Netra™ CP2140 Technical Reference and Installation Manual

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Safety Agency Compliance Statements

Read this section before beginning any procedure. The following text provides safety precautions to follow when installing a Sun Microsystems product.

Safety Precautions

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.

Symbols

The following symbols may appear in this book:

Caution – There is a risk of personal injury and equipment damage. Follow the instructions.

Caution – Hot surface. Avoid contact. Surfaces are hot and may cause personal injury if touched.

Caution – Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

On – Applies AC power to the system.

Depending on the type of power switch your device has, one of the following symbols may be used:

Off – Removes AC power from the system.

Standby – The On/Standby switch is in the standby position.

Modifications to Equipment

Do not make mechanical or electrical modifications to the equipment. Sun Microsystems is not responsible for regulatory compliance of a modified Sun product.

Placement of a Sun Product

Caution – Do not block or cover the openings of your Sun product. Never place a Sun product near a radiator or heat register. Failure to follow these guidelines can cause overheating and affect the reliability of your Sun product.

Noise Level

In compliance with the requirements defined in DIN 45635 Part 1000, the workplace-dependent noise level of this product is less than 70Db(A).

SELV Compliance

Safety status of I/O connections comply to SELV requirements.

Power Cord Connection

Caution – Sun products are designed to work with power systems having a grounded neutral (grounded return for DC-powered products). To reduce the risk of electric shock, do not plug Sun products into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.

Caution – Not all power cords have the same current ratings. Household extension cords do not have overload protection and are not meant for use with computer systems. Do not use household extension cords with your Sun product.

The following caution applies only to devices with a Standby power switch:

Caution – The power switch of this product functions as a standby type device only. The power cord serves as the primary disconnect device for the system. Be sure to plug the power cord into a grounded power outlet that is nearby the system and is readily accessible. Do not connect the power cord when the power supply has been removed from the system chassis.

The following caution applies only to devices with multiple power cords:

Caution – For products with multiple power cords, all power cords must be disconnected to completely remove power from the system.

Battery Warning

Caution – There is danger of explosion if batteries are mishandled or incorrectly replaced. On systems with replaceable batteries, replace only with the same manufacturer and type or equivalent type recommended by the manufacturer per the instructions provided in the product service manual. Do not disassemble batteries or attempt to recharge them outside the system. Do not dispose of batteries in fire. Dispose of batteries properly in accordance with the manufacturer's instructions and local regulations. Note that on Sun CPU boards, there is a lithium battery molded into the real-time clock. These batteries are not customer replaceable parts.

System Unit Cover

You must remove the cover of your Sun computer system unit to add cards, memory, or internal storage devices. Be sure to replace the cover before powering on your computer system.

Caution – Do not operate Sun products without the cover in place. Failure to take this precaution may result in personal injury and system damage.

Rack System Warning

The following warnings apply to Racks and Rack Mounted systems.

Caution – For safety, equipment should always be loaded from the bottom up. That is, install the equipment that will be mounted in the lowest part of the rack first, then the next higher systems, etc.

Caution – To prevent the rack from tipping during equipment installation, the anti-tilt bar on the rack must be deployed.

Laser Compliance Notice

Sun products that use laser technology comply with Class 1 laser requirements.

Class 1 Laser Product
Luokan 1 Laserlaite
Klasse 1 Laser Apparat
Laser Klasse 1

CD and DVD Devices

The following caution applies to CD, DVD, and other optical devices.

Caution – Use of controls, adjustments, or the performance of procedures other than those specified herein may result in hazardous radiation exposure.

Nordic Lithium Battery Cautions

Norge

ADVARSEL – Litiumbatteri — Eksplosjonsfare.Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

Sverige

VARNING – Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

Danmark

ADVARSEL! – Litiumbatteri — Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

Suomi

VAROITUS – Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Regulatory Compliance Statements

Your Sun product is marked to indicate its compliance class:

- Federal Communications Commission (FCC) — USA
- Industry Canada Equipment Standard for Digital Equipment (ICES-003) — Canada
- Voluntary Control Council for Interference (VCCI) — Japan
- Bureau of Standards Metrology and Inspection (BSMI) — Taiwan

Please read the appropriate section that corresponds to the marking on your Sun product before attempting to install the product.

FCC Class A Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if it is not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

FCC Class B Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / television technician for help.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

Shielded Cables

Hardwire connections between the workstations and peripherals must be made using shielded cables to comply with radio frequency emission limits. Hardwire Network connections can be made using unshielded twisted-pair (UTP) cables.

ICES-003 Class A Notice - Avis NMB-003, Classe A

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

ICES-003 Class B Notice - Avis NMB-003, Classe B

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

VCCI 基準について

クラス A VCCI 基準について

クラス A VCCI の表示があるワークステーションおよびオプション製品は、クラス A 情報技術装置です。これらの製品には、下記の項目が該当します。

この装置は、情報処理装置等電波障害自主規制協議会 (VCCI) の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

クラス B VCCI 基準について

クラス B VCCI の表示  があるワークステーションおよびオプション製品は、クラス B 情報技術装置です。これらの製品には、下記の項目が該当します。

この装置は、情報処理装置等電波障害自主規制協議会 (VCCI) の基準に基づくクラス B 情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。取扱説明書に従って正しい取り扱いをしてください。

BSMI Class A Notice

The following statement is applicable to products shipped to Taiwan and marked as Class A on the product compliance

label.

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻 干擾，在這種情況下，使用者 會被要求採取某些適當的對策。

Declaration of Conformity

Compliance Model Number: CP2140F
Product Family Name: Netra CP2140 (Universal CompactPCI Board)

EMC

USA—FCC Class B

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This equipment may not cause harmful interference.
2. This equipment must accept any interference that may cause undesired operation.

European Union

This equipment complies with the following requirements of the EMC Directive 89/336/EEC:

As Telecommunication Network Equipment (TNE) in Both Telecom and Other Than Telecom Centers per (as applicable)*:*

EN300-386 V.1.3.1 (09-2001) Required Limits:

EN55022/CISPR22	Class B
EN61000-3-2	Pass
EN61000-3-3	Pass
EN61000-4-2	6 kV (Direct), 8 kV (Air)
EN61000-4-3	3 V/m 80-1000MHz, 10V/m 800-960 MHz and 1400-2000 MHz
EN61000-4-4	1 kV AC and DC Power Lines, 0.5 kV Signal Lines
EN61000-4-5	2 kV AC Line-Gnd, 1 kV AC Line-Line and Outdoor Signal Lines, 0.5 kV Indoor Signal Lines > 10m.
EN61000-4-6	3 V
EN61000-4-11	Pass

As Information Technology Equipment (ITE) Class B per (as applicable)*:*

EN55022:1998/CISPR22:1997	Class B
EN55024:1998 Required Limits:	
EN61000-4-2	4 kV (Direct), 8 kV (Air)
EN61000-4-3	3 V/m
EN61000-4-4	1 kV AC Power Lines, 0.5 kV Signal Lines and DC Power Lines
EN61000-4-5	1 kV AC Line-Line and Outdoor Signal Lines, 2kV AC Line-Gnd, 0.5 kV DC Power Lines
EN61000-4-6	3 V
EN61000-4-8	1 A/m
EN61000-4-11	Pass
EN61000-3-2:1995 + A1,A2,A14	Pass
EN61000-3-3:1995	Pass

Safety

This equipment complies with the following requirements of the Low Voltage Directive 73/23/EEC:

EC Type Examination Certificates:

EN 60950:1992, 2nd Edition, Amendments 1, 2, 3, 4, 11	TÜV Rheinland Certificate No. R2172589
UL 60950, 3rd Edition, CSA C22.2 No. 950-00	File: E138989 Vol. 21 Sec. 2

Supplementary Information: This product was tested and complies with all the requirements for the CE Mark.

/S/
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Declaration of Conformity

Compliance Model Number: CP2140R
Product Family Name: Netra CP2140 (Universal CompactPCI Board)

EMC

USA—FCC Class A

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This equipment may not cause harmful interference.
2. This equipment must accept any interference that may cause undesired operation.

European Union

This equipment complies with the following requirements of the EMC Directive 89/336/EEC:

As Telecommunication Network Equipment (TNE) in Both Telecom and Other Than Telecom Centers per (as applicable)*:*

EN300-386 V.1.3.1 (09-2001) Required Limits:

EN55022/CISPR22	Class A
EN61000-3-2	Pass
EN61000-3-3	Pass
EN61000-4-2	6 kV (Direct), 8 kV (Air)
EN61000-4-3	3 V/m 80-1000 MHz, 10 V/m 800-960 MHz and 1400-2000 MHz
EN61000-4-4	1 kV AC and DC Power Lines, 0.5 kV Signal Lines
EN61000-4-5	2 kV AC Line-Gnd, 1 kV AC Line-Line and Outdoor Signal Lines, 0.5 kV Indoor Signal Lines > 10m.
EN61000-4-6	3 V
EN61000-4-11	Pass

As Information Technology Equipment (ITE) Class A per (as applicable)*:*

EN55022:1998/CISPR22:1997	Class A

EN55024:1998 Required Limits:

EN61000-4-2	4 kV (Direct), 8 kV (Air)
EN61000-4-3	3 V/m
EN61000-4-4	1 kV AC Power Lines, 0.5 kV Signal Lines and DC Power Lines
EN61000-4-5	1 kV AC Line-Line and Outdoor Signal Lines, 2kV AC Line-Gnd, 0.5 kV DC Power Lines
EN61000-4-6	3 V
EN61000-4-8	1 A/m
EN61000-4-11	Pass
EN61000-3-2:1995 + A1,A2,A14	Pass
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Preface

The Netra™ CP2140 CompactPCI board is designed to address critical applications in the core network and access network infrastructures, including wireless infrastructure.

The Netra CP2140 board CompactPCI board incorporates a 650-MHz UltraSPARC™ IIi processor and runs on Solaris™ 8 Operating Environment. This board also supports advanced architectural capabilities for next-generation network infrastructure requirements.

The *Netra CP2140 Technical Reference and Installation Manual* (816-4908-*xx*) describes the functions of the CP2140 board, its controls, indicators, connectors, pinouts, boot sequence, and specifications. It also provides some mechanical drawings of the board.

Who Should Use This Book

The *Netra CP2140 Technical Reference and Installation Manual* is written for computer hardware engineers, system programmers, computer technicians, and others involved in the integration of the Netra CP2140 board. References are provided for further details.

How This Book Is Organized

The *Netra CP2140 Technical Reference and Installation Manual* is organized as follows:

Chapter 1 explains the capabilities and major features of the Netra CP2140 board.

Chapter 2 describes how to install the Netra CP2140 board in different configurations.

Chapter 3 provides a summary of specifications of the Netra CP2140 board.

Chapter 4 provides a short description of the function of each block on the Netra CP2140 board.

Chapter 5 describes the sequence of events that occur at power up in a reference configuration.

Chapter 6 describes the structure and function of initialization firmware. It also provides information on the Netra CP2140 board system OpenBoot™ firmware.

Appendix A describes the pinouts of the connectors on the Netra CP2140 board. Also provided are the illustrations of all the major connectors.

Appendix B contains mechanical drawings of the Netra CP2140 board.

Appendix C describes the Sun Validation Test Suite (SunVTS™) software, a comprehensive package that tests and validates the Netra CP2140 board by verifying the configuration and functions of most hardware controllers and devices on the motherboard.

Appendix D describes how to access the Solaris Sun FRU ID information on the Netra CP2140 board.

Related References

Specifications and Standards:

- *IEEE Standard 1275-1994, Standard For Boot (Initialization, Configuration) Firmware,* Core Practices and Requirements
- *IEEE Standard 1275.1-1994, Standard For Boot (Initialization, Configuration) Firmware,* ISA Supplement for IEEE P1754 (SPARC)
- *IEEE Standard P1275.6/D4, Standard For Boot (Initialization, Configuration) Firmware, 64-Bit Extensions*

- *PCI Bus Binding to IEEE 1275-1994, Standard for Boot (Initialization, Configuration) Firmware*, Revision 1.0, 14 April 1994, Prepared by the Open Firmware Task Force of the PCI Alliance

Integrated Circuit Specifications:

SME1040 Highly Integrated 64-bit RISC Processor, PCI Interface Data Sheet (805-0086-02)

- *STP2003QFP PCI Input Output Controller (PCIO) User's Manual* (802-7837-01)
- *STP2210QFP Reset/Interrupt/Clock Controller (RIC) User's Manual* (805-0167-01)
- *SME2411BGA-66 Advanced PCI Bridge (APB) User's Manual* (805-1251-01)
- *Intelligent Chassis Management Bus Bridge Specification*, version 1.0, published by Intel, Hewlett-Packard, NEC and Dell

Sun Microsystems Publications

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System Architecture:

- *The SPARC Architecture Manual, Version 9*, David L. Weaver and Tom Germond, editors, PTR Prentice Hall (ISBN: 0130992275)
- *PCI System Architecture*, by Shanley and Anderson, Inc. MindShare Press (ISBN: 0201309742)
- *Solaris 8 7/01 Release Notes (SPARC Platform Edition)* (806-7942-11) FCS
- *Solaris 8 Installation Supplement* (806-7500-10)
- *Solaris 8 Desktop User Supplement* (806-7501-10)
- *Solaris 8 System Administration Supplement* (806-7502-10)
- *Solaris 8 Software Developer Supplement* (806-7503-10)
- *OpenBoot 3.X Command Reference Manual* (802-5837-10)
- *OpenBoot 3.X Command Supplement for PCI (Solaris 2.5.1, 8/97)* (805-1627-10)
- *Writing Fcode 3.x Programs* (802-6287-10)
- *ASM Utilization and Calibration Application Note* (805-4877-01)
- *SunVTS 2.1 SunVTS User's Guide* (802-7299) August 1997, Rev. A
- *SunVTS Quick Reference Card* (802-7301) August 1997, Rev. A
- *SunVTS 2.1.3 Test Reference Manual* (805-4163-10) May 1998, Rev. A

- *SunVTS 4.2 User's Guide* (part no. 806-6515-*xx*)
- *SunVTS 4.2 Test Reference* (part no. 806-6516-*xx*)

Reference Documents

- *XCP2040-TRN I/O Transition Card Manual for Netra CP2040/CP2140 cPCI Board* (806-6743-*xx*)
- *Netra CP2140 Board Product Note* (816-4870-*xx*)
- *PICMG® 2.0 R3.0 CompactPCI® Specification*
- *PCI Local Bus Specification, Revision 2.1*, PCI Special Interest Group, Portland
- *OpenBoot 3.x Command Reference*, Sun Microsystems (802-5837-10, Rev A)
- *PCI Bus Binding to IEEE 1275-1994, Standard for Boot (Initialization, Configuration) Firmware*, Revision 1.0, 14 April 1994, Prepared by the Open Firmware Task Force of the PCI Alliance
- *OpenBoot 3.x Command Supplement for PCI*, Sun Microsystems (805-1627-10)
- *PCIO PCI Input Output Controller User's Manual* (802-7837-*xx*)

Typographic Conventions

Typeface	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
`AaBbCc123`	What you type, when contrasted with on-screen computer output	`% su` `Password:`
AaBbCc12	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be superuser to do this.
AaBbCc123	Command-line variable; replace with a real name or value	To delete a file, type `rm` *filename*.

Shell Prompts

Shell	Prompt
C shell prompt (in Solaris)	*machine-name*%
C shell superuser prompt (in Solaris)	*machine-name*#
Bourne shell and Korn shell prompt	$
Bourne shell and Korn shell superuser prompt	#
OpenBoot PROM prompt	ok

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You can view and print a broad selection of Sun™ documentation, including localized versions, at:

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You can also purchase printed copies of select Sun documentation from iUniverse, the Sun documentation provider, at:

`http://corppub.iuniverse.com/marketplace/sun/`

Sun Welcomes Your Comments

Sun is interested in improving its documentation and welcomes your comments and suggestions. You can email your comments to Sun at:

`docfeedback@sun.com`

Please include the part number (816-4908-10) of your document in the subject line of your email.

CHAPTER 1

Introduction

The Netra CP2140 CompactPCI board incorporates a 650-MHz UltraSPARC IIi processor and uses the Solaris 8 operating environment in order to meet enhanced availability requirements. This board also supports advanced architectural capabilities for next-generation network infrastructure requirements.

The Netra CP2140 board is a crucial building block in developing carrier-grade systems. It can function either as a system controller or as a satellite board. As a modular solution, the Netra CP2140 board is easy to configure and install. It is designed to support next-generation requirements, in conjunction with the Netra CP2060/CP2080 satellite CompactPCI boards, for continuous uptime in the core network and access network infrastructures.

The Netra CP2140 board complies with the PICMG CompactPCI 3.0 specification. In the system host role, the Netra CP2140 board supports *Basic*, *Full,* and *High-Availability* hot swap. FIGURE 1-1 shows the Netra CP2140 board.

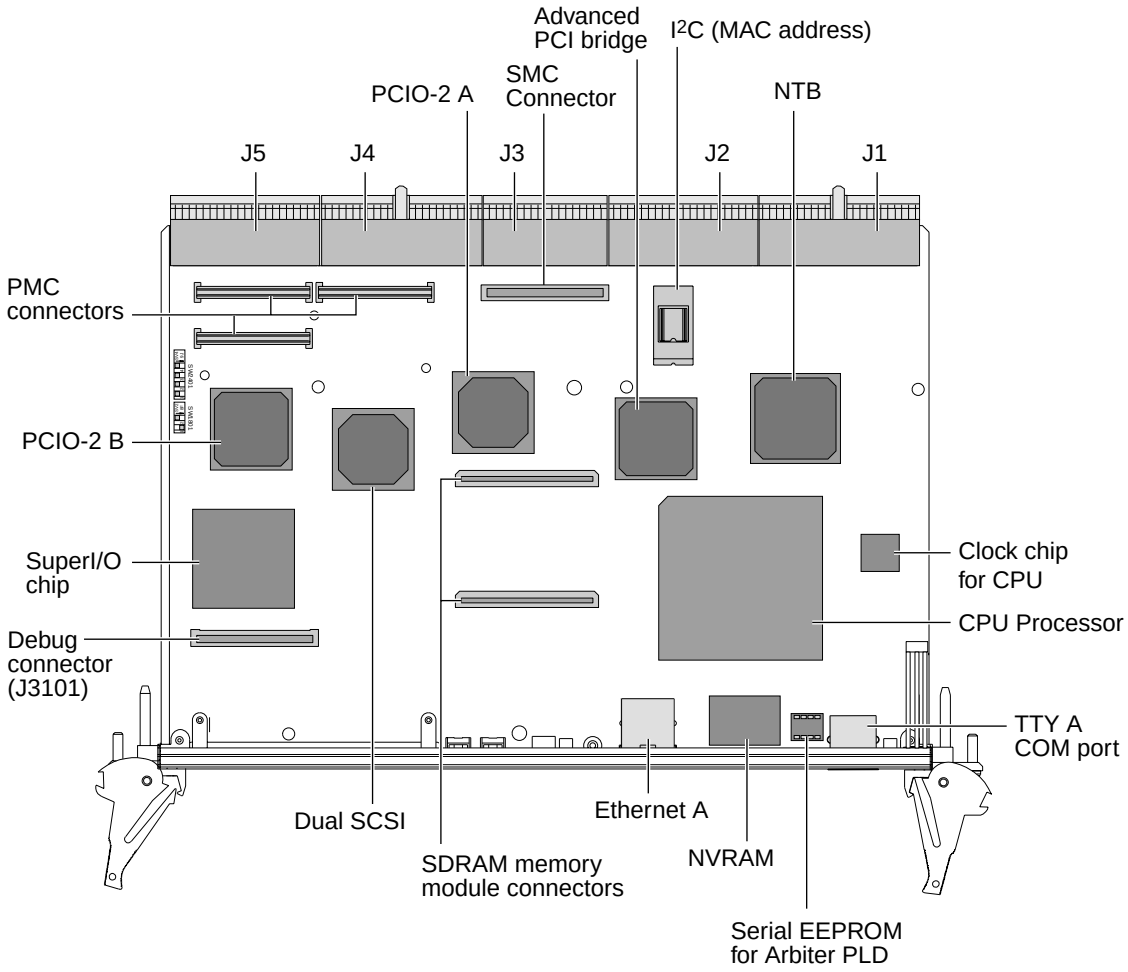


FIGURE 1-1 Netra CP2140 Board (Without Heat Sink)

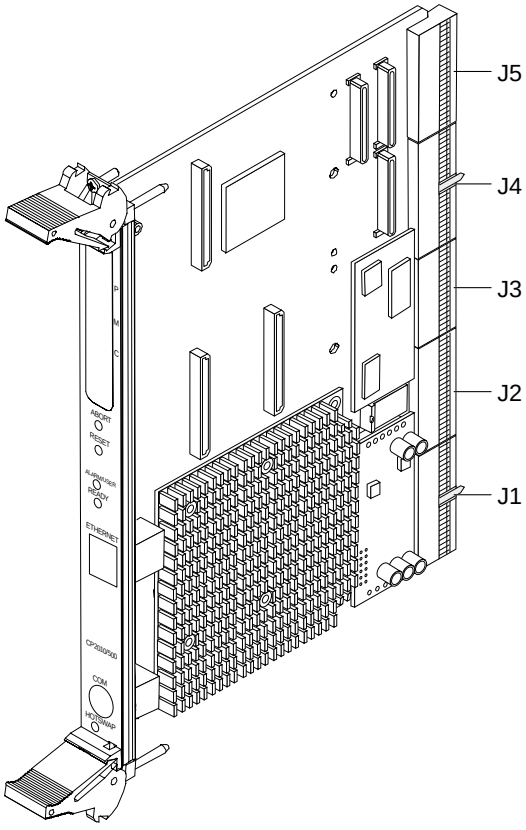


FIGURE 1-2 Typical Netra CP2140 Board System Host or Satellite Host Board

Caution – The CPU module, heat sink, System Management Controller, and power module are all integral to the Netra CP2140 board. Any attempt to disassemble or replace these devices on the board voids the warranty (see FIGURE 4-1 for location of devices).

1.1 Netra CP2140 Board System Configuration

Systems that conform to CompactPCI specifications require differentiation of chassis board slots depending upon the mode in which a board is to function.

To function as a System Host, a CP2140 processor includes connections to distribute PCI clocks and to receive interrupts from peripherals. It must also be situated in a System Host slot in the CompactPCI segment because only these chassis slots have backplane wiring with the full set of connections required to enable the System Host function. The CP2140 directly controls the CompactPCI peripheral hardware. Netra CP2140 boards assume a System Host role when installed in a PICMG system slot. A system slot is marked with an open triangle legend specified in *CompactPCI Specification*, PICMG 2.0 R3.0.

The CP2140 can be installed in one of the remaining (non-System Host) slots if the user wants to use it as a Satellite Host.

The simplest configurations of the Netra CP2140 board are shown in FIGURE 1-3. They contain one System Host that can supply any input/output (I/O) required by itself (a), or use an added I/O board (b). There is no redundancy in either of these arrangements.

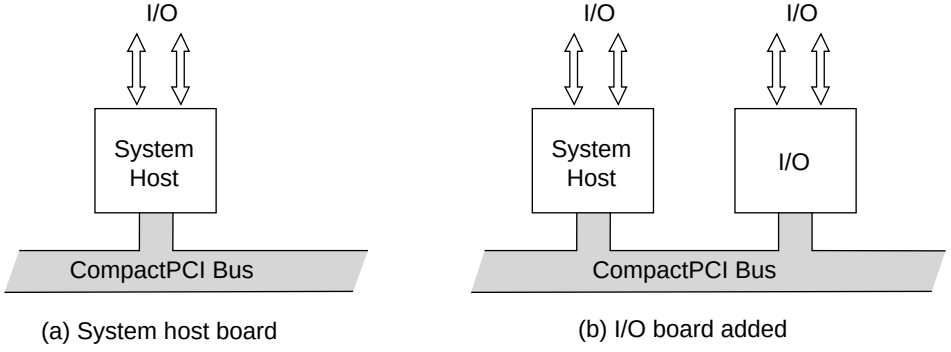


FIGURE 1-3 Non-redundant Netra CP2140 Board HA Configuration - One System Host Board

Satellite Hosts do not control any peripheral I/O outside their own board and are typically used to perform independent processor-intensive tasks.

1.2 Features of Netra CP2140 Board CompactPCI Host Board

The CP2140 is designed to support hot-swap operation, system management, and environmental monitoring. These functions are implemented in the *System Management Controller* which is designed as a mezzanine module on the CP2140. In addition, the CP2140 has PCI mezzanine connectors that enable the connection of a compatible PMC peripheral. The CP2140 supports two 10/100Mbps Ethernet ports and two serial ports, two universal serial bus (USB) ports, two SCSI ports, floppy port, and PS/2 keyboard and mouse port.

TABLE 1-1 summarizes the key features of the CP2140.

TABLE 1-1 Netra CP2140 Board Features

Feature	Description
CPU	UltraSPARC IIi 650 MHz processor with internal 512KB integrated cache
Memory	No on-board memory. Up to 2GB memory is supported via the following memory modules: • 2x512MB single-wide memory, 2x1GB double-wide memory • Installation of a double-wide memory module makes the PMC slot unusable • A maximum of two memory modules can be stacked together.
CompactPCI Bus interface	64 bit, 33 MHz, #5V bus interface
Power requirement	At approximately 20W (with 512MB) and 32W (with 2GB) at 650MHz (excluding PMC power)**. These figures are application dependant.**
PICMG compliance	Meets PICMG CompactPCI 3.0 and PCI revision 2.1 specifications
Availability	Carrier-grade
Host-mode support	Universal
IPMI compliance	The on-board SMC supports the following IPMI commands as specified in the IPMI Specification v1.1.0 Rev 1.1: • Global commands • Watchdog timer commands. Level 1 and Level 2 watchdog timer commands are supported. • Event commands • FRU commands • Sensor Device commands

TABLE 1-1 Netra CP2140 Board Features *(Continued)*

Feature	Description
Hot-swap support	• Basic, Full and HA hot swap supported when installed in the System Controller slot of a Sun proprietary HA hot-swap backplane. • Supports both basic and full hot-swap functions when installed in the System Controller slot of a standard full hot-swap chassis.
Operating environment	Solaris 8 2/02 or subsequent compatible version with *CP2000 Supplemental CD 4.0 for Solaris 8* (*CP2000 Supplemental CD 3.1 for Solaris 8* can also be used with the CP2140 board, but it does not contain all of the features of CD 4.0).
Ethernet support	Dual 10/100Mbit Ethernet with MII interface to the backplane. Ethernet A port is also routed to the front panel with on-board PHY and magnetics (only front or rear access of this Ethernet A port is enabled, no simultaneous accesses to this port are permitted)
I/O	• Dual Async serial ports via dual mini-DB9 (non-standard) connectors on transition card • One console serial port brought to front panel via a DIN 8 connector • Dual USB ports on the transition card. Each USB port is driven by individual controllers (both USBs routed to the CompactPCI backplane via the J5/P5 connector) • IPMI I^2C bus is routed to the CompactPCI backplane via J1/P1. This can be bused to all slots on the CompactPCI backplane • One I^2C bus routed to the transition board via the J5/P5 connector
Backplane I/O—accessible through rear transition card faceplate	• Two RS 232 serial ports • Two SCSI ports • One cutout to support the use of a PIM card on the transition card panel. • Access to a floppy port, parallel port, a keyboard and a mouse port. The use of these ports would consume 2U space. • Provision to add one IHV-supplied PCI Interface Module (PIM) I/O port when used with transition card
CompactPCI interface	• Compliant with PICMG 2.0 R3.0 Compact PCI Bus Specification for 33 MHz PCI speed • Supports both 32-bit and 64-bit Compact PCI I/O boards • CompactPCI interface supports only +5Volt PCI environment • Compliant with PICMG 2.1 R1.0 Compact PCI hot swap • Specification in Basic, Full and HA hot swap • Compliant either as a System Controller or as a satellite board

TABLE 1-1 Netra CP2140 Board Features *(Continued)*

Feature	Description
Disk interface	Dual single ended channel Ultra-SCSI that can support up to 40MB/sec data transfer rate. Both SCSI connectors are brought out to the Transition Card.
PMC support	• Supports up to one PMC slot* • Compliant with CMC Standard IEEE-P1386.1, PMC mezzanine modules specification • PMC slot supports only +5V PCI environment • Mapping of 64 user-defined PMC I/O signals to J3/P3 on CompactPCI backplane • Provision for adding one IHV supplied PMC expansion port on front panel
PIM support	Compliant with PMC I/O Module Standard, VIT 36-199X, Draft VTA Standards Organization. Can be achieved when using Sun designed transition card for CP2140.
Watchdog timer	Two levels of watchdog timer are supported: • Level 1 causes an interrupt to the SPARC processor. • Level 2 causes the system to reset, power down, or power cycle.
NVRAM/TOD	8KB of non-volatile memory storage and TOD
System flash	1 MB onboard
User flash	8MB (2 x 4MB)
Building compliance	NEBS Level 3
Flash update	Supported from downloaded file
Physical dimensions	Standard 6U CompactPCI form factor. Fits into a single CompactPCI slot with two memory modules installed.

