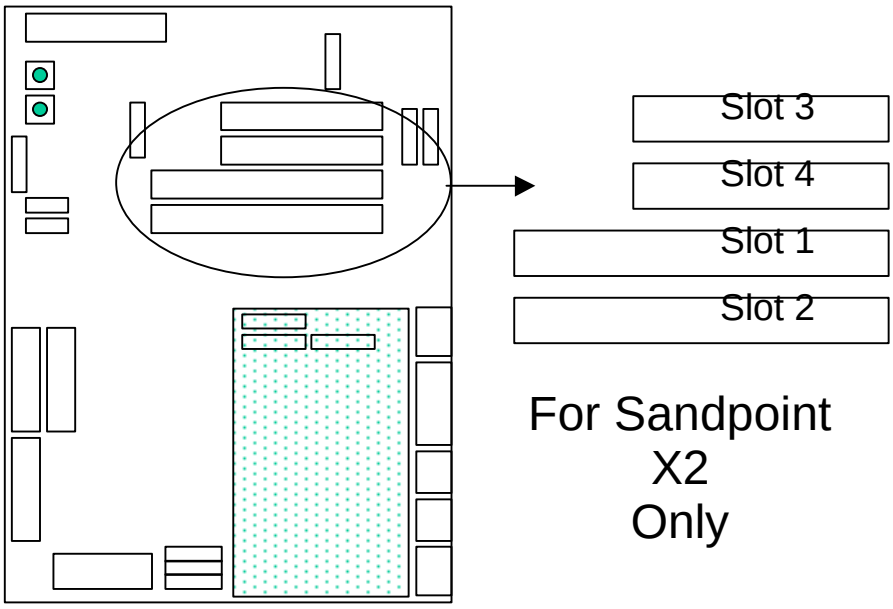
The following table descirbes the interrupt sources seen by the PMC when the Sandpoint has been configured for mode 0. This is the default configuration, and assumes that the on-board I/O interrupt is shared with slot 1 (also the default)

| PMC Interrupt Line (INT(0-3)) | | | | Description |
|---|---|---|---|---|
| **0** | **1** | **2** | **3** | |
| Slot 1 **INTA#** | Slot 2 **INTA#** | Slot3 **INTA#** | Slot 4 **INTA#** | Each slot's primary interrupt output (INTA) is routed to a corresponding interrupt input on the PMC card. |
| Slot 2 **INTB#** | Slot 3 **INTB#** | Slot 4 **INTB#** | Slot 1 **INTB#** | |
| Slot 3 **INTC#** | Slot 4 **INTC#** | Slot 1 **INTC#** | Slot 2 **INTC#** | |
| Slot 4 **INTD#** | Slot 1 **INTD#** | Slot 2 **INTD#** | Slot 3 **INTD#** | |
| | SIOINT# | | | On-board I/O interrupts are shared with "slot 2" by default |

# 9 PCI SLOT INFORMATION

The following table describes the PCI slot information of the Sandpoint host board. This information is constant for any mode selected.

| PCI Slot/ Device | Physical Location | Configuration IDSEL | Configuration Address | Note |
|---|---|---|---|---|
| Winbond | N/A | AD11 | 0x8000_08XX | |
| 1 | Second-nearest PMC | AD13 | 0x8000_20XX | **Slot 1 and 2 are mis-labeled on Sandpoint X2 version; the actual ordering is 2-1-4-3 (from the PMC outward)** |
| 2 | Nearest PMC | AD14 | 0x8000_40XX | |
| 3 | Third-from PMC | AD15 | 0x8000_80XX | |
| 4 | Furthest from PMC | AD16 | 0x8001_00XX | |
| | | | | |



# APPENDIX A: INTERCONNECTION DIAGRAM