* One PMC card is supported with the use of single-wide memory module/s. No PMC slot is supported with the use of double-wide memory module/s.

1.3 Hot-Swap Support

The Netra CP2140 board is capable of performing basic hot swap, full hot swap and high-availability (HA) hot swap of a Sun-supported CompactPCI I/O card.

- Basic hot swap: This feature provides hardware features required to perform hot swap, but an operator is required to execute software steps such as system configuration and installation of device drivers.

- Full hot swap: This feature provides both hardware and software features required for software connection protocol. Board software connection control resources provide the following:
  - ENUM# signal to indicate service requests to the system host, which include adding or removing software drivers for boards that have been inserted or removed.
  - Hot-swap switch to indicate that an operator wishes to extract a board.
  - LED which is illuminated to indicate that it is safe to remove a board without interrupting system operation.
- HA hot swap: In a high-availability (HA) system, hardware and software is added to enable a higher degree of system control. The following signals are used to control each slot in the system:
  - BD_SEL#: The shortest pin on a system backplane - this pin is the last to mate and first to break contact. This ensures that sensing takes place at a time when all other pins are reliably connected.
  - HEALTHY#: A radial signal that signals a board is suitable to be released from reset and allowed onto the PCI bus.
  - PCI-RST#: Driven by the system host, platforms can use this signal to control the electrical connection process - boards cannot come out of reset until HEALTHY# signal is indicated.

1.4 Front Panel I/O Connectors and Indicators

FIGURE 1-4 illustrates the indicators and I/O connectors on the CP2140 front panel. The front panel connectors, buttons, and LEDs from top to bottom are as follows:

- One peripheral mezzanine card (PMC) I/O slot
- ABORT – push button switch; passes an XIR signal to the SMC
- RESET – A reset push button switch; passes a Button Power-on-Reset (BOR) signal to the SMC
- ALARM/USER – A red/green (two color) LED — for board status
- READY – A green power LED, sourced from the power module
- Ethernet – RJ45 Ethernet connector (10/100 Mbps)
- COM – 8-pin DIN RS-232 serial I/O port
- HOT SWAP – A blue LED for hot-swap status, sourced from the SMC
- A hot-swap latch that has to be closed at insertion of board and opened prior to extraction of the CP2140.

FIGURE 1-4 Netra CP2140 I/O Front Panel

1.5 Software Requirements

The CP2140 requires at least the Solaris 8 2/02 operating environment. The *CP2000 Supplemental CD 4.0 for Solaris 8* is available that offers additional features on the Netra CP2140 board, such as driver support and satellite hot-swap support. The *CP2000 Supplemental CD 3.1 for Solaris 8* can also be used for the CP2140, but does not contain all of the features of CD 4.0.

For further information on how to obtain *CP2000 Supplemental CD 4.0 for Solaris 8,* please contact your Field Application Engineer.

1.6 Determining Netra CP2140 Board Identification Numbers

This section provides details on how to identify the Netra CP2140 board.

1.6.1 Netra CP2140 Board Assembly Identification

For proper identification of the Netra CP2140 board, labels are provided on the board (see also FIGURE 1-5):

The Sun barcode label provides the following information:

- Board part number (for example, 5016358) which is the first seven digits on the barcode label. The next six digits are the board serial number (for example, 000230).

The Subcon label provides the following information:

- Product part number (for example, 6403), product dash (for example, 04) and revision number (for example REV 09).

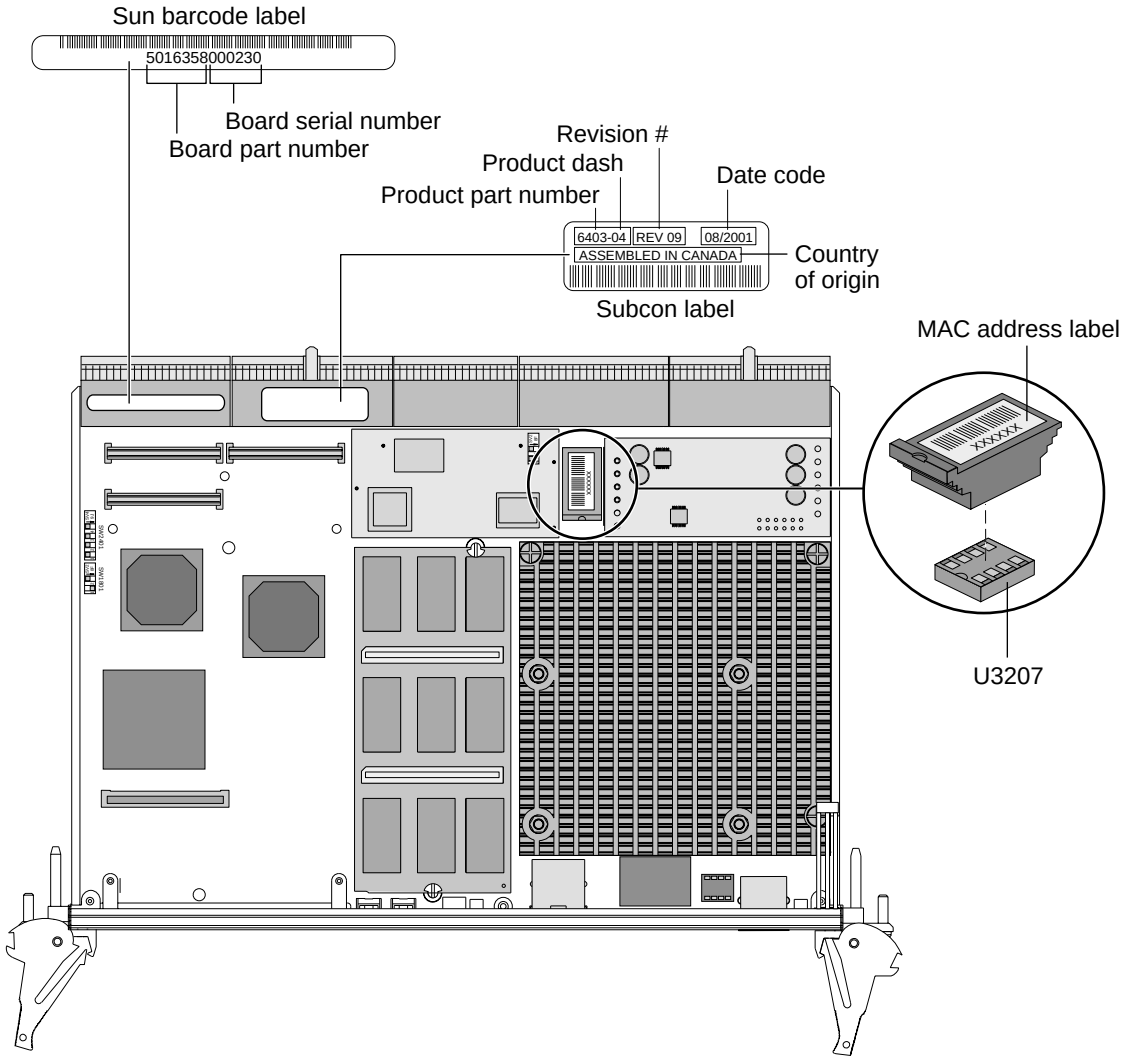


FIGURE 1-5 Location of Netra CP2140 Board Identification Labels

1.6.2 Determining Firmware Versions

To display the OpenBoot PROM version, SMC firmware, PLD and SMC FPGA information, type at the OK prompt:

```
ok .version
```

The following is an example of a *typical* display:

```
SMC Firmware Release 3.4.9 Platform ID 10
FPGA Version 1.0
PLD Version 1.3
Firmware CORE Release 1.0.3 created 2002/4/19 15:2
Release 4.0 Version 2 created 2002/04/19 14:47
cPOST version 1.0.3 created 2001/9/24
ok
```

1.6.3 Determining Software Version

To determine the release number of Solaris operating environment, at the *machine-name* prompt type:

machine-name% **uname -r**

The Solaris version displays in the following format: *X.X.X* or *X.X*

1.7 Technical Support and Warranty

If you have any technical questions or issues that are not addressed in the *Netra CP2140 Technical Reference and Installation Manual* or on the web site, contact your local sales representative. To contact Sun Enterprise Services in the U.S., phone (800) USA-4SUN (800-872-4786). To find the Sun Enterprise Services Worldwide Solution Center nearest you go to this URL:

`http://www.sun.com/service/contacting/solution.html`

When you call Sun Enterprise Services, be sure to identify the product by the product name: Netra CP2140 board. Also provide its part number (see “Determining Netra CP2140 Board Identification Numbers” on page 1-10).

The CP2140 comes with a warranty. If your board fails during the warranty period, contact your local Sun Enterprise Services representative for instructions. Before you call, get the Netra CP2140 board date code, part number, and serial number from the labels as described in “Determining Netra CP2140 Board Identification Numbers” on page 1-10.

CHAPTER 2

Installation

This chapter describes the system configurations available for the Netra CP2140 board and a brief procedure summary. It also describes how to configure the board and its transition card.

2.1 System Configurations

The Netra CP2140 board can be mounted in various enclosures. It can be deployed in various electrical configurations to suit each end-user's requirements. For example, the host board can be used with a transition card and configured to boot from a network as a diskless client. Alternatively, industry-standard PMC and PIM hardware from independent hardware vendors (IHVs) can provide local disk I/O which can optionally be used as a boot path. The basic installation procedure is independent of the type of enclosure used: a floor-mounting rack, a bench-top cabinet, or some other configuration. The memory is user-configurable. See FIGURE 2-1 for Netra CP2140 board hardware configuration examples.

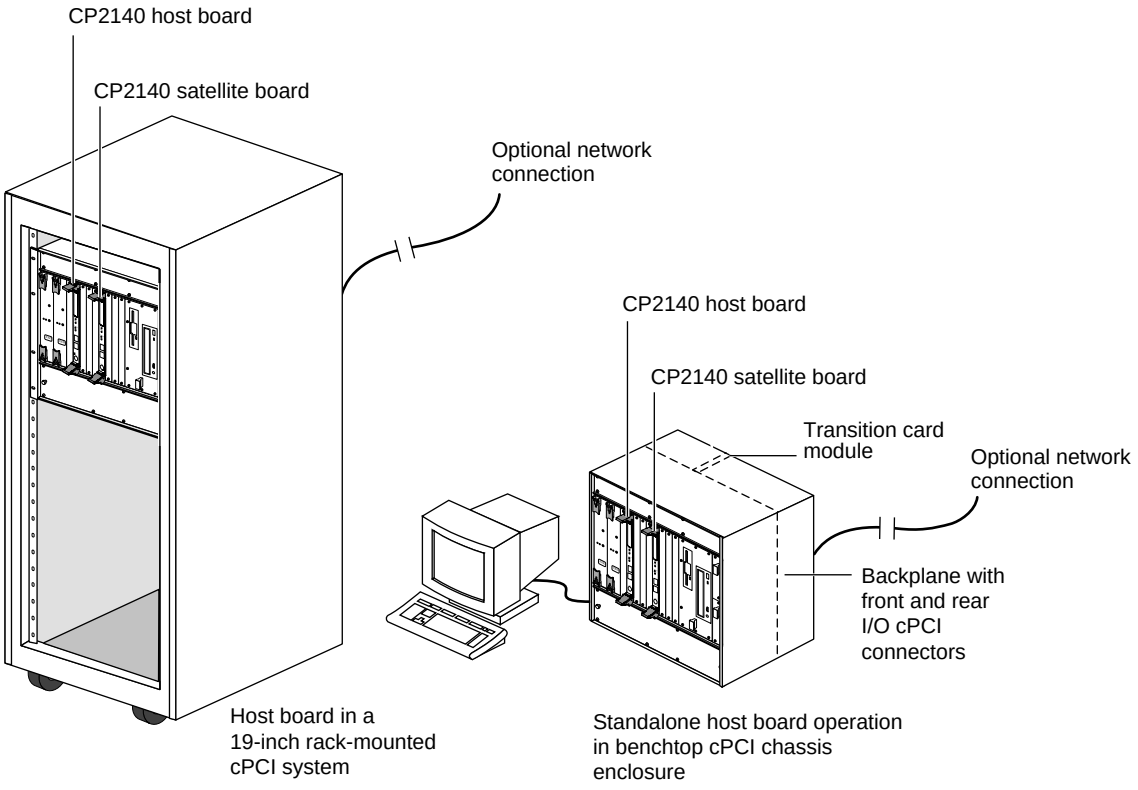


FIGURE 2-1 Examples of Netra CP2140 Board Hardware Configurations

FIGURE 2-1 shows the board hardware configuration options. For more information you see the product website at:

`http://www.sun.com/products-n-solutions/nep/hardware/boards/cp2140/`

TABLE 2-1 Netra CP2140 Board Hardware Configurations

Configuration and Use	Network/Server	Chassis Requirements and Other External Hardware
Diskless node (for normal user operation running at least Solaris 8 2/02 operating environment)	Requires network connection to server	Standard CompactPCI chassis
Standalone operation (for engineering development environment)	Can be connected to network and server	Special CompactPCI chassis with backplane that provides front and rear I/O connection. Also requires the XCP2040-TRN I/O Transition Card.
Carrier-grade rack-mounted configuration (for Telco operations)	Network and server connection not required	Rack-mountable 19 inch x 6U chassis

2.2 Orderable Items

The following items that are related to the Netra CP2140 board can be ordered from Sun Microsystems:

- Host board: Netra CP2140-650 - 1 Gbyte total memory or 2 Gbyte total memory
- Netra CP2140 board SDRAM memory modules
  - XCP2000-MEM-512MB: 512 Mbyte memory mezzanine card
  - XCP2000-MEM-1GB: 1 Gbyte memory mezzanine card
- The *CP2000 Supplemental CD 4.0 for Solaris 8.*
- XCP2040-TRN I/O Transition Card (see FIGURE 2-3). This board is compatible with the Netra CP2140 board.

The customer must obtain the other hardware and software as required:

- Solaris 8 2/02 operating environment, or subsequent compatible version
- CompactPCI enclosure to accommodate 6U boards, comprising: chassis, backplane, power supply. FIGURE 2-1 shows a typical configuration. See Chapter 2 to ensure that your enclosure meets the power supply and cooling requirement specifications.
- Serial terminal or terminal emulation for console output
- Cables for terminal and network connection

- PIM and PMC hardware

The Netra CP2140 board can accommodate the addition of IHV-built PMC modules to access I/O on their front panels. PMC modules decode their custom I/O from the host's onboard PCI bus B signals.

The XCP2040-TRN I/O Transition Card is installed from the rear of the CompactPCI enclosure and interfaces with the host board's I/O connectors J3, J4, and J5 through the backplane. The backplane carries two RJ45 ports, two serial ports, two parallel ports, one floppy port, two SCSI ports, and two USB ports out to its rear panel. FIGURE 2-2 shows the major components and connectors of the Netra CP2140 board. FIGURE 2-8 shows the physical interface between two Netra CP2140 host boards and two transition cards. To see a typical Netra CP2140 board with memory installed see FIGURE 2-5.

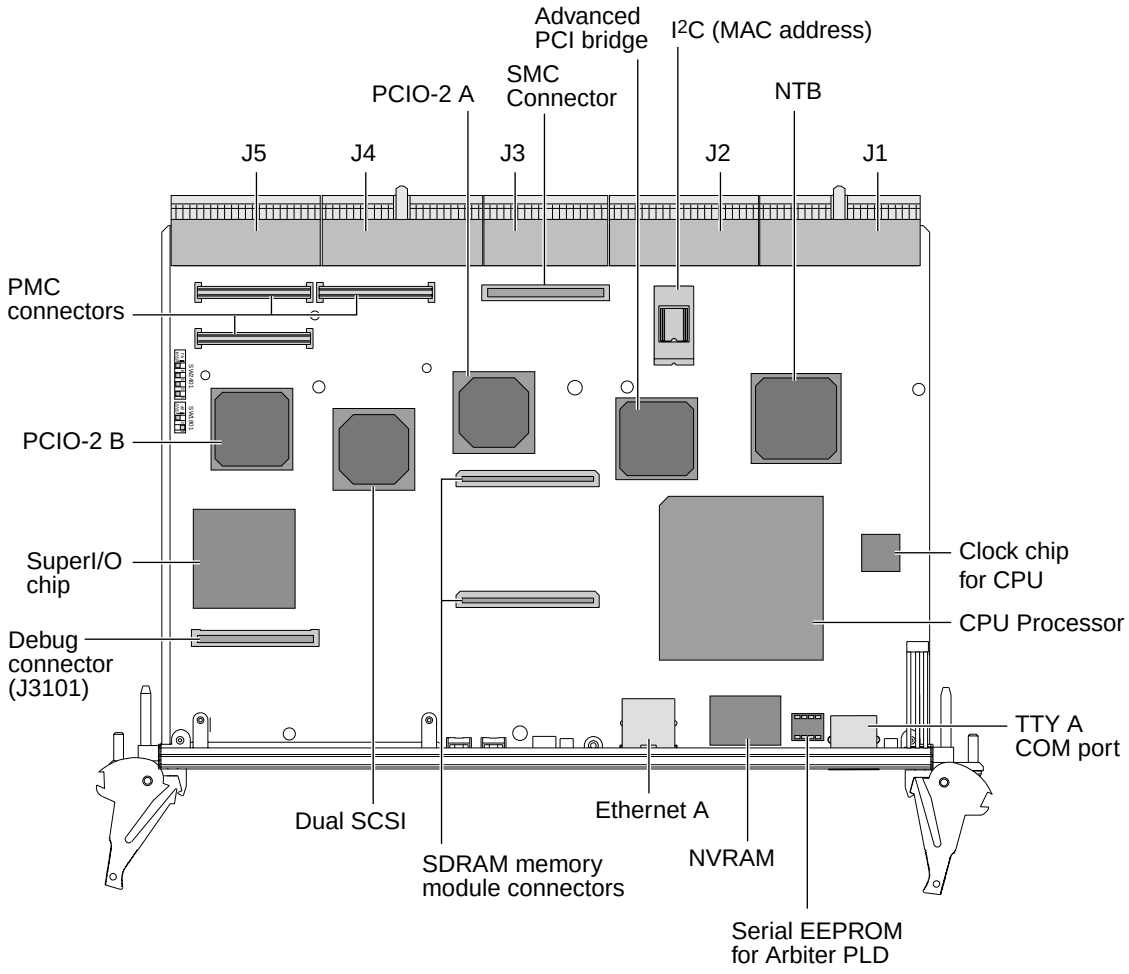


FIGURE 2-2 Netra CP2140 Board Major Components and Connectors

FIGURE 2-3 shows the XCP2040-TRN Transition Card and its connectors.

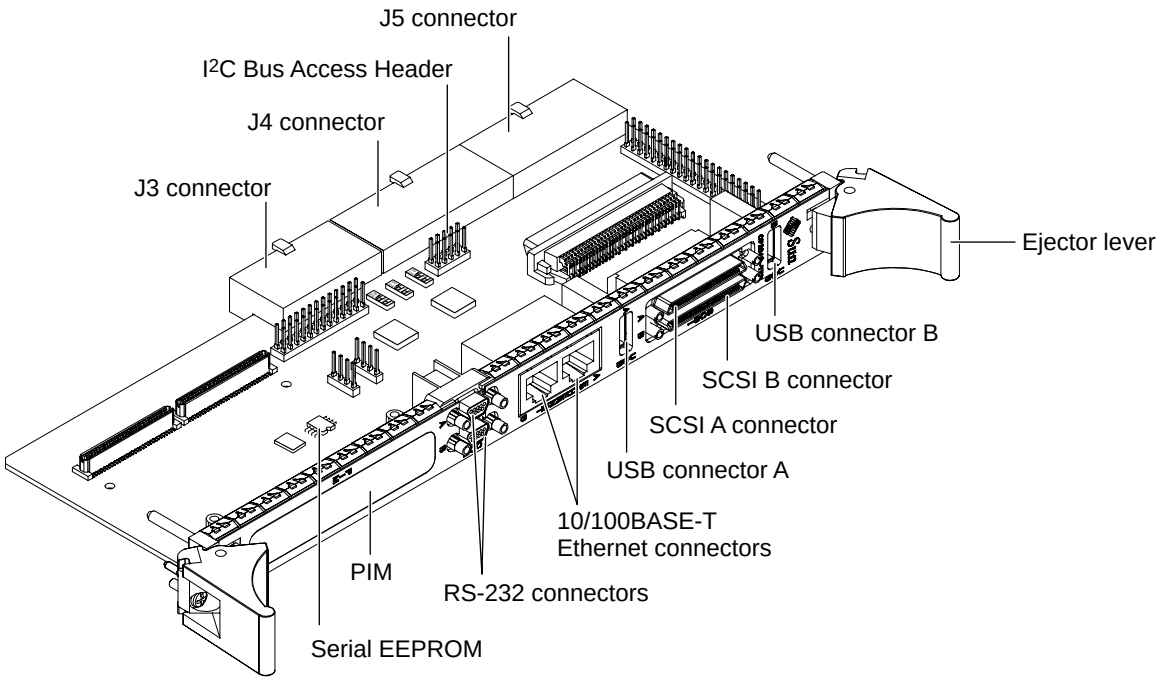


FIGURE 2-3 XCP2040-TRN Transition Card Connectors

2.3 Preinstallation Checklist

The Netra CP2140 board installs into a customer-supplied 6U chassis. It is important to review the information in the following sections before installing the host board. TABLE 2-2 lists the items to check before installing the board.

TABLE 2-2 Preinstallation Checklist

Activity	Reference
Verify that all required hardware and software have been received and inventoried.	Section 2.3.1, “System Checklist” on page 2-7
Read supporting manuals and Web site.	Section 2.3.2, “Viewing Web Pages and Reading Documents” on page 2-8
Go over the power budgeting.	Section 2.3.3, “Power Budgeting” on page 2-8
Make sure you have the latest OpenBoot PROM.	Section 2.3.4, “Getting the Latest OpenBoot PROM Version” on page 2-8
Verify that you have the necessary space to install the host board. Verify that proper space, local area networking (LAN), and environmental preparations have been properly completed.	Section 2.3.5, “Completing Space, Network, and Environmental Planning” on page 2-9
Determine the Ethernet and IP address and hostnames and be sure they have been properly allocated and registered at the site.	Section 2.3.6, “Determine Local Network IP Addresses and Host Names” on page 2-9

2.3.1 System Checklist

- Check all the parts in the shipment and make sure that the shipment is complete as indicated in the *Netra CP2140 CompactPCI Board Product Note* (816-4870-*xx*).

  Make sure that you have received all the contents listed in the product note document at the site and that the shipment has cleared the local inventory control procedures. If an item is missing or damaged, contact your Sun distributor.

- Make sure that the switch settings are as indicated in the *Netra CP2140 CompactPCI Board Product Note* (816-4870-*xx*).

  If the switches are not set properly at the factory, contact your Field Application Engineer.

The Netra CP2140 board system requires various other hardware and software components which are necessary for proper operation. The OEM customer is responsible for providing the following components as required:

- Solaris 8 2/02 operating environment or a subsequent compatible version.

- A chassis (enclosure) that complies with standard CompactPCI form factor with a power supply that must provide sufficient power for all the components.
- Memory modules. A minimum of 512 Mbyte memory is required to run the Solaris™ operating environment.
- Keyboard (PS/2 keyboard or standard USB).
- Mouse (PS/2 mouse or standard USB).
- Verify that you have the necessary space to install the host board. Verify that proper space, local area networking (LAN), and environmental preparations have been properly completed.
- Determine the Ethernet and IP addresses and host names and be sure they have been properly allocated and registered at the site.
- Make sure you have the latest OpenBoot PROM. See Chapter 6 for details.

2.3.2 Viewing Web Pages and Reading Documents

The latest product information along with technical manuals are available on the Web. It is important to read the *Netra CP2140 Product Note* document (816-4870-xx) that is shipped with the board. For online documents and other information related to the Netra CP2140 board, visit the following Web site:

`http://www.sun.com/products-n-solutions/hardware/docs/CPU_boards/`

2.3.3 Power Budgeting

To determine your power supply requirements see Chapter 3.

2.3.4 Getting the Latest OpenBoot PROM Version

The Netra CP2140 board requires the latest OpenBoot PROM compatible with your Solaris operating environment. The board is shipped with the version of OpenBoot PROM available at the time of manufacture (version 4.0.x). The OpenBoot PROM might be out-of-date by the time you get this board.

For the latest OpenBoot PROM version, go to the product website:

`http://www.sun.com/products-n-solutions/nep/hardware/boards/cp2140`

2.3.5 Completing Space, Network, and Environmental Planning

Ensure that the proper physical, electrical, and environmental preparations have been completed before the installation. For a list of the Netra CP2140 board specifications, see Chapter 2. Make sure that the following conditions are met:

- The enclosure supports the sum of the specified maximum board power loads.
- The enclosure supports the cooling and airflow requirements. See Section 3.1.5, “Environmental Specifications” on page 3-5.
- The facility power load supports the rack or enclosure power requirements.
- The Netra CP2140 board fits a standard CompactPCI chassis. If your installation requirements are different, contact your Field Application Engineer (FAE).

2.3.6 Determine Local Network IP Addresses and Host Names

You must have the following information to configure the local area network (LAN). Make sure that the IP addresses are not duplicated on different servers (if separated).

- IP addresses and host names on this network for each Netra CP2140 board client. (Local IP addresses are not needed if they are assigned by a network DHCP server.)
- Domain name
- Type of name service and corresponding name server names and IP addresses (for example, DNS and NIS (or NIS+)
- Subnet mask
- Gateway router IP address
- NFS server names and IP addresses
- Web server URL

Note – You might need the MAC (Ethernet) addresses of the local hosts to make name server database entries. The MAC address is displayed in the console output while booting to the ok prompt. It can also be derived from the host ID seen on the label of the MAC address (SEEPROM) package (MAC = 8.0.20.*hostid*). The different network services can be located on a single server to simplify the configuration.

2.4 Safety

Carefully read the *Important Safety Information for Sun Hardware Systems* (816-7190-*xx*) document included in your board kit and the following statements before you install or remove any part of the system.

Caution – Installation of this product requires specific training and technical knowledge. These instructions have been provided for use by Sun Microsystems trained personnel. This equipment uses electrical power internally that is hazardous if the equipment is improperly assembled or disassembled. Although this and some other boards are designed for hot-swap operation, other components must not be subjected to such stresses. Do not disassemble or service the system if the power is connected to the chassis. Follow all safety procedures to avoid injury to personnel and damage to equipment. Before you begin to install or remove a board or any other components, make sure the system power is turned off and the system power cord is removed from the AC source.

The host board and other boards are extremely sensitive to damage from electrostatic discharge (ESD) caused by the build-up of electrical potential on clothing and other materials.

Follow these safety and ESD preventive measures:

- Before connecting, disconnecting, or handling boards or peripherals, attach one end of the ground strap to your wrist and the other end to a grounded surface.
- Keep the boards in the antistatic bags until they are needed.
- Remove a board from its antistatic bag only when you are properly grounded with a ground strap.
- Place the boards only on an antistatic mat. Do not place boards on top of an antistatic bag unless the outside of the bag also has antistatic protection.

2.5 Installation Procedure Summary

Here are the general steps to configure, install, and set up a Netra CP2140 board system. Ensure that the guidelines outlined in Section 2.3, “Preinstallation Checklist” on page 2-6 are met before configuring and installing the board.

1. Configure the Netra CP2140 board and the associated hardware.

2. Install the CP2140 into an enclosure (see Section 2.10, “Installing the Netra CP2140 Board” on page 2-18).

3. Install the XCP2040-TRN Transition Card.

4. Connect a SCSI interface, if applicable to your system. Connect the SCSI interface with a cable to one of the SCSI connectors on the XCP2040-TRN Transition Card. Also connect any other necessary cables to the XCP2040-TRN Transition Card. For further details, see Section 2.13, “Connecting Devices to a XCP2040-TRN I/O Transition Card” on page 2-27.

5. Install the Solaris operating environment (see Section 2.15, “Software Installation” on page 2-30).

6. Connect the CP2140 to the server using existing Ethernet lines or run the CP2140 as a standalone system (see Section 2.17, “Standalone Operation” on page 2-32).

7. Set up the system that is using the CP2140.

8. Power on the CP2140 client.

9. Run related applications.

2.6 Materials and Tools Required

This section provides information on the materials and tools required to perform installation. The minimum tools required to perform installation are:

- Straight slot screwdriver, 1/4 inch
- Phillips screwdrivers, No. 1, No. 2
- Antistatic wrist strap
- Needle nose pliers
- Terminal

2.7 Configuring the Netra CP2140 Board Hardware

This section describes how to configure related hardware such as memory modules, PMC modules, and the XCP2040-TRN Transition Card. Most of this hardware must be configured before the CP2140 is installed.

TABLE 2-3 Netra CP2140 Board I/O Hardware Configurations

I/O	Hardware Required	Description
Ethernet	XCP2040-TRN I/O Transition Card—supplied as an option	Default boot path uses Ethernet port on Transition Card; host runs in diskless client configuration
SCSI	XCP2040-TRN I/O Transition Card, two SCSI connectors and internal connectors	Can be used for local boot. Use SCSI interface on the XCP2040-TRN I/O Transition Card.
Serial data	XCP2040-TRN I/O Transition Card	Serial A port on optional transition card is path of default console I/O
USB	XCP2040-TRN I/O Transition Card	Can be used for keyboard I/O for use with video graphics

2.7.1 Installing Memory Modules

The CP2140 can accommodate both single- and double-wide memory modules. FIGURE 2-4 shows two typical memory modules used on the Netra CP2140 board.

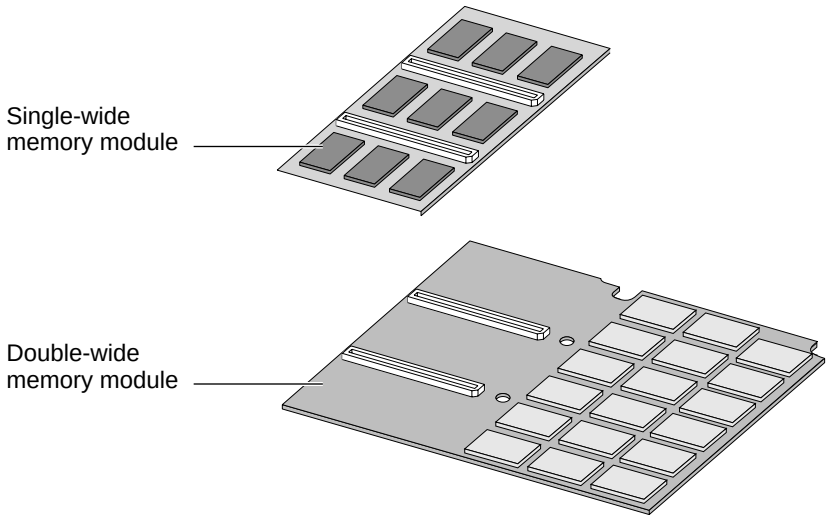


FIGURE 2-4 Single- and Double-wide Memory Modules

Up to two modules in any supported memory configuration can be installed in any combination (512 Mbyte, 1 Gbyte). However, if two memory modules need to be installed and one of the modules is double-wide, the double-wide module should be installed first (on the bottom). Refer to Section 3.1.2, “Main Memory” on page 3-3 for a list of possible memory module configurations.

FIGURE 2-5 shows a typical SDRAM memory module installed on a CP2140.

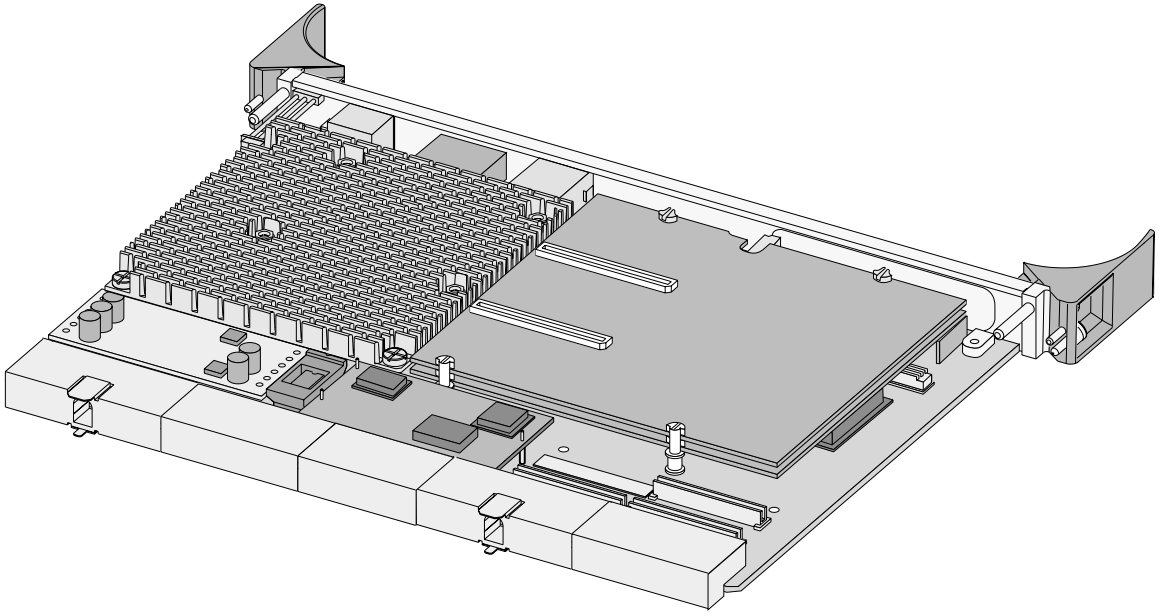


FIGURE 2-5 A Typical Netra CP2140 Board with Memory Modules Installed

2.7.2 PMC Module Installation

The PCI Mezzanine Card (PMC) is installed on J3001, J3002, and J3003 connectors on the motherboard. These connectors interface with the matching connectors on the PMC board: PN1, PN2, and PN4, respectively. The PMC is secured with two mounting posts and screws. Refer to the user documentation from the PMC card manufacturer on how to install the PMC module. FIGURE 2-6 shows how the PCI Mezzanine Card is installed.

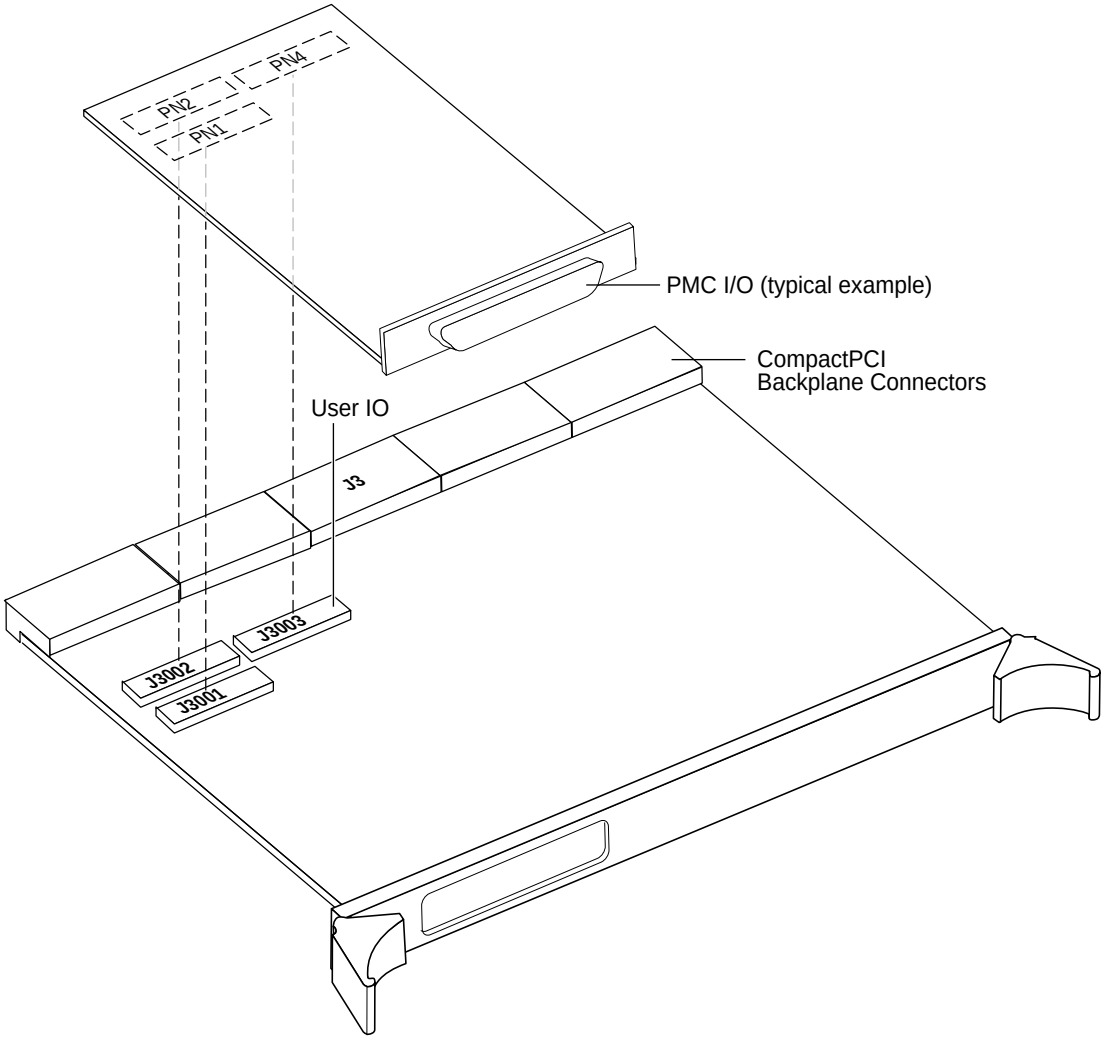


FIGURE 2-6 Installing the PCI Mezzanine Card

2.8 Configuring Transition Card Hardware

This section provides information on installing PIM assemblies and replacing the Serial EEPROM.

2.8.1 Installing PIM Assemblies

Refer to the user documentation from the PIM manufacturer on how to install the PIM module.

2.8.2 Replacing the Serial EEPROM

This device is installed on the motherboard at the factory. This step is not necessary unless you are installing a replacement board that does not have the host ID. If you must return the CP2140 to the factory, remove this EEPROM from the board before shipping it to the factory. The Serial I^2C EEPROM is the MAC address carrier and it stores the backup copy of the board MAC address and host ID information (see Section 5.1.3.4, “Serial I^2C EEPROM” on page 5-3).

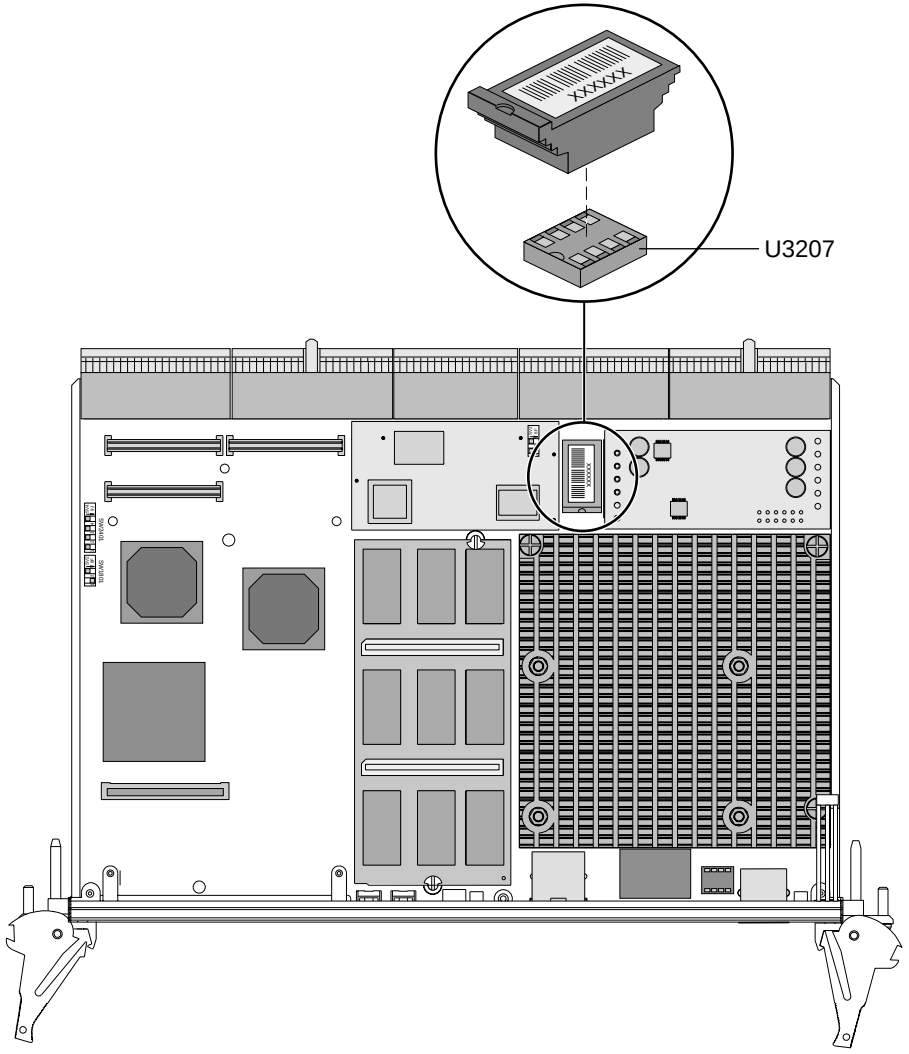


FIGURE 2-7 Replacing the Serial I^{2}C EEPROM

The CP2140 supports the Serial I^{2}C EEPROM. If you must replace the CP2140, remove the Serial I^{2}C EEPROM from the original board and install it on the new CP2140.

To correctly position the EEPROM and to precisely install it on the CP2140, see FIGURE 2-7.

2.9 Installing the XCP2040-TRN I/O Transition Card

Refer to the installation procedure detailed in the *XCP2040-TRN I/O Transition Card Manual for Netra CP2040/CP2140 CompactPCI Board* (806-6743-*xx*) for installing the XCP2040-TRN Transition Card.

2.10 Installing the Netra CP2140 Board

Follow all the safety rules described in Section 2.4, “Safety” on page 2-10 when installing any hardware into the CompactPCI chassis enclosure.

A number of CompactPCI chassis enclosures come with an internal power supply and fan. FIGURE 2-8 shows two Netra CP2140 boards (system host and satellite host) being installed in a CompactPCI chassis.

Smaller CompactPCI enclosures have four board slots. One of these slots is reserved for one 6U form factor board, while the remaining three slots are for either 3U or 6U boards. The larger eight-slot enclosures have two 6U and six 3U slots. In addition, some special CompactPCI enclosures are equipped with a backplane that enables board connection to the front and rear of the chassis.

A CompactPCI chassis contains:

- A system slot, usually on the far left (viewed from the front) whose position is indicated by a triangle symbol visible on the backplane (if the chassis meets the PICMG 2.0 CompactPCI Specification).
- Seven peripheral slots (for a single-segment chassis). Peripheral slots are identified by a circle symbol visible on the backplane.

Note – The CP2140 can be installed in either a peripheral slot or in a system slot.

---

1. **Ensure that power is disconnected from the chassis.**

   The CP2140 can be installed while the chassis is powered-on—however, *this method is recommended only when absolutely necessary.*

2. **Check that the corresponding XCP2040-TRN I/O Transition Card is installed.**

   Install the transition card before installing the Netra CP2140 board. This step is important if the chassis is powered-on during the installation. The transition card is *not* hot-swappable. Take the step as a safety precaution.

3. **Slide the CP2140 into the appropriate slot on the corresponding top and bottom mounting rails and towards the backplane while gently keeping the board handles pushed inward (see** FIGURE 2-8 **and** FIGURE 2-9**).**

   While pushing the board, ensure that the CP2140 extraction levers are aligned perpendicular to the card flange in the unlocked position and that the board connectors are aligned with the transition card connectors.

4. **Install two screws at the top and bottom of the front connector plate to secure the board.**

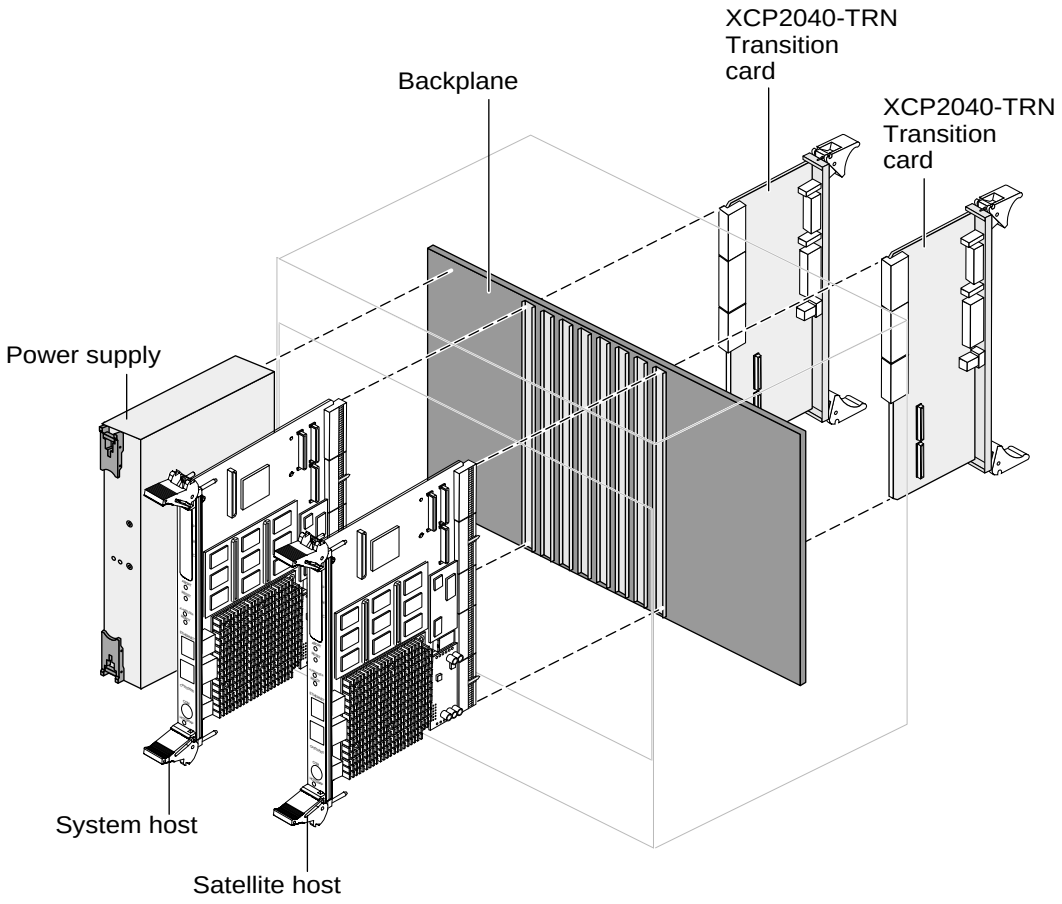


FIGURE 2-8 Netra CP2140 Board System Interface: One System Controller Board, One Satellite Board, Two Transition Cards

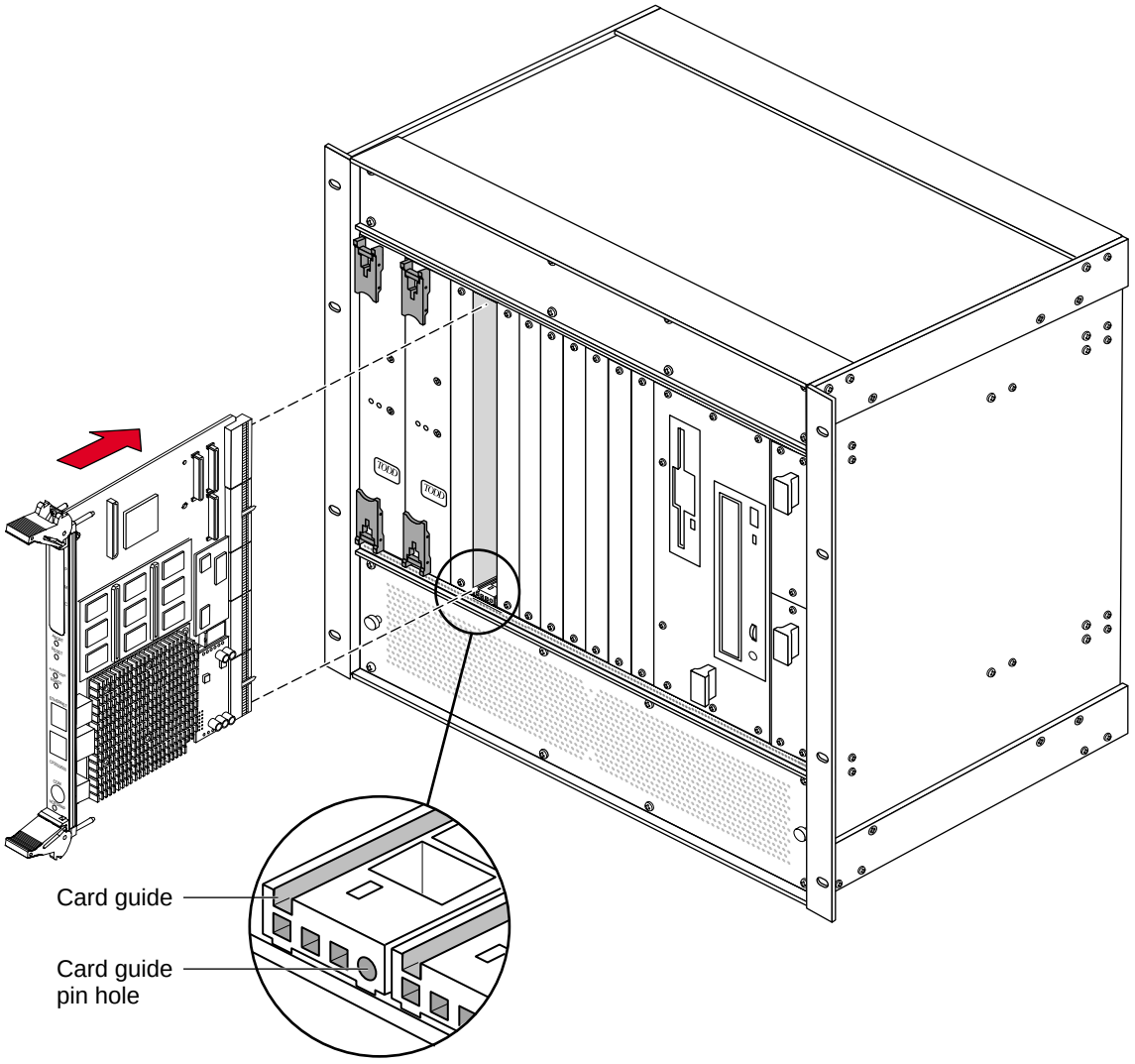


FIGURE 2-9 Netra CP2140 Board Installation (Close-up View)

The transition card can also be fitted with IHV-supplied PCI interface modules (PIMs) which are configured to bring I/O channels to the unit rear panel. A unit of PIM hardware is a kit that includes a card for the PMC slot and a card for the PIM slot on the transition card. A PIM is essentially a rear-panel extension added to a PMC module.

Note – If the PMC card (used with the PIM) has front I/O connectors, when you configure PIM rear connector I/O, the front I/O connectors will not be functional.

You can order the XCP2040-TRN Transition Card, build a compatible custom card, or buy from an IHV. A minimal set of I/O must provide for a boot path for the host board and a path for console I/O to deliver commands and to read board and system status.

2.11 Connecting Cables to the Netra CP2140 Board

This section describes how to connect cables to a computer that contains the CP2140.

1. **Connect the Ethernet (if required) where shown in** FIGURE 2-3**.**
2. **Use the** `tip` **utility on the host system to establish a full-duplex terminal connection with the system containing a CP2140.**
3. **At the UNIX® prompt in a command tool or shell tool, type:**

   ```
   tip -9600 /dev/ttya
   ```

4. **Connect a serial cable to Port A (COM port) on the CP2140 or TTYA port of the XCP2040-TRN I/O Transition Card of the target system and to the serial port of the host system.**

Note – Use shielded cables that are grounded at both ends for serial and USB ports.

5. **Connect any other peripheral devices (such as a printer) to the appropriate connector.**
6. **Power on the system that contains the CP2140 to run the power-on self-tests (POST).**
   - If POST is successful, install the appropriate Solaris software package on the system (see Section 2.15, “Software Installation” on page 2-30).
   - Read the following caution carefully before plugging devices into the XCP2040-TRN I/O Transition Card.

Caution – There are a total of three serial port connections available (one on the CP2140 and two on the XCP2040-TRN I/O Transition Card). At any one time, up to two serial ports can be used. The serial port connector (*TTYA)* on the XCP2040-TRN I/O Transition Card and the serial interface on the CP2140 *cannot* be used at the same time.

7. Plug devices into the XCP2040-TRN I/O Transition Card, as necessary.

See *XCP2040-TRN I/O Transition Card Manual for Netra CP2040/CP2140 CompactPCI Board* (806-6743-*xx*) for instructions.

2.11.1 Powering on Your System With External SCSI Peripherals

If you have connected SCSI peripherals that receive power from a source separate than the system's power supply to a system containing a Netra CP2140 board, you *must* power on the system prior to powering on SCSI peripherals. After powering on the system, you can safely power on the external SCSI peripherals.

2.12 Hot-Swapping the Netra CP2140 Board

Note – If the CP2140 is being used as system host and not functioning as an I/O card, it cannot be hot-swapped.

A blue LED is lit on a hot-swappable board during extraction process to indicate that it is permissible to extract the board. The blue LED indicates that the system software has been placed in a state for an orderly removal of a board.

During the insertion process, when a board is hot inserted, the blue removal LED is lit again automatically by the system hardware until the hardware connection process is complete. The blue LED is turned off by the software until it indicates once again that the removal of a board is permitted.

Two ejector handles are used for inserting and removing a CompactPCI board. The lower ejector handle is tied to a latch, which when pressed, informs the system that the board is ready for extraction. When the system has unconfigured the board, a blue LED is lit indicating that the board is ready for extraction. You must wait until the blue LED is lit before removing the board.

2.12.1 Basic Hot-Swapping

The basic hot swap is initiated by the `cfgadm` configure / unconfigure administration command:

The `cfgadm` command provides configuration administration operations on dynamically reconfigurable hardware resources. Configuration administration is performed at attachment points, places where system software supports dynamic reconfiguration of hardware resources during continued operation of the Solaris operating environment.

Configuration administration distinguishes between hardware resources that are physically present in the server and hardware resources that are configured and visible to the Solaris software. The nature of configuration administration functions are hardware-specific and are performed by calling hardware-specific libraries. Refer to the man pages (by typing `man cfgadm`) for additional information on the options associated with this command.

1. **Type the unconfiguration command:**

   `# cfgadm -c unconfigure` *pci1:hsc0_slot5*

   To inform the system to enable the extraction and insertion of a device, if permissible. The blue LED is lit if the process is successful, indicating that the board can be extracted.

2. **Remove the I/O board and set it aside.**

3. **Slide the new I/O board into the top and bottom mounting rails in the same slot into the backplane while gently keeping the board handles in the open position. Once the board is all the way in, lock the ejector handles (see** FIGURE 2-10**).**

   The blue LED is lit once the board makes complete contact with the backplane. The LED goes off shortly after the ejector handles are closed, if the hardware initialization of the board is successful. Otherwise, it remains lit, indicating that the board must be replaced.

4. **Once the blue LED of the board is off, secure the board to the chassis.**

5. **Type the configuration command:**

   # **`cfgadm -c configure`** *pci1:hsc0_<slot5>*

   The part of the command in parenthesis indicates the slot in which the board resides.

6. **Take any other step necessary for board-specific configuration.**

2.12.2 Full Hot-Swapping

Hot-swapping a line card does not require the system power to be turned off. Refer to the chassis manufacturer's documentation for slot assignments and additional information. In addition, a full hot-swap board does not require running the `cfgadm` administrative command. The system automatically configures the card for using the system resources. The board-specific configuration steps are still necessary after the completion of host-specific configuration.

Follow these steps to hot-swap a line card in a chassis that contains the Netra CP2140 system host board.

1. **Remove the I/O board screws.**
2. **Release the latches of the I/O board and wait for the blue LED to light.**
3. **Remove the I/O board and set it aside.**
4. **Slide the new I/O board into the top and bottom mounting rails in the same slot into the backplane while gently keeping the board handles in the open position. Once the board is all the way in, lock the ejector handles (see** FIGURE 2-10**).**

   FIGURE 2-10 shows how to release and to lock the CP2140 injector/ejector handles.

   The blue LED is lit once the board makes a complete contact with the backplane. The LED goes off shortly after the ejector handles are closed, if the hardware initialization of the board is successful. Otherwise, it remains lit, indicating that the board must be replaced.
5. **Once the blue LED of the board is off, install two screws at the top and bottom of the front connector plate to secure the board.**

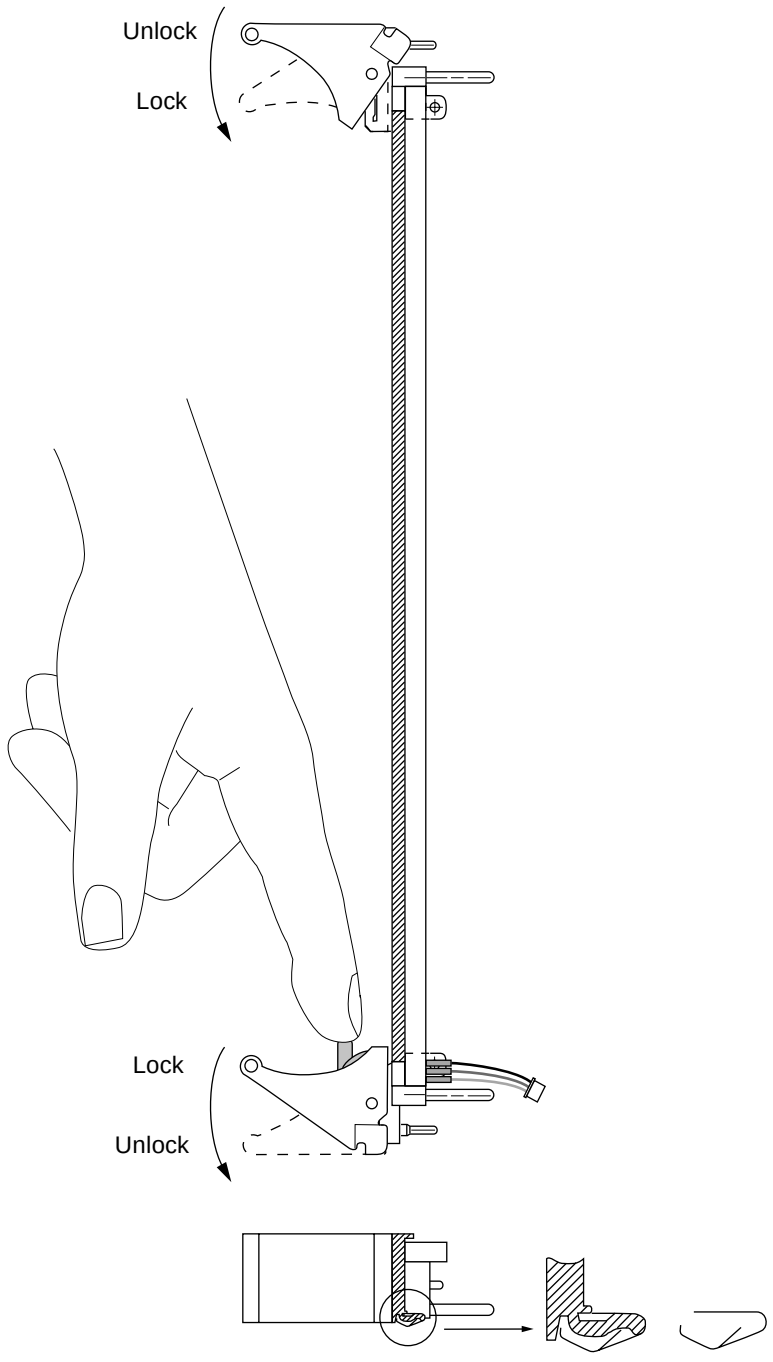


FIGURE 2-10 Releasing and Locking the Netra CP2140 Board Injector/Ejector Handles

2.13 Connecting Devices to a XCP2040-TRN I/O Transition Card

The XCP2040-TRN I/O Transition Card is an interface card that provides access to the following connector features which are supported by the CP2140:

- Two USB ports
- Two TTY ports
- Two Ethernet ports
- Two SCSI ports
- KB (PS/2 keyboard)
- KB (PS/2 mouse)
- FLOPPY
- PARALLEL
- PIM

Install the XCP2040-TRN I/O Transition Card as directed in the transition card manual.

Note – To comply with NEBS Level 3 Intrabuilding Lightning Surge Tests (Telecommunications Port), the intrabuilding cabling must be shielded and the shield must be grounded at both ends. Refer to GR-1089-CORE, Section 4.5.9.

---

1. **Connect a single-ended SCSI drive and cable to the internal SCSI connector on the XCP2040-TRN I/O Transition Card.**

   The internal SCSI connector is more suitable for attaching internal devices to the system.

Caution – For SCSI A, both internal and external SCSI connectors are on the same SCSI A bus. Use only one connector at a time to avoid signal problems on the SCSI chain. Also, the SCSI cable cannot exceed more than 9 feet (3 meters) in length to avoid possible data errors.

---

2. **Connect other supported peripheral devices as required.**

Note – For a detailed description of the XCP2040-TRN I/O Transition Card, refer to *XCP2040-TRN I/O Transition Card Manual for Netra CP2040/CP2140 CompactPCI Board* (806-6743-*xx*).

2.13.1 Adding CompactPCI Cards and Drivers to a Netra CP2140 Board System

The CP2140 configuration supports IHV CompactPCI cards. To add CompactPCI cards and drivers, refer to the documentation provided with the CompactPCI card. Usually software drivers and related documentation are provided on the CD or floppy diskettes. Read all documentation furnished with the package. The manufacturer's Web site might also have the latest product and driver information.

2.13.1.1 To Install a CompactPCI Card

1. **Halt the operating environment and power down the system.**
2. **Install the CompactPCI card.**
3. **Make necessary connections.**
4. **Power up the system.**
5. **Boot with `-r` option (or with `-rv` for verbose messages).**
6. **At system prompt, become superuser.**
7. **Add package using `pkgadd` command.**
8. **Reboot if necessary.**

Note – In a properly configured system, a card can be hot inserted and then manually configured by unsing `cfgadm`.

2.13.1.2 To Verify That the Board is Recognized by the System

1. **Use the `prtconf -D` command to display the device tree.**

   It should show the PCI bus instances #0 and #1 for the two PCI buses on the CP2140. There are instances of various PCI cards connected to each one. A PCI card might show up as pci*VVVV,DDDD*, where *VVVV* is the vendor ID, for example, 1011 and *DDDD* is the device ID, for example 008e. If the driver for the card is already loaded, then you might see the device name supplied by the driver in the device tree.

2. **Use the `modinfo` command to see whether the driver for the card is loaded.**

   Typically the description of the driver contains the name of the product or the vendor.

3. **At the OpenBoot PROM prompt, the PCI board is visible in the device tree even if the driver is not installed.**

2.13.1.3 To Obtain Additional Assistance

1. **Run the following commands and record the output.**

```
prtconf
modinfo
dmesg
cat /etc/driver_aliases
cat /etc/path_to_inst
```

2. **Contact the PCI card vendor.**

2.13.2 Backplane and Cardcage Considerations

To successfully run a Netra CP2140 board system, consider the following points related to the CompactPCI backplane and cardcage:

- For CompactPCI connector information see Appendix A.
- Power supply requirements for backplane and cardcage (for more details see Chapter 3.)
- Cooling fan requirement.
- Overtemperature conditions.
- Shock and vibration standards (see Section 3.1.7, “Compliance” on page 3-6).

2.14 Initial Power-On and Firmware Update

This section describes the power-on procedure for the CP2140. This procedure is intended only for advanced UNIX users and system administrators.

1. **Power up the system.**

   a. **Position the power supply switch to ON.**

   b. **Use the `tip` utility to establish a full-duplex terminal connection between the Sun workstation and the CP2140.**

   c. **At the UNIX prompt in a command or shell tool window type:**
   `tip -9600 /dev/ttya`

2. **Perform the following diagnostic steps.**

   a. **Verify the accuracy of the following information before continuing to the next step.**

      - Valid memory configuration is displayed on the banner.
      - Valid Ethernet address is displayed on the banner.

   b. **At the** ok **prompt, type:**

      ok **probe-scsi-all**

      Make sure all devices are recognized by the system. Ensure that the hard disk drive is recognized as target 0 and that the CD-ROM drive is recognized as target 6.

   c. **At the** ok **prompt, type:**

      ok **.version**

      For details on output information, see Section 6.6, “Determining Firmware Version” on page 6-18.

2.15 Software Installation

The CP2140 requires the Solaris 8 2/02 operating environment software. *CP2000 Supplemental CD 4.0 for Solaris 8* is available that offers additional features for the CP2140 such as CompactPCI net driver support and satellite hot-swap support. *CP2000 Supplemental CD 3.1 for Solaris 8* can also be used with the Netra CP2140 board, but does not contain all of the features available on CD 4.0.

For further information on how to obtain the CD, contact your Field Application Engineer.

- To install the system from the CD , go to Step 1.
- To install the system from a network, go to Step 2.

1. **To install the system from the CD , at the** ok **prompt, enter:**

   ok **boot cdrom**

   The system boots from the CD and the Solaris operating environment installation begins. Provide appropriate answers to various prompts that are displayed as the system is installed.

2. **To install the system from a server, obtain the boot client Ethernet address (the system being built).**

a. At the ok **prompt (on the system being built), type:**

```
ok banner
```

The Ethernet address displayed in the following format: *X:X:XX:XX:XX:XX* for example: `8:0:20:7e:f6:dc`

b. Type the Ethernet address obtained in Step a into the install server as a boot client.

Refer to the Solaris software documentation to set up an install server.

c. At the ok **prompt on the client (of the system being built), type:**

```
ok boot net
```

The system boots from the network and the Solaris software is installed from the network. Various prompts are displayed as the system is installed; answer them as appropriate.

3. After the Solaris operating environment is installed, at the ok **prompt, enter:**

```
ok boot disk -rv
```

The system configures itself after the installation.

If the installation is successful, the system boots to a Solaris login prompt.

2.16 Setting Up a Network

The minimal necessary infrastructure to enable network computing involves a boot server with networking software and the CP2140. The boot server senses the CP2140 booting up on the network and supplies the client with its boot image: Solaris software.

Note – The Netra CP2140 board also depends on a domain network server (DNS) and a network information server (NIS); do not attempt to set up clients on a network without them.

An administrator can also choose a separate Internet Message Access Protocol version 4 (IMAP4) server and a home directory server. These software services can be installed on a single server or spread out over several servers.

Follow these guidelines to help ensure a successful CP2140 client/server configuration.

- Install the CP2140 clients on the same subnet as the boot server. You *cannot* boot across a gateway or router. The CP2140 boot process uses a Trivial File Transfer Protocol (TFTP) broadcast to receive a secondary boot program called

`inetboot.jd` from the server. Messages using TFTP are automatically disabled as a security measure in routers. The boot process might be changed in future product releases to enable booting across routers. Application or Web servers do not have to be on the same subnet and can be accessed across a router or gateway.

- Do not configure a CP2140 to more than one boot server. You cannot have multiple boot servers attached to the same client.
- Avoid using the UNIX command-line interface to set up the client/server network. Use the available client configuration tools from the WebTop Server software environment. The configuration tools have an easy-to-use graphical user interface (GUI).

2.17 Standalone Operation

The CP2140 provides a complete I/O subsystem and can operate as a standalone computer for development purposes or other special applications. The CP2140 provides two UltraWide single-ended SCSI connections that are accessible through the rear of a special CompactPCI chassis that contains a backplane. This enables connection to a hard drive, tape, or a number of other SCSI devices. Software can be downloaded through the internet or from a CD into a hard drive connected to the XCP2040-TRN I/O Transition Card.

CHAPTER 3

Netra CP2140 Board Specifications

This chapter provides the Netra CP2140 board specifications.

3.1 Board Features and Specifications

TABLE 3-1 shows the physical dimensions of the CPU board.

TABLE 3-1 Netra CP2140 Board Physical Dimensions

CPU Board Parameter	6U CompactPCI Form Factor
Height	233.35 mm
Depth	160 mm
Width	19.80 mm

Described below is some information on CompactPCI height restrictions and the Netra CP2140 board standard components.

The CompactPCI standard, PICMG 2.0 Rev 3, calls out the maximum component heights of 13.71 +/- 0.03 mm. Due to variations in parts, board flatness, board thickness, and manufacturing tolerances, the stacked height of two expansion memory boards and memory turrets installed on a CP2140 board may exceed this limit.

PICMG 2.0 R3 and IEEE 1101.10-1996 require 2.54mm between the top of components and the separation plane, and there is at least approximately 0.5mm to 2mm of clearance to solder-side components or leads of an adjacent board from that same separation plane. Therefore, there is very little chance that a small specification violation will impact an adjacent card in a PICMG 2.0 R3 compliant chassis.

Care should be taken when installing the boards in systems that have extreme solder-side component heights or in system chassis that don't allow clearances specified in the PICMG or IEEE standards.

TABLE 3-2 shows the system compatibility attributes.

TABLE 3-2 System Compatibility Attributes

Attribute	Compatibility
System host capability	Yes
Satellite host capability	Yes
CompactPCI compliance	64-bit, 33 MHz, 5V bus interface; PICMG 2.0 R3.0 Bus specification PICMG 2.1 R1.0 hot-swap specification PICMG 2.9 D0.6 System Management specification
NEBS compliance	NEBS level 3 compliance

TABLE 3-3 shows a detailed description of the CompactPCI bus interface.

TABLE 3-3 CompactPCI Bus Interface

Parameter	Description
Configuration	6U +5V, 33 MHz, 64 bits with support for seven additional external bus slots.
Connector	2mm pin-and-socket (IEC-1076-4-101)

3.1.1 CPU

TABLE 3-4 shows the CPU specification.

TABLE 3-4 CPU Specification

Parameter	Description
CPU	650 MHz UltraSPARC IIi
Architecture	Sun 4U; 64-bit SPARC V9 architecture with the VIS Instruction Set
Cache	512 KB L2 cache
PCI bus local interface	PCI Bus 2.1 compatible, 33/66 MHz, 32-bit, 3.3V (internal to board only, does not come on connector)

3.1.2 Main Memory

TABLE 3-5 shows the memory specification.

TABLE 3-5 Memory Specification

Parameter	Description
Memory size—min	512 MB
Memory configuration—soldered	No soldered memory
Memory configuration—stackable	Up to two custom stackable modules; see TABLE 3-6 for allowable combinations
Memory type	3.3V, DRAM with ECC LVTTL-compatible CMOS; configured on bus width of 64-bit + 8-ECC bits
Interface	Unbuffered

TABLE 3-6 shows the Netra CP2140 board memory module configurations.

TABLE 3-6 Netra CP2140 Board Memory Module Configurations

Bottom SDRAM Module PN and Specification	Top SDRAM Module PN and Specification	Total Memory Available on Board
375-3025-*xx* 512MB	375-3025-*xx* 512MB	1024MB
375-3026-*xx** 1024MB	375-3026-*xx* 1024MB	2048MB

* The 1024MB (part no. 375-3026-xx) is a double wide memory module.

Note – The memory module configurations provided in TABLE 3-6 are the configurations that have been tested and are supported. Other memory configurations are possible on the Netra CP2140 board but customers will not receive technical support if they use other memory configurations.

Any two modules in any supported memory configuration can be installed in any combination (512 Mbyte, 1 Gbyte). However, if two memory modules need to be installed and one of the modules is double-sized, it should be installed on the bottom.

If a double-sized memory module is installed on the Netra CP2140 board, then the installation of a PMC card is not supported.

For detailed information on installation and removal of memory modules, see *256/512 MB Memory Module Installation and Removal Guide for Netra CP2000/CP2100 Series Compact Boards* (816-0854-*xx*) and *1 GB Memory Module Installation and Removal Guide for Netra CP2000/CP2100 Series CompactPCI Boards* (816-2917-*xx*).

3.1.3 PCI Mezzanine Module (PMC) Interface

TABLE 3-7 shows the PMC interface specification.

TABLE 3-7 PMC Interface Specification

Parameter	Description
PMC module interfaces on system board	One: PMC
Interface IEEE P1386.1 compliance	With draft 2.1
Connector configuration, PMC (P1386 designations)	J11, J12 carry PCI signals; J14 module I/O is connected to CompactPCI backplane J3; J13 connector is not fitted
PMC connections to CompactPCI backplane	PMC I/O on J3
PCI clock	33 MHz
PCI bus width	32-bit
CP2140 keyed for signalling voltage	5V
Max power load—per module, combined 5V and 3.3V rails	7.5 W*

* Sum of power allowable from any one rail or both rails together.

3.1.3.1 Estimated Power Requirements

TABLE 3-8 shows the estimated power dissipation for Netra CP2140 board. Note that the figures provided in the table below are approximate and are application dependant.

TABLE 3-8 Estimated Power Dissipation for the Netra CP2140 Board

Configuration (Netra CP2140 Board with 650 MHz)	Watts Dissipation (Typical)
512 MB memory	Low power ~20 Watt typ. PCI mezzanine card and transition card not included (~32 Watt maximum)
Input power	+5V/3.3V/12V/-12V from CompactPCI backplane (with PCI mezzanine card support)

3.1.4 Mechanical

The Netra CP2140 board complies with the mechanical specifications found in the CompactPCI specification PICMG 2.0 R3.0.

3.1.5 Environmental Specifications

TABLE 3-9 shows the environmental conditions and limits.

TABLE 3-9 Environmental Conditions and Limits

Ambient Conditions	Lower Limits*	Upper Limits*
Transportation and storage temperature	-40˚ C for 72 hrs. max.	+70˚ C for 72 hrs. max.
Transportation and storage humidity	5% relative humidity, non-condensing	95% relative humidity, non-condensing
Operating temperature	0˚ C (-5˚ C short term)	40˚ C (55˚ C short term)
Operating humidity	5% relative humidity, non-condensing	85% RH (90% relative humidity short term) non-condensing
Shock and vibration	As stated in NEBS GR-63 CORE specifications, section 4.3.1 and 4.3.2 for shock criteria and 4.4.3 for vibration criteria; MIL-STD 810E, Method 514.4, CAT I MIL-STD 810E, Method 516.4, II-3.2	
Electrostatic discharge	GR-1089 Section 2	
Altitude	0 foot to 10,000 feet operational (0 meter to 3408 meters)	
Cooling	300 linear feet per minute (LFM) (minimum requirement)	

* Short term, in this column, refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year.

3.1.6 Reliability and Availability

Reliability prediction is the first measurement point of expected behavior of the inherent design mean time between failures (MTBF) of the product.

TABLE 3-10 shows the reliability prediction for board level MTBF.

TABLE 3-10 Reliability Prediction for Board Level MTBF

Items	MTBF (hours)	Annualized Failure Rate (AFR in%)†
CP2140 board* + 2x512 MB memory	163,878	5.35
CP2140 board + 2x1 GB memory (double wide)	136,647	6.41
XCP 2140-TRN card	823,050	1.06

* Board ambient temperature at 40° C

† AFR (%) is Annualized Failure Rate based on 8,760 power on hours (POH) per year

3.1.7 Compliance

All printed wiring boards (PWBs) are manufactured by UL recognized manufacturers, and have a flammability rating of 94-V1 or better. Compliance with EMI and safety regulations for products including the Netra CP2140 board is entirely the responsibility of OEMs. The Netra CP2140 board has passed FCC Class B tests in representative enclosures.

The Netra CP2140 boards are intended to be incorporated into systems meeting the following regulations and compliances:

- USA FCC part 15 Class B
- USA Safety UL 1950
- Canadian ICES Class B
- Canadian Safety CSA C22.2 Number 950
- European Union EMC CE Mark EN55022 and EN50082-1
- European Union Safety CE Mark EN 60950
- European Union Safety TÜV
- Japanese EMC VCCI Class B
- NEBS Level 3

  Board requirements for NEBS Level 3 criteria provide the highest assurance of product operability with minimal service interruptions over the life of the equipment. The requirements include the following categories and all associated sections and subcategories:

  - NEBS GR-63-CORE, Issue 1, October 1995 - Network Equipment-Building System Requirements: Physical Protection

- GR-1089-CORE, Issue 2, Revision 1, February 1999 - Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment

---

Note – Refer to the note in Section 2.13, “Connecting Devices to a XCP2040-TRN I/O Transition Card” on page 2-27.

3.1.8 Safety

Please read the cautionary note provided below.

Caution – The Netra CP2140 board holds a lithium battery attached to the real-time clock, The battery is not a customer replaceable part. Do not dispose of battery in fire. Do not attempt to disassemble or recharge it. Failure to comply may cause the battery to explode.

CHAPTER 4

Hardware Description

This chapter summarizes the CP2140 hardware. See Chapter 5 for a detailed functional description of the hardware.

4.1 Physical

The CP2140 is a 6U-sized circuit card with CompactPCI connectors J1 and J2 for CompactPCI, and J3 - J5 for I/O.

- The CP2140 provides front-panel I/O through an RJ45 connector, a TTY connector, and a slot for a PMC card.
- Through the CompactPCI backplane, a transition card can be connected to provide connector access for two serial ports, two RJ45 Ethernet ports, two USB ports, one parallel port, one floppy port, PS/2 keyboard/mouse, and two SCSI ports.
- The PMC card interface accepts an IHV-supplied PMC I/O card.
- The IHV-supplied PCI Interface Module (PIM) can duplicate front-panel PMC I/O ports. The PIM interfaces with a transition card and enables access to I/O ports at the rear of the enclosure.

A PMC module can be installed on the CP2140. A cut-out is provided on the front-panel for the PMC card. The CP2140 front panel also provides an RJ45 Ethernet connector and a mini-DIN TTY connector. The panel includes status lamps and reset push buttons which are listed top to bottom as follows (see FIGURE 1-4):

- ABORT – push button
- RESET – push button
- ALARM/USER – red/green
- READY – green
- Blue LED for hot swap
- Front panel latch to lock and unlock the CP2140 for insertion or removal.

See for FIGURE 1-1 for the Netra CP2140 board key onboard components and FIGURE 1-4 for the front panel.

Note – The CP2140 is shipped with the CPU, heat sink, the SMC module and the power module as integral parts of the board (see FIGURE 4-1).

FIGURE 4-1 shows the CP2140 with the heat sink, SMC, power module, and SDRAM module.

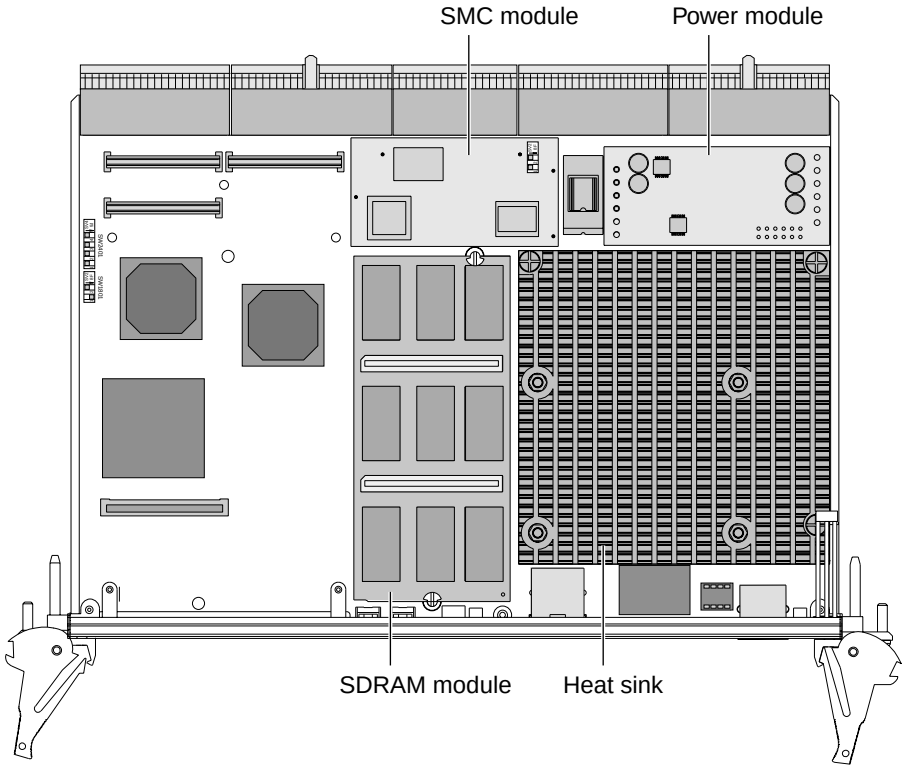


FIGURE 4-1 Netra CP2140 Board with Heat sink, SMC, Power Module and SDRAM Module

FIGURE 4-2 shows the solder side of the Netra CP2140 board.

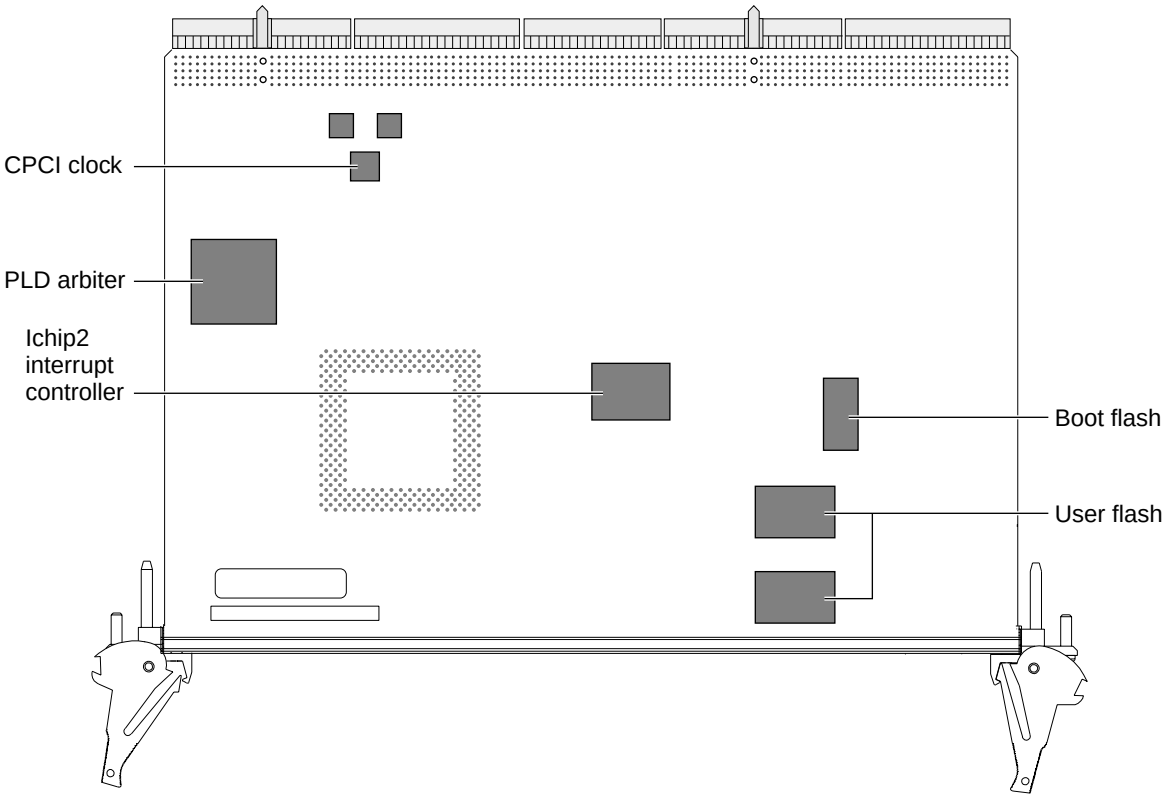


FIGURE 4-2 Solder Side of the Netra CP2140 Board

4.2 Summary Description

A simplified CP2140 block diagram is shown in FIGURE 4-3. For detailed descriptions of on-board components, see Chapter 5.

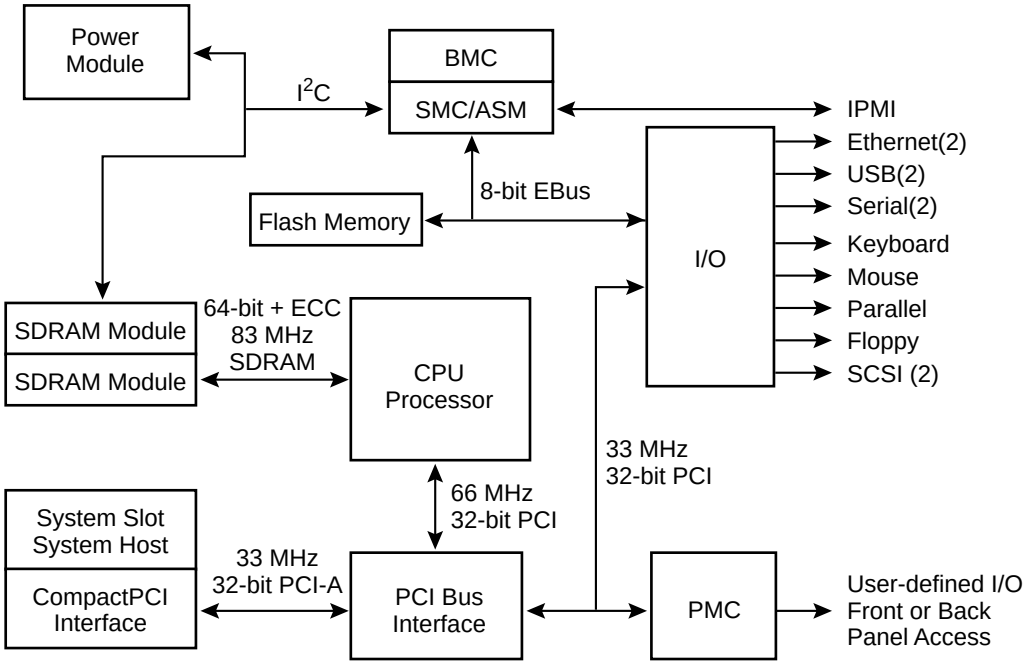


FIGURE 4-3 Netra CP2140 Board Functional Block Diagram

The UltraSPARC IIi processor has a 512 Kbyte 4-way set associative integrated cache.

Apart from incoming interrupts, the processor handles all I/O through its built-in 66MHz, 32-bit PCI bus interface. This interface is used to connect to an Advanced PCI Bridge (APB) that services two 33 MHz, 32-bit downstream interfaces: PCI bus A and PCI bus B.

PCI bus A connects to a nontransparent PCI bridge (NTB) which services the principal PCI bus connection to the CompactPCI backplane through connectors J1 and J2. In a System Host role, a PCI bus arbiter provides arbitration signals for the CompactPCI backplane bus. It also supplies clocks for the CompactPCI bus. The arbiter is only active if the host board functions in a System Host role. When the board is required to function as a satellite board, the CompactPCI bus arbiter is disabled by the System Management Controller (SMC).

PCI Bus B connects the APB to each of two PCIO-2 (SouthBridge) packages: PCIO-2 A and PCIO-2 B, the Dual SCSI device and PMC slot.

PCIO-2 A provides downstream interfaces:

- Network media-independent interface (MII) A to the CompactPCI/J4 connector and to an on-board PHY package A that interfaces the front panel of RJ45
- USB A port that is routed through CompactPCI/J5 backplane connector
- The EBus is a versatile 8-bit data, 24-bit address bus similar to an ISA bus. EBus A connects to:
  - NVRAM, which stores real-time clock and MAC address information
  - System and user flash memory
  - Main PLD, which provides EBus decodes for chip selects and CompactPCI arbiter control logic
  - Super I/O PC97307 interface

PCIO-2 B provides the following interfaces:

- Network MII B to the CompactPCI/J4 connector
- USB B port that is routed through CompactPCI/J5 backplane connector
- EBus B connects to the System Management Controller (SMC) to complete the UltraSPARC host-SMC communication path.

The PCI bus B from the APB connects to a 33 MHz, 32-bit PMC interface on the host board and the SCSI 53C876E from LSI.

The SMC features are:

- The bus arbiter enabling it to control CompactPCI bus arbitration, clock, and reset functions
- The onboard I^2C bus, enabling it to communicate with sensors and controls
- The User IPMI bus, enabling user management of other entities in the system. Peripheral hot-swap control is also enabled through this path.

The SMC activates the power module and controls the system reset signals. In addition, it handles high-availability (HA) hot-swap signals from the CompactPCI backplane. For example, ENUM, HEALTHY, BD_SEL, and PCI_RST (the PCI reset signal).

CHAPTER 5

Functional Description

This chapter provides a functional description of the Netra CP2140 board, including functional blocks of the board, block diagrams, user interface, and various functions related to Netra CP2140 boards.

FIGURE 5-1 shows a detailed block diagram of the CP2140.

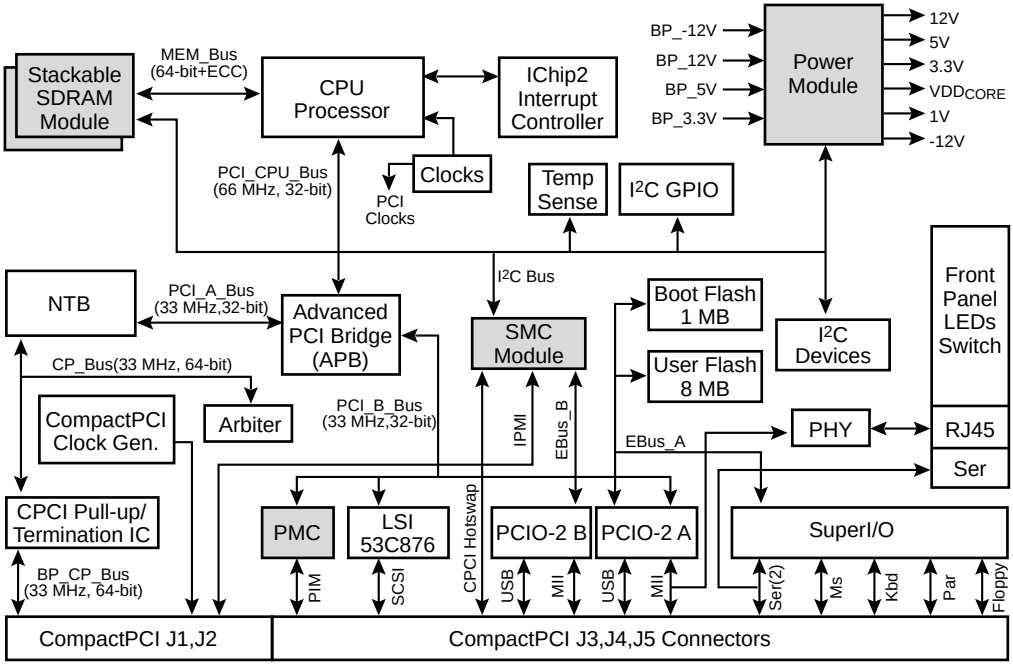


FIGURE 5-1 Netra CP2140 Board Detailed Block Diagram

Note – CP2140 memory and SMC circuits are on mezzanine modules.

5.1 Functional Blocks

The main functional blocks of the Netra CP2140 board are provided in this section.

5.1.1 UltraSPARC IIi Processor

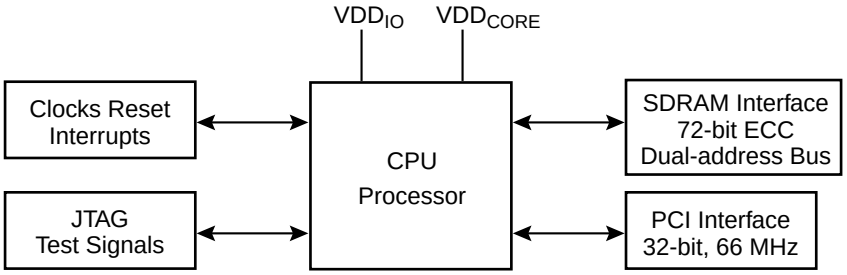


FIGURE 5-2 UltraSPARC IIi Interface

The UltraSPARC IIi 650-MHz processor is based on the 64-bit SPARC V9 architecture. This 4-way superscalar CPU processor has integrated memory controller, PCI controller and 512 KBytes of L2 cache. The processor is directly connected to the board SDRAM through an ECC path.

5.1.2 SDRAM Memory

The Netra CP2140 board has no on-board memory. The memory is composed of up to two mezzanine memory modules. Each mezzanine memory module has two 100-pin male connectors on its bottom surface which plug into corresponding female connectors (J0601 and J0602) on the system board. The module also has two of the same type of female connectors on its top side for memory expansion. Up to two memory modules can be stacked. The CP2140 memory system supports up to two stackable 512 Mbyte/1024 Mbyte Synchronous DRAM (SDRAM) memory modules in any combination.

5.1.3 Firmware

5.1.3.1 System (Boot) Flash Memory

A 1 Mbyte x 8-bit system flash device resides in one megabyte of space. It contains Common Operations and Reset Environment (CORE) firmware, comprehensive POST, and OpenBoot PROM boot code. The system flash can be upgraded by running a program out of OpenBoot PROM or by executing a Solaris software script. If the system flash becomes corrupted for any reason, contact your Field Application Engineer.

5.1.3.2 User Flash Memory

The board is equipped with 8 Mbytes of user flash memory, which is used to house *dropins*. Dropins simplify customizing a system for the user.

5.1.3.3 NVRAM

The use an 8 K-bit x 8 timekeeper SRAM (NVRAM) package. This component provides:

- Battery backup using a removable lithium battery with an approximate ten-year life
- A time-of-day (TOD) real-time clock with an accuracy of 1 sec/day
- 8 Kbytes storage for environment variables, user modifiable. The Ethernet address and host ID are stored in the NVRAM.
- On firmware boot up, the Ethernet address stored in the NVRAM is compared against the backup copy stored in the Ethernet serial EEPROM on the CP2140 and is updated if it differs from the backup copy.

Note – To ensure proper function, replace NVRAM only with the same or equivalent type recommended by the manufacturer. Dispose off used batteries according to the manufacturer's instructions.

5.1.3.4 Serial I^2C EEPROM

The serial I^2C EEPROM, also called the MAC address carrier, stores the backup copy of the board MAC address and host ID in a removable serial EEPROM that is accessible through the I^2C bus. OpenBoot PROM supports retrieving the Ethernet address from the EEPROM, deriving host ID, and downloading this data to the

NVRAM. The user can remove and retain this EEPROM for future use in case the board needs to be shipped to the factory for replacement. The replacement board is not shipped with an EEPROM.

5.2 Clock Frequencies

TABLE 5-1 shows the clock frequencies on the CP2140 components:.

TABLE 5-1 Clock Frequencies

Components	Frequencies
CPU processor	650 MHz
MC12429	250 MHz
MC12429 XTAK	325 MHz
CY2292 XTAL	14.38181 MHz
Memory	92.86 MHz
CPU APB	66 MHz
PCI / CompactPCI	33 MHz
SuperI/O	24 MHz
USB	48 MHz
Ethernet	25 MHz
SCSI	40 MHz
1^2C	6 MHz

5.3 Bus Subsystems

There are three internal PCI buses on the CP2140:

- PCI_CPU Bus—32-bit, 66MHz, UltraSPARC IIi primary bus interface (onboard only)
- PCI_A Bus—32-bit, 33 MHz, APB A bus interface
- PCI_B Bus—32-bit, 33 MHz, APB B bus interface

There is also an external CompactPCI bus driven to and from the backplane.

One of the internal PCI buses, PCI bus B, is bridged to two lower-speed buses: Ebus A and EBus B. PCI bus A communicates with the CompactPCI backplane through the nontransparent PCI bridge (NTB) as shown in FIGURE 5-3.

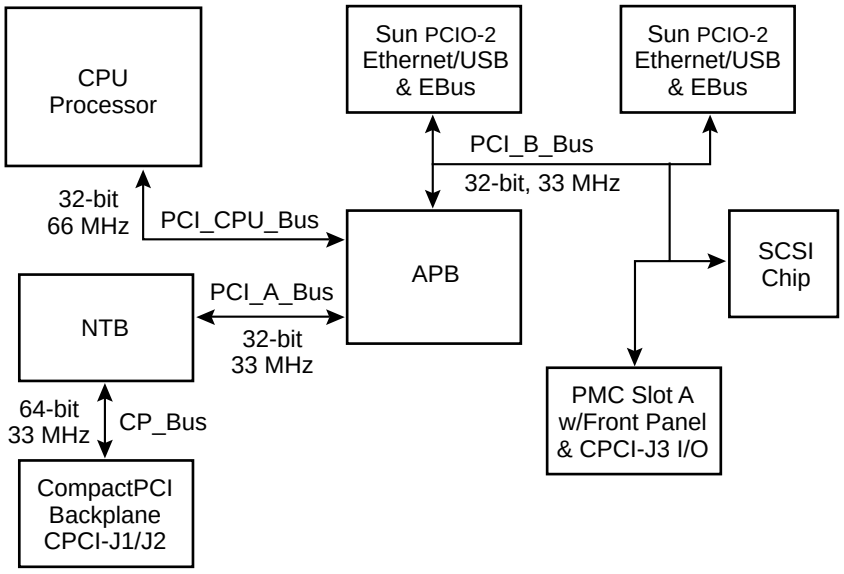


FIGURE 5-3 Netra CP2140 Board PCI Bus Interface

5.3.1 APB PCI Bus Interfaces

The UltraSPARC IIi processor has an integrated 32-bit, 66 MHz PCI bus interface. The Advanced PCI Bridge (APB) splits this bus into two 32-bit, 33 MHz PCI buses. Of these, the PCI A bus connects to the PCI nontransparent bridge (NTB) which forms the interface to the CompactPCI backplane. The PCI B bus connects to two PCIO-2 bridges. Each of these bridges carries an EBus and peripheral interface at the other end.

5.3.2 PCIO-2 A and PCIO-2 B Devices and EBus Paths

The two PCIO-2 bridges connect between two APB devices PCI bus B and their peripheral interfaces at their other ends. Each of these bridges carries one EBus interface. The EBus is similar to the ISA bus and runs at comparable speed. It is used to interface slower internal peripherals.

EBus A connects PCIO-2 A to:

- System flash EEPROM. The UltraSPARC IIi processor accesses system flash EEPROM through the APB and PCIO-2 A.
- User flash EEPROM
- NVRAM
- Serial I/O through a dual universal asynchronous receiver/transmitter (DUART) device

EBus B connects PCIO-2 B to the System Management Controller (SMC). This path is the primary means of communication between the UltraSPARC IIi host and the SMC and is used to transfer host commands to it.

The UltraSPARC IIi processor expects access to a boot PROM/flash which is normally mapped onto the EBus and requires that the EBus device be directly accessible to the UltraSPARC IIi processor.

5.3.3 CompactPCI Bus

FIGURE 5-4 shows the CompactPCI bus interface.

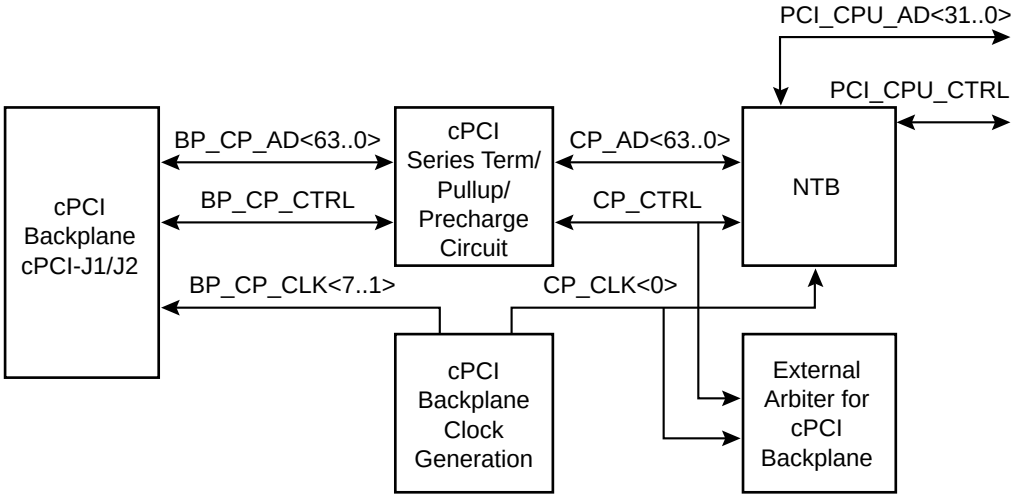


FIGURE 5-4 CompactPCI Bus Interface

This part of the CP2140 interfaces to the CompactPCI backplane. It is a 64-bit, 33 MHz interface that conforms to the *PICMG 2.0 D3.0 Compact PCI Specification* and the *PICMG 2.1 R1.0 Hot Swap Specification*. In order to operate in satellite or nonhost mode, its interface requires the following:

- Hot-swap capable, nontransparent PCI-to-PCI bridge
- 10-ohm series termination resistor for every CompactPCI bus input

- 1V precharge bias (Vp) for every CompactPCI bus input

The latter two requirements (series termination and precharge bias) are provided by a custom integrated circuit to save on board space and reduce complexity.

The CompactPCI bus circuit includes a system slot (host CPU) functionality which entails the following:

- Providing the external arbiter for the CompactPCI backplane
- Providing PCI clocks to all slots on the CompactPCI backplane
- Providing bus pull-ups for all signals on the CompactPCI backplane

In addition, the host CPU also provides the Baseboard Management Controller (BMC) functions described in Section 5.3.6, “System Management Controller” on page 5-9.

As seen in FIGURE 5-1, there are three interfaces to the CompactPCI circuit: the 64-bit CompactPCI backplane, the CompactPCI clock generation, and the output from the bridge onto the PCI_CPU bus.

5.3.4 System I/O

This section describes the CP2140 system I/O features. FIGURE 5-5 shows the CP2140 I/O interface.

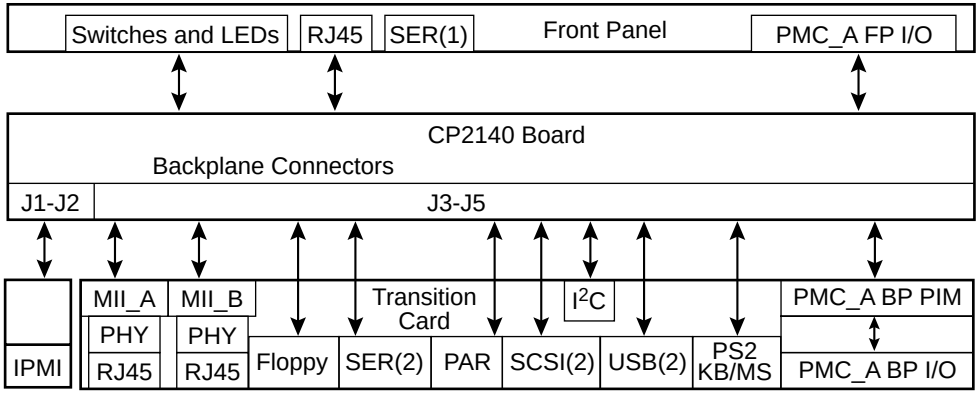


FIGURE 5-5 Netra CP2140 Board I/O Interface

The CP2140 I/O subsystems are onboard SCSI and SuperI/O, which provide two single-ended UltraWide SCSI ports, one parallel port, one floppy port, two serial ports, one keyboard port, and one mouse port.

Each PCIO-2 ASIC provides 10/100BASE-T Ethernet, as well as a USB port.

Access to CP2140 system I/O is provided either partially through the front panel or through the XCP2040-TRN transition card that attaches to the CompactPCI backplane connectors J3-J5 as shown in FIGURE 5-5.

The PMC module provides either front-panel I/O ports or sends user-defined I/O to the backplane/transition card, where a PIM connector is available to attach the PMC card I/O connector and provide rear-panel I/O access.

I/O to the front panel includes:

- LEDs - Power, Status, and Hot Swap (blue)
- Microswitches - POR and XIR (eXternal Interrupt Request)
- RJ45 10/100BASE-T Ethernet
- Serial A (via mini-DIN 8 connector, also available to transition card)
- PMC front panel I/O cutout

I/O through the backplane through the transition card includes:

- Two Ethernet (MII to backplane, two RJ45 connectors out of transition card)
- I/O (floppy, serial A and B, parallel, keyboard, mouse) provided by SuperI/O
- Dual SCSI
- Two universal serial bus (USB) ports provided by PCIO-2s
- PMC/PIM module cutout for PMC rear panel I/O
- I^2C to the transition card for identification

5.3.5 PMC and PIM Interface

The PCI Mezzanine Card (PMC) interface is defined by IEEE and PICMG standards. The PMC interface enables independent hardware vendor (IHV) PMC cards to be used to implement a particular I/O interface choice from the host at the system integration level. This choice is independent of any I/O that is provided by the primary hardware. The PMC connectors are provided on the CP2140 to provide modular front panel I/O expansion via a slim mezzanine card mounted parallel to the host computer. This is for user-defined I/O front or back panel access.

Note – The Netra CP2140 board supports one PMC card when single-sized memory modules are used. No PMC card is supported with the use of double-sized memory modules.

A compatible XCP2040-TRN I/O transition card is installed at the rear of the backplane that provides for the attachment of matching IHV-supplied PCI Interface Module (PIM) hardware. The PIM hardware comprises a PMC module which may or may not carry an I/O connector on its front flange. It enables the PIM card to connect to the transition card PIM sockets. These items together can duplicate the

PMC front-panel interface at the transition card panel which is at the rear of the enclosure. Examples of such interfaces are a display controller, Ethernet, SCSI, or T1 or T3 communications channels.

FIGURE 5-6 shows the PCI mezzanine module interface on the host board.

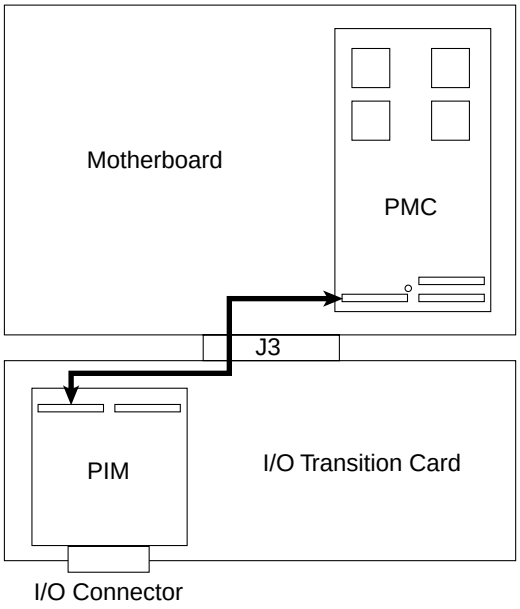


FIGURE 5-6 PCI Mezzanine Module Interface on Host Board

The APB on the CP2140 supplies PCI bus signals to PMC connectors J3001 and J3002. The PMC card logic decodes its specific I/O interface which it makes available at the front panel. J3003 is specified for user I/O and carries PMC signals to CompactPCI backplane connector J3.

5.3.6 System Management Controller

FIGURE 5-7 shows the system management controller interface.

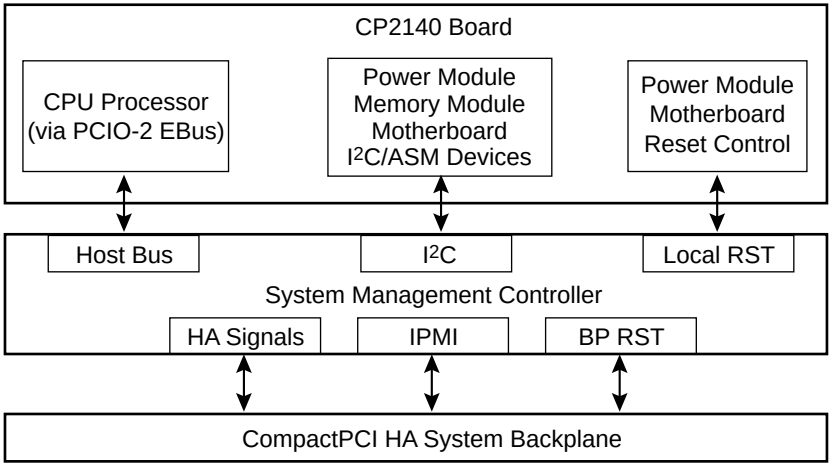


FIGURE 5-7 System Management Controller Interface

The System Management Controller (SMC) provides two main functions:

- The *Advanced System Maintenance (ASM)* capability, which involves monitoring and controlling the local state using an I^2C interface. Some functions performed by the ASM unit include temperature sensing, voltage sensing, power on/off control, board self-configuration.
- The *BMC and/or Peripheral Management Controller* function as defined by the *PICMG Hot Swap Specification* using an IPMI link through the backplane to communicate with other slots. Since CP2140 can operate in both the system and satellite slots of a CompactPCI HA/hot-swap backplane, the SMC must be able to provide both BMC and Peripheral Management Controller functionality.

As shown in FIGURE 5-7, the SMC interface consists of two parts: the internal/local board interface for ASM and host processor communications, and the interface to the CompactPCI HA/hot-swap backplane.

ASM functions of the SMC include:

- Temperature sensing
- Module and board ID (SPD)
- Module control (such as power on/off)
- Local CPU/OS communication via EBus
- Receive System/CompactPCI reset events to generate local board reset

Backplane interface functions of the SMC include:

- IPMI communications to Baseboard Management Controller
- Interface with hot-swap (Healthy/ENUM/PRESENT) related signals
- Generate/Receive System/CompactPCI reset events to generate local board reset

5.3.7 Watchdog Timer

In the Netra CP2140 board, the SMC implements a two-level watchdog timer. The host-SMC command interface defines communication between host and SMC. The host and the SMC constantly communicate with each other when the watchdog timer is enabled. The SMC monitors the heartbeat of the CPU processor host. The heartbeat is sent in the form of reset watchdog timer from the CPU to the SMC. It must be programmed to ensure that it does not get too close to the expiration. There should be some time accounting for the latency overhead or unexpected event that may delay transmission of the heartbeat.

For additional information on the watchdog timer, contact your Field Application Engineer.

The two levels of the watchdog timer are as follows:

- Countdown register timer (16 bits, 100 msec. resolution)
- Pre-timeout timer (1 sec. resolution)

The two watchdog timers are enabled by messages sent over the host-SMC command interface using the set watchdog timer command. The commands enabled in the host-SMC command interface for watchdog timer functionality are:

- Reset watchdog timer
- Set watchdog timer
- Get watchdog timer

TABLE 5-2 descibes the uses of these functions.

TABLE 5-2 Host-SMC Commands

Host-SMC Command	Use For
Reset watchdog timer	Starting-restarting watchdog timer from the initial countdown value
Set watchdog timer	Initializing, configuring and stopping the watchdog timer
Get watchdog timer	Retrieval of current settings and present timer value of watchdog timer

5.4 Reset and Interrupts

This section describes the CPU Reset, Reset Modes and Interrupts.

5.4.1 CPU Reset

This section lists the reset sequences followed during power on and power off.

5.4.1.1 Power On

The power-on reset process is as follows:

1. **Power supply is turned on.**
2. **POWER_OK is asserted by power supply.**
3. **System sequences the release of reset.**
4. **CPU reset is released last.**
5. **CPU propagates the PCI_RST_L to PCI devices.**
6. **CPU retrieves the first instruction.**

5.4.1.2 Power Off

The power-off reset process is as follows:

1. **Power supply fails.**
2. **POWER_OK is immediately deasserted.**
3. **System reset is asserted.**
4. **PCI_RESET_L is asserted.**
5. **CPU stops executing.**

5.4.2 Reset Modes

This section describes the reset modes for system slot and peripheral slot operations for the Netra CP2140 board when used in various roles and CompactPCI slots.

TABLE 5-3 describes the available modes of operation in response to a reset request on the CompactPCI backplane. Determination of system or peripheral slot/satellite operation is made from the state of the CompactPCI backplane SYSEN# signal as specified in the PICMG 2.0 R 3.0 Specification. Note that the RESET# signal has no effect on the System Management Bus or its associated Intelligent Peripheral Microcontrollers.

TABLE 5-3 Available Reset Operating Modes

Reset Mode	System Slot	Peripheral/Satellite Slot
11	The board generates normal CompactPCI RESET# and PCI signalling for the backplane in its role as system controller.	Backplane reset is propagated to the SPARC, the 21555 bridge and other resetable components on the board, resulting in a complete reset of the SPARC section of the board.
22	Standalone Mode. The board generates a constant CompactPCI RESET# and does not respond to any CompactPCI transaction on the backplane.	Standalone Mode. The local CompactPCI bridge is held in reset, isolated from the CompactPCI bus. The board does not respond to any PCI transaction on the CompactPCI bus.
66	Standard System Slot Operation. The board generates normal CompactPCI RESET# and PCI signalling for the backplane in its role as a system controller.	Standalone Mode. The local CompactPCI bridge is held in reset, isolated from the CompactPCI bus. The board does not respond to any PCI signalling on the CompactPCI bus.

The default setting for the Netra CP2140 board is mode 66, giving standard system controller operation when the board is installed in the system slot and standalone operation for use in peripheral/satellite slots.

Note – You can reprogram the operating mode from the OpenBoot PROM prompt, then reboot the system for the new reset mode to take effect. Some of these modes might be incompatible with various PICMG Specifications. You need to consider the risk associated with reprogramming these modes.

FIGURE 5-8 shows the simplified Reset paths.

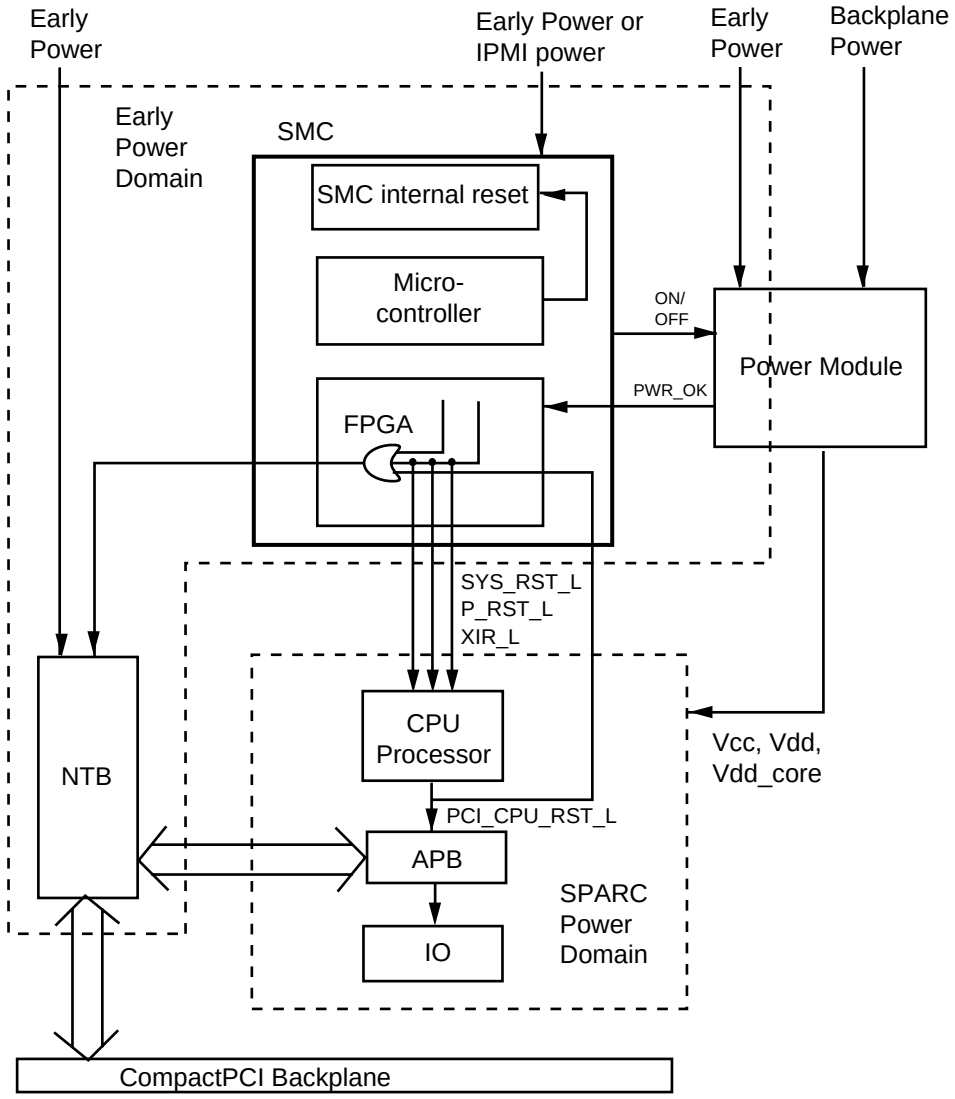


FIGURE 5-8 Simplified Reset Paths

Portions of the system are powered by *early power* before the SPARC domain receives power (backend power). See Section 5.5, “Power Subsystem” on page 5-15. At the onset of early power, the SMC is reset.

- When the SMC is reset, the whole system is reset.
- When the CPU is reset, the CPU I/O and the NTB are reset.

- The SMC can reset the 21555 PCI bridge on satellite boards without resetting the CPU. On a hot swap chassis with a system board controller and CP2000/CP2100 series satellite boards configuration, at the ok prompt, if the PCI_RESET# is removed by the system board controller either by a soft reset or some other means, then this reset removal is detected by the SMC and a notification is dispatched to the local CPU via a SMC Async packet. This can result in a soft reset request by the local CPU in order to reconfigure the local PCI bridge.

5.5 Power Subsystem

FIGURE 5-9 shows a simplified diagram of the power subsystem. This subsystem provides for powering the Netra CP2140 board in a way that supports a hot-swap environment.

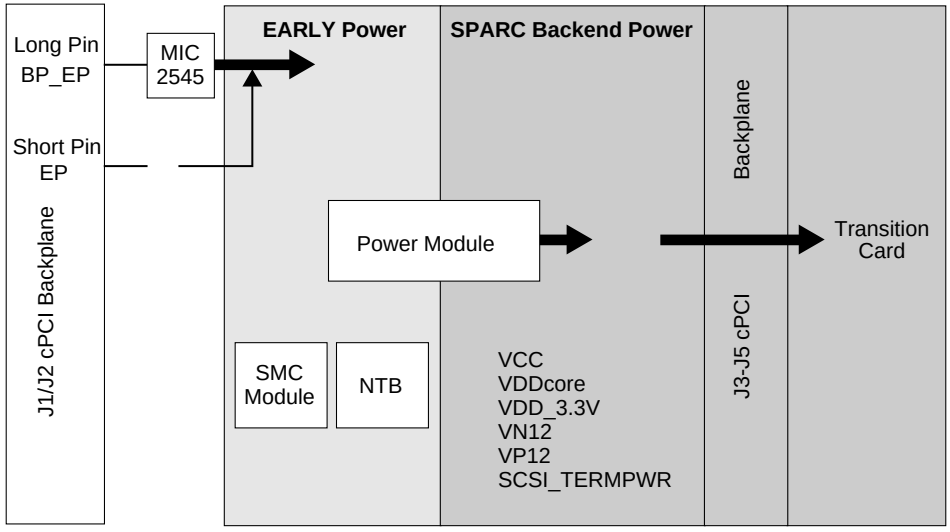


FIGURE 5-9 Power Distribution Block Diagram

The CP2140 sequences power in two time-separated domains:

- Early Power domain
- SPARC Power domain—This is the *Backend Power* in the PICMG Hot Swap specification.

Early power is applied to the board from backplane long pins as the board is inserted. Early power current flows to board subsystems:

- Power Module—Supplies precharge current to the CompactPCI bus interface components
- SMC—Needed to control logical state of the CompactPCI interface circuits as they are connected
- IPMI/I^2C subsystems—Needed for management and monitoring functions at this stage; I^2C power also extends to the transition card
- NTB and CompactPCI Interface components—Must be placed in a known state during attachment to the CompactPCI bus.

5.5.1 Power Module

The power module subassembly is a self-contained DC/DC converter with an on-board hot-swap controller for the CompactPCI voltages +/-12V, 5V, and 3.3V. The power module is controlled by the SMC using the local I^2C bus. Monitoring tasks also are implemented over the I^2C bus. Functions controlled by SMC include core voltage, output level, and module on or off state. Within the power module, there are automatic controls such as overcurrent shutdown and voltage regulation.

This subsystem performs the following functions:

- Generates Vp, the CompactPCI hot-swap precharge bias voltage using early power
- Generates VDDCORE, the UltraSPARC processor core voltage supply
- Controls and gates 5V, +/-12V, and 3.3V power rails for the board
- Automatically shuts down in case of over-current or over-voltage
- Asserts the PWR_MOD_OK signal

This module uses early power from the backplane to provide precharge voltage for the NTB and other CompactPCI interface hardware. The remaining power rails are activated by the SMC after the board is fully inserted into the backplane. When these rails have stablized, the PWR_MOD_OK signal does the following:

- Passes to the SMC, which in turn releases resets to the board logic
- Enables the NVRAM chip select signal to go low and the NVRAM to be accessed; this feature ensures that the NVRAM is not corrupted as the board starts up
- Switches on the green power LED on the front panel flange

5.5.2 Early Power and IPMI Power

In the event of a failure of system power for the backplane, the SMC can use IPMI Power, typically supplied from an uninterruptible power supply (UPS), instead of Early Power from the CompactPCI backplane.

FIGURE 5-10 shows the circuit arrangement that selects between these power sources.

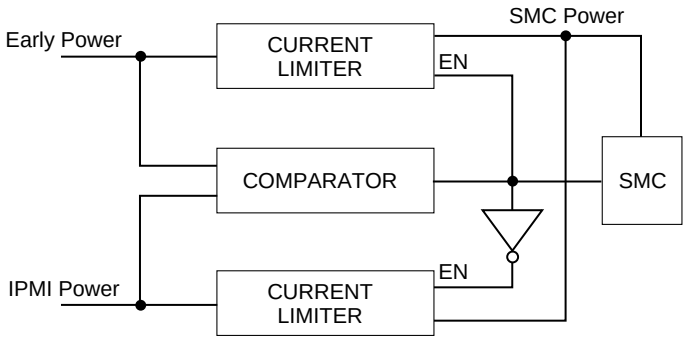


FIGURE 5-10 Selection Between Early Power and IPMI Power

The comparator monitors Early Power and IPMI Power and enables one of the current limiters—based upon MOSFET switches—at a time. When Early Power voltage drops below specification, its supply to the board is disabled and the IPMI Power MOSFET switch is turned on, passing that supply to the load instead. Restoration of Early Power returns the switches to their original states.

5.6 Hot Swap

This section provides hot-swap architecture information and a description of the different hot-swap models.

In general, hot swapping is the capability or property of a system element to be removed or replaced while the system hardware is nominally operating under power. The objectives in introducing hot-swap capability to a CompactPCI system include the following:

- Enable the insertion and extraction of boards without adversely affecting system operation.
- Provide programmatic access to hot-swap services to enable system reconfiguration and fault recovery, with no down time and minimum operator intervention.
- For HA applications, hot swap enables the system to isolate faulty boards so that a system can continue operations in the event of failure.

There are three levels of hot swap:

Basic: Provides hardware features required to perform hot swap, but operator intervention is required to execute software steps such as system configuration and installation of device drivers.

Full Hot Swap: Provides both hardware and software features required for software connection control. Board software connection control resources provide the following:

- ENUM# signal to indicate service requests to the system host, which include adding or removing software drivers for boards that have been inserted or extracted.
- Hot swap switch: to indicate an operator wishes to extract a board
- Blue LED: which is illuminated to indicate that it is safe to extract a board without interrupting system operation.

High Availability (HA): In an HA system, hardware and software is added to enable a higher degree of system control. The following signals are issued to control each slot in the system:

- BD_SEL#: One of the shortest pins on a system backplane - this pin is the last to mate and the first to break contact. This ensures that sensing takes place at a time when all other pins are reliably connected.
- Healthy#: A radial signal that signals a board is suitable to be released from reset and enabled onto the PCI bus.
- PCI_RST#: Driven by the system host, platforms can use this signal to control the electrical connection process - boards cannot come out of reset until Healthy# signal is indicated.

5.7 Programmable Logic Device (PLD) / Arbiter

The arbiter in the PLD provides arbitration of the CompactPCI bus interface with SMC optional boot flash PROM interfaces. As a system controller, the arbiter receives seven requests from the CompactPCI bus and one request from the NTB. The arbiter processes the eight requests based on a round-robin arbitration scheme. As a satellite, the arbiter is disabled and the system passes the NTB request to CompactPCI request 0 and passes CompactPCI grant 0 to 21555 request.

CHAPTER 6

Firmware

This chapter describes the structure and function of initialization firmware. The Netra CP2140 board platform comprises a modular firmware architecture that enables the user to customize initialization and test firmware, even enabling the installation of a custom operating environment.

The SPARC firmware consists of two components: Common Operations and Reset Environment (CORE) and OpenBoot PROM. The CORE in its expanded form is Common Operations and Reset Environment. CORE handles the early initialization of the board before the SPARC control is transferred to OpenBoot PROM. It also provides a trap-based interface for the OpenBoot PROM and user firmware.

This platform also employs the System Management Controller (SMC). The SMC controls the CompactPCI interface, System Management and hot-swap control, and some board hardware. The SMC configuration is controlled by separate firmware.

6.1 Initialization Firmware

The control flow at board startup is shown in FIGURE 6-1. Execution begins in Firmware CORE, which includes Basic POST (BPOST). Then it passes to Comprehensive POST (CPOST) and Extended POST (EPOST), if these are present, before returning to Firmware CORE and on to OpenBoot PROM.

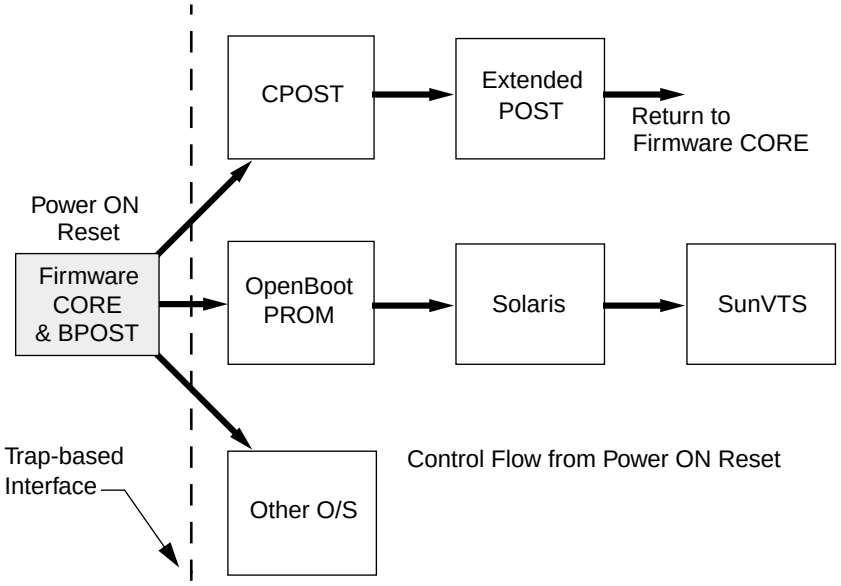


FIGURE 6-1 Control Flow from Power On for Firmware CORE and Client Modules—Solaris Case

6.1.1 Firmware CORE and BPOST

Firmware CORE:

- Unifies system initialization and I/O operations for a higher level client, for example, OpenBoot PROM for Solaris software
- Avoids any duplication of effort for the same type of functions among various clients
- Provides a unified interface to higher level software using a soft-trap mechanism. Trap services (software interrupts) are used to abstract hardware-dependent features behind a uniform service interface. Sun SPARC processors are designed with a common software trap structure that is useful for this common programming interface, so that clients do not need to carry another copy of those drivers and can use those services provided by Firmware CORE until their drivers take over.
- Provides access, early in the boot sequence, to the hardware-dependent services needed for client initialization; examples are I/O devices including serial port, flash, floppy, and net.
- Provides basic system tests that can replace existing POST in *min mode*
- Enables extensive system testing using the POST drop in *max mode*

- Provides error recovery from exceptions which currently does not exist in OpenBoot PROM
- Enables use of popular languages with efficient compilation and easier debugging for development

See Section 6.10, “Firmware Diagnostics” on page 6-38 for detailed information.

BPOST is integrated into Firmware CORE. Its tests are interleaved with the initialization activities of Firmware CORE to present a foundation of validated and initialized hardware to run subsequent code such as that in CPOST or OpenBoot PROM. The tests listed in TABLE 6-1 are examples of CORE and BPOST flow of execution.

Note – Not all of the hardware listed in this table is present on this platform. If a hardware item is not detected by the firmware, the firmware makes no attempt to test or initialize it.

Because BPOST runs from PROM, the extent of testing is limited to that needed by modules that are loaded later. Such a module, for example CPOST, can perform comprehensive testing more quickly because it executes from DRAM.

TABLE 6-1 Firmware CORE and BPOST Flow of Execution

Firmware CORE Service	Detail
Initialize Processor	Set processor in stable state
Initialize NVRAM	Set up state variables
Initialize EBus and bridges	Initialize EBus and bridges in path between CPU and EBus devices
Initialize Super I/O, TTY	For keyboard/mouse, message display, floppy
Set memory timings	
Verify NVRAM	Check magic number. Set defaults if invalid
Check keyboard	Probe and initialize keyboard, set TTYA otherwise
Check I/P device for key pressed	Set state variables in NVRAM accordingly
Cache, MMU test	Perform basic diagnostics on caches and MMUs*
Initialize caches, MMUs	Set up I and D caches and MMUs
Memory test	Perform partial memory test†
Memory probe	Probe memory and clear top memory region
MMU and cache setup	Set up I/D MMUs with valid mappings; enable MMUs and I/D caches

TABLE 6-1 Firmware CORE and BPOST Flow of Execution *(Continued)*

Firmware CORE Service	Detail
Copy Firmware CORE	Copy Firmware CORE into memory and transfer control to the RAM copy
Set up trap table	Set up trap table in memory
Initialize interrupts	Set up hardware interrupts
Probe flash PROMs	Probe for type and size of flash PROMs in the system
Initialize TOD	
Set up CPU counter	Calibrate CPU counter to determine module speed
Probe PCI bus	Probe for Primary PCI system bus
Execute POST dropin†	
Locate the client	Locate the client in PROM. If found, copy into memory and transfer control to it
Enter user interface	OpenBoot PROM for Solaris software, else RTOS or custom OS

* Execute if hardware power-on, run-post set to true, post-level set to min / max, and key to skip post not pressed.

† Execute if hardware power-on, run-post set to true, post-level set to max, and key to skip post not pressed.

6.1.2 CPOST and EPOST

CPOST contains tests for higher level board functions. By placing these tests in a separate module, the user has the option of performing them and the developer can substitute them with other tests. Examples of CPOST tests are:

- PBM, IOMMU, APB, tests
- PCI Tests
- PCIO-2 Tests
- SCSI controller tests
- SMC diagnostic tests
- Memory stress tests

EPOST is used for additional POST code dropins that are provided by the user.

6.1.3 OpenBootPROM

Note – Always upgrade board OpenBoot PROM before upgrading SMC (System Management Controller) firmware.

OpenBoot PROM exists in the form of a dropin in the System Flash memory area. OpenBoot PROM probes for devices and builds the device tree, a table that contains entries for how drivers communicate with connected hardware. Each line, or entry, of the device tree is a reference for the node entry for the peripheral in the `/dev` directory in the `/` directory. The device tree is inherited by Solaris software as it is booted.

To display the device tree, type **`show-devs`** at the `ok` prompt. An example of a device tree follows.

6.1.4 Example of a show-devs Device Tree

CODE EXAMPLE 6-1 show-devs Command Output

```
ok  show-devs
/SUNW,UltraSPARC-IIe@0,0
/pci@1f,0
/multiplexer@0,0
/virtual-memory
/memory@0,0
/aliases
/options
/openprom
/chosen
/packages
/pci@1f,0/pci@1
/pci@1f,0/pci@1,1
/pci@1f,0/pci@1/pci@1
/pci@1f,0/pci@1,1/scsi@4
/pci@1f,0/pci@1,1/usb@3,3
/pci@1f,0/pci@1,1/network@3,1
/pci@1f,0/pci@1,1/scsi@2,1
/pci@1f,0/pci@1,1/scsi@2
/pci@1f,0/pci@1,1/usb@1,3
/pci@1f,0/pci@1,1/network@1,1
/pci@1f,0/pci@1,1/ebus@3
/pci@1f,0/pci@1,1/ebus@1
/pci@1f,0/pci@1,1/scsi@2,1/tape
/pci@1f,0/pci@1,1/scsi@2,1/disk
/pci@1f,0/pci@1,1/scsi@2/tape
/pci@1f,0/pci@1,1/scsi@2/disk
/pci@1f,0/pci@1,1/ebus@3/sysmgmt@14,600000
/pci@1f,0/pci@1,1/ebus@1/flashprom@10,800000
/pci@1f,0/pci@1,1/ebus@1/flashprom@10,400000
```

CODE EXAMPLE 6-1 show-devs Command Output *(Continued)*

```
/pci@1f,0/pci@1,1/ebus@1/flashprom@10,0
/pci@1f,0/pci@1,1/ebus@1/power@14,722000
/pci@1f,0/pci@1,1/ebus@1/su@14,3602f8
/pci@1f,0/pci@1,1/ebus@1/su@14,3803f8
/pci@1f,0/pci@1,1/ebus@1/ecpp@14,340278
/pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0
/pci@1f,0/pci@1,1/ebus@1/idprom
/pci@1f,0/pci@1,1/ebus@1/eeprom@14,0
/openprom/client-services
/packages/kbd-translator
/packages/console-pkg
/packages/dropins
/packages/ps2-keyboard
/packages/SUNW,builtin-drivers
/packages/ufs-file-system
/packages/cdfs
/packages/ufs-file-system
/packages/disk-label
/packages/obp-tftp
/packages/deblocker
/packages/terminal-emulator
ok
```

OpenBoot PROM also contains aliases for some of the devices shown in the device tree. These aliases can simplify hardware access at the ok prompt, for example:

ok **boot disk1**

The **devalias** command lists the device tree aliases. An example of the devalias command follows.

6.1.5 Example of devalias Command

CODE EXAMPLE 6-2 devalias Command Output

```
ok devalias
userprom2
/pci@1f,0/pci@1,1/ebus@1/flashprom@10,800000
userprom1
/pci@1f,0/pci@1,1/ebus@1/flashprom@10,400000
systemprom               /pci@1f,0/pci@1,1/ebus@1/flashprom@10,0
output-mux               /multiplexer:output
input-mux                /multiplexer:input
dload                    /pci@1f,0/pci@1,1/network@1,1:,
hsc                   /pci@1f,0/pci@1,1/ebus@3/sysmgmt@14,600000
pcic                     /pci@1f,0/pci@1/pci@1
pcib                     /pci@1f,0/pci@1,1
pcia                     /pci@1f,0/pci@1
ebus2                    /pci@1f,0/pci@1,1/ebus@3
ebus                     /pci@1f,0/pci@1,1/ebus@1
net2                     /pci@1f,0/pci@1,1/network@3,1
net                      /pci@1f,0/pci@1,1/network@1,1
floppy                   /pci@1f,0/pci@1,1/ebus@1/fdthree
diskx                    /pci@1f,0/pci@1,1/scsi@2,1/disk@0,0
cdromx                   /pci@1f,0/pci@1,1/scsi@2,1/disk@6,0:f
tapex                    /pci@1f,0/pci@1,1/scsi@2,1/tape@4,0
tapex1                   /pci@1f,0/pci@1,1/scsi@2,1/tape@5,0
tapex0                   /pci@1f,0/pci@1,1/scsi@2,1/tape@4,0
diskxf                   /pci@1f,0/pci@1,1/scsi@2,1/disk@f,0
diskxe                   /pci@1f,0/pci@1,1/scsi@2,1/disk@e,0
diskxd                   /pci@1f,0/pci@1,1/scsi@2,1/disk@d,0
diskxc                   /pci@1f,0/pci@1,1/scsi@2,1/disk@c,0
diskxb                   /pci@1f,0/pci@1,1/scsi@2,1/disk@b,0
diskxa                   /pci@1f,0/pci@1,1/scsi@2,1/disk@a,0
diskx9                   /pci@1f,0/pci@1,1/scsi@2,1/disk@9,0
diskx8                   /pci@1f,0/pci@1,1/scsi@2,1/disk@8,0
diskx7                   /pci@1f,0/pci@1,1/scsi@2,1/disk@7,0
diskx6                   /pci@1f,0/pci@1,1/scsi@2,1/disk@6,0
```

CODE EXAMPLE 6-2 devalias Command Output *(Continued)*

```
diskx5                   /pci@1f,0/pci@1,1/scsi@2,1/disk@5,0
diskx4                   /pci@1f,0/pci@1,1/scsi@2,1/disk@4,0
diskx3                   /pci@1f,0/pci@1,1/scsi@2,1/disk@3,0
diskx2                   /pci@1f,0/pci@1,1/scsi@2,1/disk@2,0
diskx1                   /pci@1f,0/pci@1,1/scsi@2,1/disk@1,0
diskx0                   /pci@1f,0/pci@1,1/scsi@2,1/disk@0,0
scsix                    /pci@1f,0/pci@1,1/scsi@2,1
disk                     /pci@1f,0/pci@1,1/scsi@2/disk@0,0
cdrom                    /pci@1f,0/pci@1,1/scsi@2/disk@6,0:f
tape                     /pci@1f,0/pci@1,1/scsi@2/tape@4,0
tape1                    /pci@1f,0/pci@1,1/scsi@2/tape@5,0
tape0                    /pci@1f,0/pci@1,1/scsi@2/tape@4,0
diskf                    /pci@1f,0/pci@1,1/scsi@2/disk@f,0
diske                    /pci@1f,0/pci@1,1/scsi@2/disk@e,0
diskd                    /pci@1f,0/pci@1,1/scsi@2/disk@d,0
diskc                    /pci@1f,0/pci@1,1/scsi@2/disk@c,0
diskb                    /pci@1f,0/pci@1,1/scsi@2/disk@b,0
diska                    /pci@1f,0/pci@1,1/scsi@2/disk@a,0
disk9                    /pci@1f,0/pci@1,1/scsi@2/disk@9,0
disk8                    /pci@1f,0/pci@1,1/scsi@2/disk@8,0
disk7                    /pci@1f,0/pci@1,1/scsi@2/disk@7,0
disk6                    /pci@1f,0/pci@1,1/scsi@2/disk@6,0
disk5                    /pci@1f,0/pci@1,1/scsi@2/disk@5,0
disk4                    /pci@1f,0/pci@1,1/scsi@2/disk@4,0
disk3                    /pci@1f,0/pci@1,1/scsi@2/disk@3,0
disk2                    /pci@1f,0/pci@1,1/scsi@2/disk@2,0
disk1                    /pci@1f,0/pci@1,1/scsi@2/disk@1,0
disk0                    /pci@1f,0/pci@1,1/scsi@2/disk@0,0
scsi                     /pci@1f,0/pci@1,1/scsi@2
ttyb                     /pci@1f,0/pci@1,1/ebus@1/su@14,3602f8
ttya                     /pci@1f,0/pci@1,1/ebus@1/su@14,3803f8
ok
```

6.2 Firmware NVRAM Variables

This section provides some information on the CORE NVRAM variables and the NVRAM configuration variables.

6.2.1 Firmware CORE NVRAM Variables

At startup, Firmware CORE defines a set of variables in the NVRAM for controlling initialization and selecting the amount of testing required. These variables determine the following functions:

- `run-post`: If true, POST is executed depending upon the value of post-level variable. If false, POST is skipped.
- `post-level`: Defines the level of diagnostics to be executed
- `msg-verbosity`: If `run-post` is nonzero, `msg-verbosity` defines the level of messages displayed on TTY interface
- `user-interface`: CORE falls into the user-interface without invoking the client
- `kernel`: Name of the client to be loaded and executed by Firmware CORE
- `trap-state`: Defines the behavior of an error trap

6.2.2 Firmware CORE Execution Control

Use the key combinations listed in TABLE 6-2 to control the flow of execution at system boot. These key combinations must be pressed at power-on.

TABLE 6-2 Firmware Execution Control Key Sequences

Key combination	Result
Control-P	Skip POST
Control-U	Enter CORE user interface
Control-N	Set default NVRAM variables
Control-M	Turn on power on messages

6.2.3 OpenBoot PROM Configuration Variables

The configuration variables are used by the OpenBoot PROM code and are stored in NVRAM. TABLE 6-3 shows a sample output when the `printenv` command is typed at the `ok` prompt. Use the `setenv` command to modify the environment variables. The boot process is controlled by several variables.

TABLE 6-3 NVRAM Configuration Variables

Variable Name	Value	Default Value
auto-run?	false	false
ip-addr-obdiag	ff.ff.ff.ff	ff.ff.ff.ff
dhcp-clientid		
multiplexer-output-devices	ttya ttye	ttya ttye
multiplexer-input-devices	ttya ttye	ttya ttye
shutdown-temperature	70	70
critical-temperature	65	65
warning-temperature	60	60
env-monitor	disabled	disabled
ntp-server-addr	255.255.255.255	255.255.255.255
ntp-enable?	false	false
auto-config-save?	false	false
diag-passes	1	1
diag-continue?	0	0
diag-targets	0	0
diag-verbosity	0	0
post-on-sir?	false	false
scsi-initiator-id	7	7
#power-cycles	743	No default
system-board-serial#	000221	No default
system-board-date	06/12/02	No default
ttyb-rts-dtr-off	false	false
ttyb-ignore-cd	true	true
ttya-rts-dtr-off	false	false
ttya-ignore-cd	true	true

TABLE 6-3 NVRAM Configuration Variables *(Continued)*

Variable Name	Value	Default Value
ttyb-mode	9600,8,n,1,-	9600,8,n,1,-
ttya-mode	9600,8,n,1,-	9600,8,n,1,-
cpci-probe-list	0,1,2,3,4,5,6,7,8,9,a,b,..	0,1,2,3,4,5,6,7,8,9,a,b,...
pcia-probe-list	1	1
pcib-probe-list	1,2,3,4	1,2,3,4
probe-delay	30	30
keyboard-click?	false	false
keymap		
mfg-mode	off	off
diag-level	max	max
watchdog-timeout	65535	65535
watchdog-enable?	false	false
fcode-debug?	false	false
output-device	screen	screen
input-device	keyboard	keyboard
load-base	16384	16384
auto-boot-retry?	false	false
boot-command	boot	boot
auto-boot?	true	true
watchdog-reboot?	false	false
diag-file		
diag-device	net	net
boot-file		
boot-device	disk net	disk net
net-timeout	0	0
ansi-terminal?	true	true
screen-#columns	80	80
screen-#rows	34	34
local-mac-address?	false	false
silent-mode?	false	false

TABLE 6-3 NVRAM Configuration Variables *(Continued)*

Variable Name	Value	Default Value
use-nvramrc?	false	false
nvramrc		
security-mode	none	No default
security-password	No default	
security-#badlogins	0	No default
oem-logo	No default	
oem-logo?	false	false
oem-banner	No default	
oem-banner?	false	false
hardware-revision	No default	
last-hardware-update	No default	
diag-switch?	false	false
ok		

Note – All numbers are hex numbers.

The `diag-switch` and `diag-level` variables listed in TABLE 6-3 affect the path through the various embedded tests. TABLE 6-4 shows the effect of setting these variables.

BPOST is embedded within Firmware CORE and is executed when the OpenBoot PROM environment variable, `diag-switch` is set to `true` and `diag- level` set to `min`. Similarly CPOST (and EPOST if it is present) is executed when `diag-level` is set to max. The permutations are shown in TABLE 6-4.

TABLE 6-4 OpenBoot PROM Environment Variable Settings for Executing the POST Modules

Module	`diag-switch`* set:	`diag-level`* set:	Description
BPOST	`false`	`X`	No messages are output to TTY
	`true`	`min (0x20)`	
	`true`	`off (0x0)`	Messages are output to TTY

TABLE 6-4 OpenBoot PROM Environment Variable Settings for Executing the POST Modules

Module	`diag-switch`* set:	`diag-level`* set:	Description
CPOST	`false`	`X`	No messages are output to TTY
	`true`	`max (0x40)`	Runs after BPOST
	`true`	`off (0x0)`	Messages are output to TTY
EPOST	`false`	`X`	No messages are output to TTY
	`true`	`max (0x40)`	Runs automatically after CPOST (if EPOST module is present)
	`true`	`off (0x0)`	Messages are output to TTY

* Firmware CORE variables `run-post` and `post-level` are equivalent to enviromnment variables `diag-switch` and `diag-level` respectively.

6.3 Firmware Memory Map

The host board boots from the 1 Mbyte system flash PROM device, which contains the firmware CORE, Basic POST code, Comprehensive POST, and OpenBoot PROM. The contents map of this PROM is shown in FIGURE 6-2. User-developed code can also be programmed into the user flash memory space in the form of *dropins*. The system flash can be upgraded by running a program out of OpenBoot PROM—see “OpenBoot PROM Flash Update” on page 6-19. It is not otherwise accessible to the user.

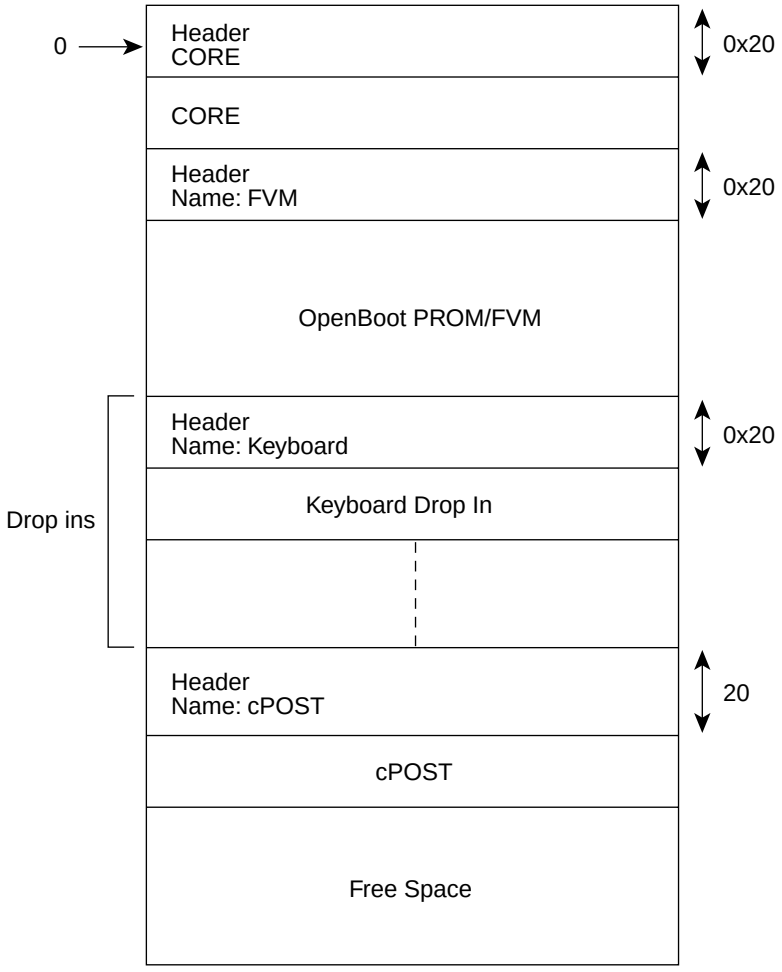


FIGURE 6-2 System Flash PROM Map

6.4 Firmware CORE Features

TABLE 6-5 lists the firmware CORE commands that are run from the monitor.

TABLE 6-5 Firmware CORE Monitor Commands

Description of Task	CORE Monitor Command
To get this help	`help`
To allocate memory buffer	`malloc <size>`
To free memory buffer	`free <addr>`
To block copy memory	`bcopy <src> <dest> <#bytes>`
To dump memory	`dump <addr> <#bytes> [asi]`
To read an address	`[safe-]peek <addr> <1|2|4|8> [asi]`
To write to an address	`poke <addr> <1|2|4|8> <data> [asi]`
To update Flash PROM	`flash-update <dev> <file-path>`
To load a file	`load <device> <file-path> <addr>`
Jump to an address	`go <addr>`
Execute client	`execute [client-name]`
Print NVRAM data	`print-nvram`
Write to NVRAM variable	`set-nvram <variable-name|ID> <data>`
Read an NVRAM variable	`get-nvram <variable-name|ID>`
Delete an NVRAM variable	`delete-nvram <ID>`
Set NVRAM variables to default	`set-defaults`
Call a trap function	`trap <trap#> <par0> ... <par5>`
Soft Reset	`reset`
To change input device	`input-device <tty|kbd>`
To initialize PCI	`init-pci`
To show all pci devices	`show-pci-devs`
To show pci config space	`show-pci-space <bus#> <device#> <function#> <offset>`
To show pci nexus nodes	`show-nexus-nodes`
To remove a pci device	`rm-pci-dev <device#>`
To add a pci device	`add-pci-dev <device#>`

TABLE 6-5 Firmware CORE Monitor Commands *(Continued)*

Description of Task	CORE Monitor Command
To remove all pci devices	`rm-pci-devs`
To add all pci devices	`add-pci-devs`
To execute UI cmd in loop	`loop <count> <command>`

Note – All numbers are hex numbers.

6.5 ASM Support

ASM support is added at the OpenBoot PROM level. The ASM monitors the CPU temperature. The CPU warning, critical and shutdown temperature default limits are set at 60˚ C, 65˚ C and 70˚ C, respectively. For more information on ASM Warning, Critical and Shutdown temperature parameter settings, refer to the *Netra CP2000 and CP2100 Series CompactPCI Boards Programming Guide for Solaris Operating Environment* (816-0854-*xx*).

The following NVRAM variables are added in OpenBoot PROM for ASM:

```
1) NVRAM variable name: env-monitor?
Function  :enables or disables environment monitoring at OBP.
Data type  :string
Valid values  :disabled or enable
Default value  :disable
OBP Usage  :OK setenv env-monitor? enable

2) NVRAM variable name  :warning-temperature
Function  :sets the cpu warning temperature threshold
Data type  :byte
Unit  :Decimal
Default value  :60
OBP Usage  :ok setenv warning-temperature <temperature-value>

3) NVRAM variable name  :shutdown-temperature
Function  :sets the cpu shutdown temperature threshold
Data type  :byte
Unit  :Decimal
```

```
Default value  :70
OBP Usage  :ok setenv shutdown-temperature <temperature-value>

CAUTION: User should exercise caution while setting the above two parameters.
Setting these values too high leaves the system un-protected against system
over-heat.
WARNING: Temperature response at OBP When cpu temperature reaches
"warning-temperature", the following message is spit out at ok prompt
at a regular interval:
     .......
Temperature sensor #2 has threshold event of

<<< WARNING!!! Crossing Warning temperature threshold >>>
The current threshold setting is: 18
The current temperature is      : 28
.......

Critical Temperature response at OBP
Sensor in IPMB Addr 20 has event ===
  Temperature sensor #2 has threshold event of

   <<< !!! ALERT!!! Crossing Critical temperature threshold >>>

  The current threshold setting is: 20  degreeC
  The current temperature is      : 28  degreeC

Shutdown Temperature response at OBP
When cpu temperature reaches "warning-temperature", the following message is
displayed at ok prompt at a regular interval,

...........

Temperature sensor #2 has threshold event of

<<< !!! ALERT!!! Upper Critical - going high >>>

The current threshold setting is: 65
The current temperature is      : 66
     ...........
```

```
show-sensor command at OBP
--------------------------
The "show-sensor" command at OBP displays the readings of all the temperature
sensors on the board.
```

6.6 Determining Firmware Version

If the installed version is not current, update the OpenBoot PROM before continuing. The third character group (X) in OpenBoot PROM is the revision number.

6.6.1 From OpenBoot PROM

To determine the installed OpenBoot PROM version, type the `.version` command at the `ok` prompt. For an example, the firmware version in the output below is the OpenBoot PROM version:

```
ok .version
Firmware version 1.0.5
SMC Firmware Release 3.4.15 Platform ID 10
FPGA Version 1.0
PLD Version 1.3
Firmware CORE Release 1.0.5 created 2002/7/22 20:53
Release 4.0 Version 5 created 2002/07/29 19:09
cPOST version 1.0.3 created 2001/9/24
ok
```

6.6.2 If Running Solaris Software

Type the **`prtconf`** command at the *machine_name* prompt:

```
machine_name% /usr/bin/prtconf -V
OBP 4.0.xx creation date
```

6.7 OpenBoot PROM Flash Update

To update the binary image for both system flash and user flash, OpenBoot PROM is always stored in system flash. User flashes are provided for you to store your own application code or a backup copy of OpenBoot PROM.

Note – The Netra CP2140 board does not support booting the Solaris operating environment from a user flash EPROM device.

6.7.0.1 Accessing SMC Config Block

Use SMC Config block to select booting mode, either from system flash or from user flash.

The following example shows how to select OpenBoot PROM booting mode using the setting in the SMC config block:

```
ok printsmcenv
config-version      : 3
backplane-type      : 1
reset-mode          : 11
sir-xir-enable      : 2
byte5               : 0
chassis-type        : 0
flash-device        : 8  (userflash mode )
byte8               : 0
ha-signal-handler   : 0
poweron-vector      : 0
ipmi-checksum-ctlr  : 0
byteC               : 0
byteD               : 0
byteE               : 0
byteF               : 0
byte10              : 0
ok

ok setsmcenv flash-device h# c
```

```
ok printsmcenv
config-version      : 3
backplane-type      : 1
reset-mode          : 11
sir-xir-enable      : 2
byte5               : 0
chassis-type        : 0
flash-device        : c  (userflash mode c is equivalent
                          to sysflash mode)
byte8               : 0
ha-signal-handler   : 0
poweron-vector      : 0
ipmi-checksum-ctlr  : 0
byteC               : 0
byteD               : 0
byteE               : 0
byteF               : 0
byte10              : 0
ok
```

6.7.0.2 Using Flash Update Commands

The command format is `flash-update` *file-path flashtype*.

`ok flash-update` *file-path* `systemprom` `<---- to update system flash`

`ok flash-update` *file-path* `userprom1` `<---- to update user flash1`

`ok flash-update` *file-path* `userprom2` `<---- to update user flash2`

In the absence of *flashtype*, the OpenBoot PROM updates OpenBoot PROM in whatever flash has the address:

`/pci@1f,0/pci@1,1/ebus@1/flashprom@10,0`

For example, in sysflash mode, the system flash is updated. In the user flash mode, the user flash #1 is updated.

If a combined SPARC and SMC binary file is provided to the `flash-update` command then it updates SMC as well as the SPARC firmware. Use the regular `flash-update` command to update the combined binary and follow the syntax of the `flash-update` command with the full file path of the combined binary.

6.7.0.3 Field CORE/OpenBoot PROM Firmware Upgrade

This firmware can only be upgraded when operating at the OpenBoot PROM level, that is, at the ok prompt. The following procedure gives the steps to update firmware on the target system.

1. **Download the latest Netra CP2140 board host firmware binaries.**

   Download the latest CP2140 host firmware (OpenBoot PROM) and SMC firmware to your server. Contact your Field Application Engineer for help on how to download it.

2. **Bring the system down to OpenBoot PROM level.**

   If your Netra CP2140 host is currently running Solaris software, become superuser and type the following command to halt the system:

   $ **shutdown -i0 -g0 -y**

   or

   $ **init 0**

3. **Check the firmware revision.**

   Check the current firmware revision on the target system by typing:

   ok **.version**

   See Section 6.6.1, “From OpenBoot PROM” on page 6-18 for an example of the output of this command.

   The Platform ID identifies the board ID. For example, if ID = 10 indicates the CP2140.

   For each release, there must be compatible revision numbers for other components. To get the correct combination, refer to the latest release notes.

4. **Disable autoboot; then reset.**

   Disable autoboot and reset the system using the following commands:

   ok **setenv auto-boot? false**

   ok **reset-all**

   The system is now reset.

5. **Flash update your firmware.**

   ok **flash-update** *obp-file-path/obp-latest-binary*

   ok **smc-flash-update** *smc-file-path/smc-latest-binary*

   If you have the combined SPARC and SMC binary file then use the following command:

ok **flash-update** *obp-smc-file-path/obp-smc-combined-latest-binary*

The system should automatically reset. If it does not, power cycle it.

6. **Check the firmware revision.**

Check the firmware revision by typing:

ok **.version**

The output appears as in the example in Step 3. Ensure that the version information shows up as expected. If not, repeat Step 1 through Step 6.

7. **Enable autobooting and reset the system.**

Enable autobooting by typing:

ok **setenv auto-boot? true**

and reset the system to boot the Solaris software:

ok **reset-all**

Contact your service personnel if you have any problems.

Note – Solaris scripts are also available to upgrade core OpenBoot PROM firmware.

6.7.0.4 Sequence to Boot Up the Correct OpenBoot PROM Image

The following sequence enables you to boot up the correct OpenBoot PROM image.

1. **You are logged in UserFlash Mode 8 with OpenBoot PROM image from User Flash #1, which has the following setup in SMC config block:**

```
ok printsmcenv
config-version      : 3
backplane-type      : 1
reset-mode          : 11
sir-xir-enable      : 2
byte5               : 0
chassis-type        : 0
flash-device        : 8
byte8               : 0
ha-signal-handler   : 0
poweron-vector      : 0
ipmi-checksum-ctlr  : 0
byteC               : 0
```

```
byteD               : 0
byteE               : 0
byteF               : 0
byte10              : 0
ok
```

2. **Flash updates new OpenBoot PROM to system flash:**
   `ok` **`flash-update`** *file-path* **`systemprom`**
3. **Change to system flash to boot up if you want to boot from it:**
   `ok` **`setsmcenv flash-device c`**
4. **Power cycle the CP2140 system.**
   The new OpenBoot PROM boots up from the system flash.

6.7.1 SMC Firmware Update

SMC firmware is updated only from the OpenBoot PROM level. Follow these steps to update the SMC firmware:

1. **Check with your Field Application Engineer.**
2. **Type the following command:**

   `smc-flash-update` *`filename`*

Note – The *filename* must be a valid binary or else the file cannot be read to complete the flash update.

---

3. **If a power failure occurs, or an error message displays, or you notice that the second binary is an F, then the flash update has failed.**

   The following example shows the binary breakdown:

First binary	Secondary binary	Third binary
SMCFw version = xx	Revision = 0xF	Build = xx

4. **You must now perform a code recovery of the SMC flash update in order for the code to work.**

6.7.2 IPMI Packet

This section describes how to send and receive packets from one board to another board using the IPMI protocol. First, you must know how to set the IPMB address of each board.

The following steps show you how to calculate the Geographical Address bits:

1. Read Geographical Address bits.

   To get the Geographical Address (GA) bits, type the following command: **`smc-get-ga`**

2. If (GA != 0) then:

   ```
   if (GA <= 9) then
     ipmb_addr = 0xB0 + (GA - 1) * 2
   else if (GA <= 30)
   ```

```
    ipmb_addr = 0xC4 + (GA - 10) * 2
  else
    ipmb_addr = 0
else
  ipmb_addr = 0
```

3. For SBC, IPMB address is always 0x20.

Note – Upon power up, the SMC sets up the IPMB address of the board automatically, but you need to provide the sender's and receiver's IPMB addresses properly within the IPMI packet in order to get the communication to work.

Before sending the IPMI packet to the other board, you must set a bit in the global enable register inside SMC.

Note – All examples shown in this section are performed at the CORE level.

To do this, send `cmd 0x2F` to the SMC (`get_smc_global_enable`).

It returns three bytes of data: The first byte is completion code, the other 2 bytes are global enable bits.

After you get the data, send the following packet to the SMC:
`command 0x2E` (`set_smc_global_enables`):

All values are in hex:

```
07 : Byte count
XX : Checksum
XX : Sequence number
18 : NetFN/LUN
2e : set_smc_global_enables
YY : Put back the first byte that you read earlier.
ZZ : Put back the 2nd byte that you read earlier, but modify bit 4 to 0.
```

Now you can send the IPMI packet through the `send_message` command. You must append this IPMI packet to the EBus packet header, plus the channel number, where 0 is IPMI channel, 1 is the interhost channel.

Here is the format:

LL: Byte count

CS: Checksum

SN: Sequence number

18: NetFN/LUN

34: send_message command

Plus:

00: Channel number, IPMI channel is 0, Interhost is 1.

Append the following IPMI packet to the header:

RA: Responder address, in this case this is the destination IPMB address.

NF: IPMI net function for the command that you want to send.

This MUST be shifted left by 2 bits, and ORed it with LUN, in this case we set it to 1.

CS: Checksum for the IPMI packet.

QA: Requester address. This is the IPMB address of the requester.

SN: Sequence number

CM: IPMI command

Here is the diagram:

EBus packet header					Channel	IPMI packet
LL	CS	SN	18	34	CH 0 or 1	Append IPMI packet here

After this command is sent to the SMC, you will receive a response packet from the SMC.

Note – This is not the IPMI response packet; this is the SMC response packet indicating that it received the command.

If the packet is received, the SMC responds with:

06: Byte count.

CS: Checksum.

SN: Sequence number

1C: Response NetFN number

```
34: send_message command.
00: OK.
```

After you retrieve that packet, you can send command 0x33 (`get_message`) in the following format

```
05: Byte count.
CS: Checksum.
SN: Sequence number
18: NetFN/LUN
33: get_message command
```

If the packet is received, the other board which is appended to the EBus packet header, responds with:

```
LL: Byte count
CS: Checksum
SN: Sequence number
1C: Response NetFN number
33: get message command
00: OK.
```

The IPMI response packet is appended to the packet header listed above. Source and destination IPMB addresses are exchanged in the response packet.

Note – In order to get the response packet from the other board properly with the `get_message` command, the sequence number expected must match the sequence number sent.

Here is an example of the `get_device_id` command:

The packet looks like:

```
Send packet to read global enable bits
5 0 0 18 2f
```

You get the following response packet from the SMC:

```
8 0 0 1c 2f 0 0 14
Send packet to set global enable bits:
7 0 0 18 2e 0 4
```

Now you can send the IPMI packet to the other board so that it can read its device ID.

```
c 0 22 18 34 0 b6 19 0 20 22 1 bd
```

The sequence number in this case is set to 22 (this number is picked arbitrarily).

Net function for `get_device_id` command is 6, and we shift it 2 bits to the left, and ORed it with logical unit number 1. Therefore it becomes 19. The b6 is the address of the board from which the device ID is requested.

Since this packet is being sent from the SBC, 20 is put as the requester IPMB address and 1 is the `get_device_id` command for Netfunction 6 (Application).

If everything goes well, SMC sends the following response packet first:

```
6 0 22 1c 34 0
```

You can read the device ID packet of the other board, by issuing a `get_message` command, the packet looks like this:

```
5 0 22 18 33
```

If the data is not available, the following response packet is received from the SMC:

```
6 0 22 1c 33 80
```

Completion code 80 indicates that data is not available.

Otherwise, you will get the following response packet from the SMC:

```
1d 0 22 1c 33 0 ......
```

followed by the IPMI response packet from the other board, with the requester and responder addresses swapped from the original IPMI packet header.

TABLE 6-6 shows an example of a chassis configuration.

TABLE 6-6 Chassis Configuration Example

Slot	1	2	3	4	5	6	7	8
Geographical Address	1	2	3	4	5	X	X	x
IPMB Address	20	B2	B4	B6	B8	BA	BC	BE

Note – On the first slot, the SBC is assigned an IPMB address of 0x20, not 0xB0. If the second slot becomes SBC, then the IPMB address becomes 0x20, not 0xB2.

To send an IPMI packet to other boards, make sure that you include the correct checksum data in the IPMI packet.

TABLE 6-7 shows what an IPMI packet looks like.

TABLE 6-7 IPMI Packet

Offset	Data
00	rsSA
01	netFn
02	Check 1
03	rqSA
04	reSeq / rqLUN
05	cmd
06	(data)
..	.....
..	.....
NN - 1	.....
NN	Check 2

Check 1: This is the 2's complement check sum of rsSA and netFn.

Check 2: This is the 2's complement check sum of data starting from rqSA all the way to NN - 1 data.

To calculate the checksum, add all the data involved for that particular checksum entry, then use this formula:

checksum = - checksum

The checksum arithmetic that is done is module 256 since only one byte is allocated for each checksum. By performing this calculation, once all the data entries for the checksum have been added and the result is added to that checksum, you get a result of 0.

The examples below show how to send a packet at the OpenBoot PROM interface at the ok prompt. At the OpenBoot PROM level, you do not have to include all EBus packet header data, making the process simple.

Type the following commands at the ok prompt as shown below:

```
ok dev hsc
ok showstack
ok words
```

The **showstack** command enables you to see the value of the returned data. The words command lists all the commands that are supported.

Now you are ready to send the packets.

The generic format is as follows:

ok *ipmi_packet CH BC* **34 execute-smc-cmd**

Reviewers: Is *ipmi_packet CH BC* supposed to be variables and 34 execute-smc-cmd the literal command?

Where the ipmi_packet is the data in the IPMI packet, CH is the channel number and BC is the byte count.

Note – The IPMI packet data is entered backwards at the ok prompt.

In this example, the get_device_id_command is used. B6 is the destination address or the responder, and 20 is the source address, or the requester. The command for get_device_id is 1 and the NetFn data field in this case is 19 (after it has been adjusted/shifted 2 bits to the left and ORed with 1). The sequence number is set to 22 in this case.

The IMPI packet looks like this:

```
b6 19 0 20 22 1 > byte count = 6
```

The channel number is 0 indicating that this is an IPMI channel.

The total byte count is 6 + 1 (the channel number) = 7.

Type the command as follows:

```
ok 1 22 20 0 19 b6 0 7 34 execute-smc-cmd
```

if everything works as planned, you get the following message:

```
0 ok
```

At this point, you can issue a clear command to clear the stack.

You see the following message:

```
0 ok clear
ok
```

Now you are ready to issue command 33 to retrieve the response packet from the other board.

Type the following command:

```
ok 0 33 execute-smc-cmd
```

If everything works as planned, you receive the following message:

```
.....ipmi_response_packet....ok
```

You also receive the EBus response data appended to the ipmi_response_packet. In this case, it is 0.

6.8 Host-to-Host Communication

An *event* is a packet of information in a fixed format which is sent by the SMC on one board to another board through IPMI. The events are usually generated by the SMC and they go to another board's SMC, which sends it to the local SPARC.

But the event can also be generated by the SPARC wherein it sends the event packet to its SMC which sends the packet to another board. FIGURE 6-3 shows the host-to-host communication.

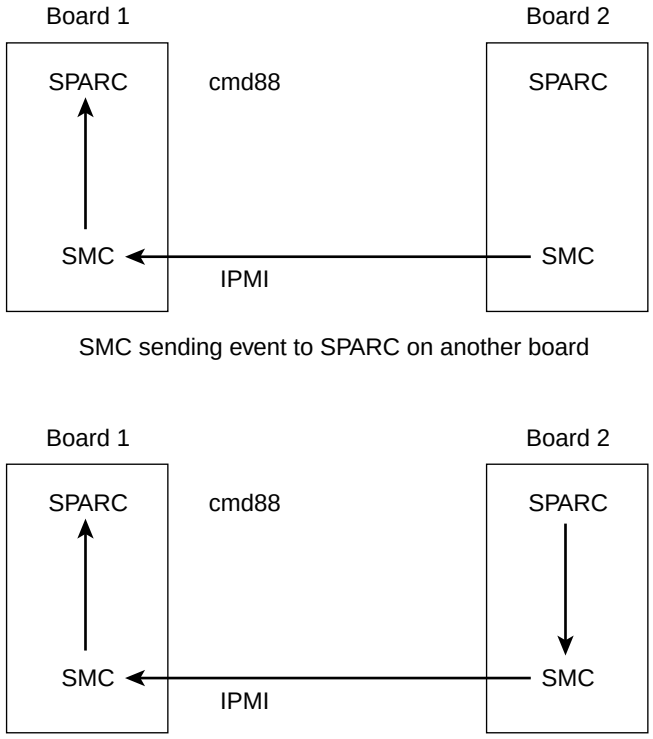


FIGURE 6-3 Host-to-Host Communication

6.8.1 Packet

There is a fixed packet for any event to be sent. That packet is as follows:

```
evm_rev         // Revision number
sensor_type
sensor_number
event_type_dir  // dir => assertion/deasserion event..
event_data1
event_data2
event_data3
```

The packet formation depends on the sensor class and value. For example, if there is a temperature sensor, where the monitor task detects the temperature value higher than the threshold value, the packet might look like the following:

```
evm_rev = 0x03;  // for current specs it is 0x03
sensor_type = TEMPERATURE_SENSOR;  // sensor 0x01,Table 30.3
sensor_number = 0xe;  // Sensor # assigned to a sensor.
event_type_dir = 0x01;  // implies Threshold based sensor,Table 30.1
event_data1 = 0x59;  // Implies that in event_data2 we have
// current temp value and in event_data3 we
// have threhold value which triggered the
// event. see table 17.5 IPMI specs
event_data2 = temp_sensor_ds1721.temp;  // current temp value.
event_data3 = temp_sensor_ds1721.high_temp;  // threshold value.
```

Thus, the values specified in the variables change depending upon the event type.

For detailed explanation of these variables, refer to *IPMI Intelligent Platform Management Interface Specification* (A00328-xxx).

6.8.2 Event Receiver

All events are sent to the current event receiver. An event receiver is the address of the board which is bound to receive the events. By default, the event receiver is the BMC address 20 for all the SAT boards. However, any board can set itself or any other board as event receiver for other boards.

For example, a board at address 0xb6 can send IPMI command `set_event_receiver` to a board at address 0xba asking it to set address 0xb2 as its event receiver, so that now all the events from satellite at address 0xba goes to address b2. Similarly, the board at address 0xb6 could have asked 0xba to set 0xb6 itself as event receiver (which usually is the case).

The SMC sends the event to the currently set event receiver, without verifying whether that address is set correctly or not.

6.8.3 Protocol

The event generation follows a particular protocol as described in the following test. As soon as an event condition is detected, the SMC creates the packet to be sent and sends an event packet to the event receiver. It then waits for the response from the event receiver to come until it times out. If the response does not come within that time, it sends the event packet again, with a different sequence number and again waits for the time out. This continues until retry count is exhausted.

During all this time, the state system is held in a state which indicates that the event is transmitted and no response has been received. So, if during this period, another event condition is generated, the event shall not be sent until the response to previously sent event has timed out.

The state changes to normal idle state if either it times out or a response to the event is received.

Refer to the *IPMI Intelligent Platform Management Interface Specification* (A00328-xxx) for more details.

When an event receiver gets an event packet, it does two things: First, it updates its mini system event log where it keeps the latest event from the SAT which is sending the event; second, it sends the event packet to the local SPARC as an asynchronous message through command 0x88.

6.8.4 Generating an Event From SPARC to Send to Another SPARC

This is a special case of event generation. Here the event is not sent to the current event receiver but to the address where the SPARC wants the event to be sent.

To send an event packet to another SPARC, the SPARC sends the packet through EBus command send event (command f6) to the local SMC. Also it sends the address where the event is to be sent. SMC extracts the packet and sends the event to this address.

The protocol to send the event to the receiver address remains the same. When the receiver gets the event packet, it sends the packet to local SPARC through command 0x88.

The EBus packet for command 0xf6 looks similar to CODE EXAMPLE 6-3:

CODE EXAMPLE 6-3 EBus Packet for Command 0xf6

```
LEN           D
CHK           0
SEQ           Sequence Number
NETFN/RSLUN   0X18
CMD           0XF6
IPMB ADDR
EVM REV
SENSOR TYPE
SENSOR NUMBER
EVENT DIR
EVENT DATA1
EVENT DATA2
EVENT DATA3
```

The response packet for this EBus command is as shown in CODE EXAMPLE 6-4:

CODE EXAMPLE 6-4 Response Packet for EBus Command 0xf6

```
LEN           5
CHK           0
SEQ           Sequence number
NETFN/RSLUN   0X1c
CMD           0XF6
CC            Completion Code
```

If the completion code is 0xC0, the SMC is waiting for the response to the previously sent event packet. If the completion code is 0, the event packet has been sent.

6.9 SMC Implementation Note

This document lists the features supported by this release (Release 3.8.9). A brief description is included for each command.

The list is sorted by the opcode number:

1. Cmd. 0x22, reset watchdog timer.

   This is used to start and restart local watchdog.

2. Cmd. 0x24, set watchdog timer.

   This is used to initialize and configure local watchdog timer.

3. Cmd. 0x25, get watchdog timer.

   This is used to get the current setting and present countdown value.

4. Cmd. 0x2e, set SMC global enables.

   This is used to set the global enable bits.

5. Cmd. 0x2f, get SMC global enables.

   This is used to read the global enable bits settings.

6. Cmd. 0x33, get message.

   This is used to retrieve data in the Receive Message Queue (RMQ). The data in RMQ is typically from IPMI channel.

7. Cmd. 0x34, send message.

   This is used to send IPMI packet to the other board. The packet is appended to the EBus packet, with the channel number.

8. Cmd. 0x52, master write-read I^2C

   This is used to communicate with devices via I^2C channel. It is normally used for raw data communication, not like IPMI packet.

9. Cmd. 0x55, get geographical address.

   This reads 5 bits of geographical address of the slot from the backplane.

10. Cmd. 0x60, select memory device.

This command is reserved for SMC flash update operations, therefore it can't be used for other purposes. It selects the device type and segment number.

11. Cmd. 0x63, write selected memory device.

    This command is reserved for SMC flash update operations. It writes multiple bytes of data into the selected device.

12. Cmd. 0x65, erase selected memory device.

    This command is also reserved for SMC flash update operations. It erases one segment of the selected device.

13. Cmd. 0x6f, get firmware version.

    This command returns multiple bytes of data, which includes version number, and if the code is running from main flash or boot flash. It also tells if the code is for actual production or testing.

14. Cmd. 0x70, reset device.

    This command is used to reset device, and to control the level of reset (max or min. reset).

15. Cmd. 0x71, get role information.

    This is used to find out if the board is SBC, SSBC or SAT.

16. Cmd. 0x83, notify SMC of host health.

    This is used by SPARC to notify SMC of its health status.It updates the SMC the execution state of the host. Useful for power up sequence.

17. Cmd. 0x84, turn blue, or red LED on/off.

    This is used to control the blue LED on the front panel of the board.

18. Cmd. 0x87, enum notification.

    This is an asynchronous message sent by the SMC to the host. It is used to notify the host of a pending ENUM condition.

Note – The host does not send this command. This is an asynchronous command which means it comes only from the SMC.

---

19. Cmd. 0x88, IPMI response message notification.

    This command is used by SMC to send unsolicited data to the host.

Note – The host does not send this command. This is an asynchronous command which means it comes only from the SMC.

---

20. Cmd. 0x8b, SMC local event.

    This is used by the SMC to update the host of the action taken by the SMC. It is normally used during power up/reset.

Note – This is also an asynchronous command, only sent by the SMC.

---

21. Cmd. 0x8c, get device table data.

This is used by the host to read device table information. The device table contains data of which slots are occupied, etc. Only the board that support IPMI is listed.

22. Cmd. 0xa0, get SMC self test results.

    This is used to read the SMC self test results. The self tests are done at power up only.

23. Cmd. 0xc3, EEPROM write.

    This command is used to write data into I^2C EEPROM devices using I^2C channel (Channel 2). Multiple data can be written in one pass.

24. Cmd. 0xc4, EEPROM read.

    This command is used to read data from EEPROM devices, using I^2C channel (Channel 2). Multiple data can be read in one pass.

25. Cmd. 0xf4, get sensor event enable. This command is used to get the sensor event enable setting.

26. Cmd. 0xf5, set sensor event enable.

    This is used to enable or disable sensor event generator. Each sensor event generator can be enabled or disabled

27. Cmd. 0xf6, send event.

    This is used by one host to communicate with the other host on another board in different slot.

28. Cmd. 0xf8, get configuration block.

    This is used to read the configuration data in the I^2C EEPROM device.

29. Cmd. 0xf9, set configuration block.

    This command is used to set the configuration data in the I^2C EEPROM device.

    The data is used for power up sequence.

Note – In order to take effect, after the new data is written, the board must be power cycled.

30. Cmd. 0xfb, set voltage.

    This is used to set voltage level in the power module. Please consult the hardware team before using this command for testing.

31. Cmd. 0xfc, get sensor reading.

    This is used to read the data of selected sensor. The data read includes the current status with respect to the threshold value, or state value.

32. Cmd. 0xfd, get sensor threshold

    This command is used to get the current sensor threshold settings.

33. Cmd. 0xfe, set sensor threshold.

    This command is used to set the sensor threshold settings.

6.10 Firmware Diagnostics

The firmware contains a comprehensive set of hardware diagnostic modules that provide tests for most situations. FIGURE 6-1, shows the control-flow relationship of the diagnostic modules with the system firmware. The Sun Validation Test Suite (SunVTS™) package can be executed from within the Solaris software if more tests are required.

The Firmware diagnostic modules are:

- Basic POST (BPOST)
- Comprehensive POST (CPOST)
- Extended POST (EPOST) (currently not available on this board)
- OBDiag

The firmware diagnostics cover address and data bits on all system buses and exercise the function of the major hardware resources on the board.

Diagnostics can be performed at OpenBoot PROM level by using the `obdiag` command, or by typing individual test commands at the `ok` prompt. These test suites are similar to those in earlier OpenBoot PROM versions but they are comprised of dropins that can be placed by the user.

6.10.1 Setting Diagnostic Levels

The user interface in terms of running POST at minimum or maximum remains the same. BPOST is embedded within Firmware CORE and is executed when the OpenBoot PROM environment variable, `diag-switch?` is set to `true` and `diag-level` set to `min`. Similarly CPOST (and EPOST if it is present) is executed when `diag-level` is set to `max`. The permutations are shown in TABLE 6-4.

CPOST, and Extended POST are clients of Firmware CORE.

6.10.2 Basic POST (BPOST)

BPOST is integrated into Firmware CORE. It can provide on-demand diagnostic services in response to:

- IPMI requests from the System Management Bus
- Requests from the network
- Requests from CompactPCI using the packet-based communication protocol

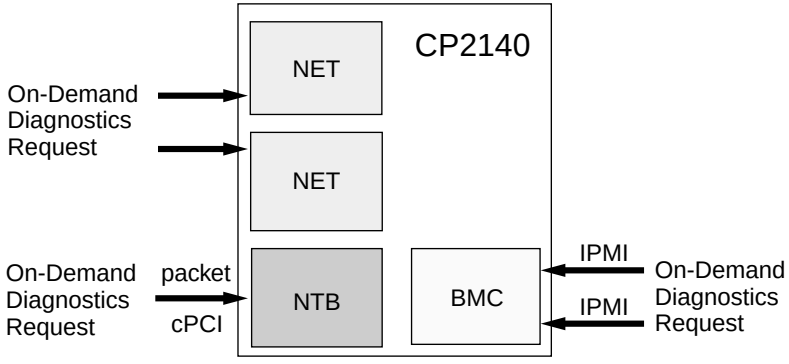


FIGURE 6-4 Basic POST Services

BPOST consists of two parts:

The first part of BPOST executes from flash memory. It is designed to validate enough of the system resources to be able to run Firmware CORE in main memory (System RAM). If this test phase is passed, BPOST is also copied into system RAM.

The part of BPOST executed from flash includes basic tests for the items:

- NVRAM
- I-cache and D-cache
- MMU
- FPU
- L2-cache tag and RAM

- Data lines
- CORE memory

The second part is performed after Firmware CORE is copied into main RAM. This part of BASIC POST executed from RAM includes:

- Memory address line test—this test assumes that the CPU, MMU, and FPU are functional.
- ECC block memory test—verifies main memory with block write and ECC checking. This test assumes that the CPU, MMU, and FPU are functional.

6.10.3 Comprehensive POST (CPOST)

Comprehensive POST (CPOST) is a client of Firmware CORE. It is a dropin module invoked by Firmware CORE and contains enhanced diagnostics for the CPU and on-board devices.

The execution of CPOST is optional and can be selectively controlled by an environment variable—see TABLE 6-4. CPOST runs after BPOST. To run CPOST, set the environment variables `diag-switch` to `true` and `diag-level` set to `max`.

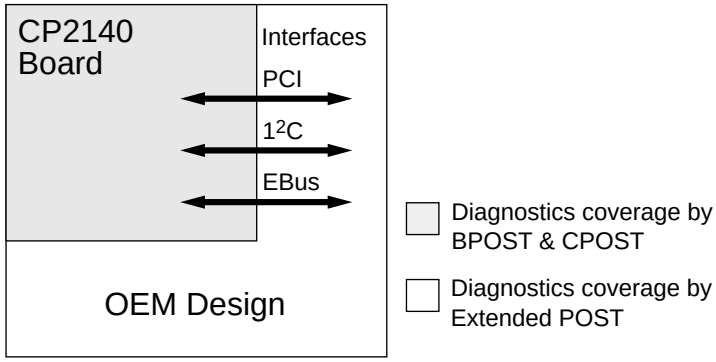
CPOST tests comprise:

- DMA logic test; advanced test of APB
- Memory stress test; advanced main memory test
- Basic PBM, IOMMU test
- Basic Advanced PCI Bridge APB test
- Basic PCI-PCI bridge test: verify the NTB
- PCI/EBus/Ethernet/SuperI/O tests
- System timers test
- SuperI/O test; verify SuperI/O
- Basic SCSI test; verify PCI configuration registers of Symbios 875 SCSI controller
- System Management Controller test
- Advanced 21555 diagnostics

Execution passes to EPOST (if it exists) or undergoes a software reset which sends it back to Firmware CORE. From this point, execution enters OpenBoot PROM (since diagnostics are only executed at power on reset).

6.10.4 Extended POST

Extended POST enables OEMs to provide additional firmware diagnostics for their hardware within a CP2140-based system. Extended POST is a dropin module invoked by CPOST and is also a client of Firmware CORE from which it uses trap-based services.



Extended POST enables OEMs to add diagnostic support for their H/W in a CP2140 system.

FIGURE 6-5 POST Enables OEMs to add Diagnostics

The conditions for execution of EPOST are:

- After CPOST completes, if there is any error, execution returns to the OpenBoot PROM with its standard interface. If BPOST tests are passed and `diag-level` is not set to `max`, execution passes to OpenBoot PROM.
- If the `diag-level` is `max`, the CPOST code checks if there is an EPOST dropin in flash or user PROM area. If it does not find one, it displays a message:

  ```
  There is no extended POST in this system
  ```

- If CPOST finds an EPOST dropin, it loads it into memory and runs it.

Before passing control to EPOST, CPOST creates a list of pointers of vital functions and passes these to EPOST.

6.10.5 OpenBoot PROM Onboard Diagnostics

The OpenBoot PROM onboard diagnostics reside in the OpenBoot PROM dropin.

To execute the OpenBoot PROM onboard diagnostics, the system must be at the ok prompt. The OpenBoot PROM onboard diagnostics comprise:

- Watch-clock
- Watch-net and watch-net-all
- Probe-scsi
- Test alias name, device path, -all
- Probe-scsi-all

6.10.6 OpenBoot Diagnostics

The OpenBoot Diagnostics are an enhancement of the traditional system tests. They reside in Forth script in a dropin and are invoked with an interactive tool started from the ok prompt.

When OpenBoot Diagnostics is started, the OpenBoot Diagnostics menu shown below is displayed.

```
1 ebus@1                2 ebus@3                3 fdthree@14,3203f0
4 flashprom@10,0        5 flashprom@10,400000   6 flashprom@10,800000
7 network@1,1           8 network@3,1           9 scsi@2
10 scsi@2,1             11 usb@1,3              12 usb@3,3

Commands: test test-all except help what printenvs setenv versions exit
```

An example of the **test-all** OpenBoot Diagnostics command follows:

```
ok obdiag
obdiag> test-all
Hit the spacebar to interrupt testing
Testing /pci@1f,0/pci@1,1/ebus@1 .....................................passed
Testing /pci@1f,0/pci@1,1/ebus@3 .....................................passed
Testing /pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0 Testing
floppy disk system.  A formatted disk should be in the drive.
Recalibrate failed.  The floppy drive is either missing,improperly
connected, or defective.
Selftest at /pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0 (return:-1) ...failed
Testing /pci@1f,0/pci@1,1/ebus@1/flashprom@10,0 .....................passed
Testing /pci@1f,0/pci@1,1/ebus@1/flashprom@10,400000 .................passed
Testing /pci@1f,0/pci@1,1/ebus@1/flashprom@10,800000 .................passed
```

```
Testing /pci@1f,0/pci@1,1/network@1,1 ..............................passed
Testing /pci@1f,0/pci@1,1/network@3,1 ..............................passed
Testing /pci@1f,0/pci@1,1/scsi@2 ...................................passed
Testing /pci@1f,0/pci@1,1/scsi@2,1 .................................passed
Testing /pci@1f,0/pci@1,1/usb@1,3 ..................................passed
Testing /pci@1f,0/pci@1,1/usb@3,3 ..................................passed

Hit any key to return to the main menu
```

APPENDIX **A**

Connector Pinouts and Switch Settings

This appendix describes the Netra CP2140 board connector pinouts and switch settings.

A.1 CompactPCI Connectors

TABLE A-1 through contain the pinouts of the CompactPCI connectors. The J1 and J2 connector pinouts follow the CompactPCI specification. The J3, J4, and J5 connectors contain semi-custom pinouts.

FIGURE A-1 shows the Netra CP2140 board connectors.

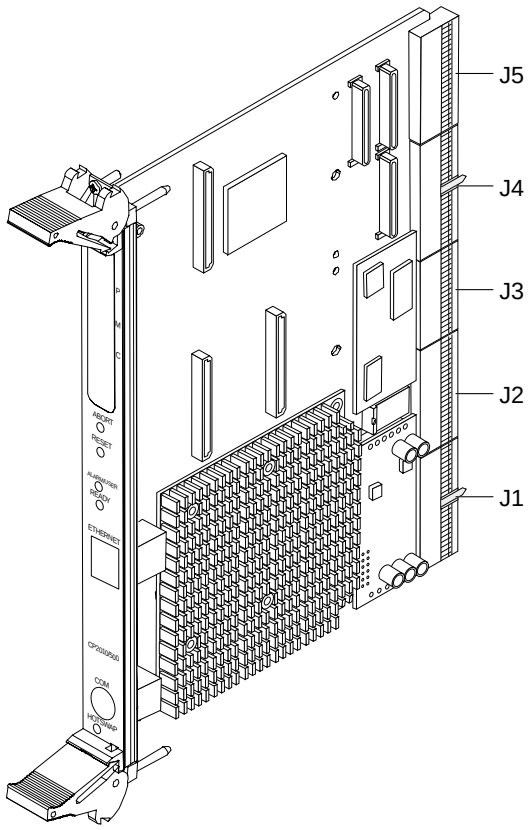


FIGURE A-1 Netra CP2140 Board Connectors

FIGURE A-2 shows the J1 connector.

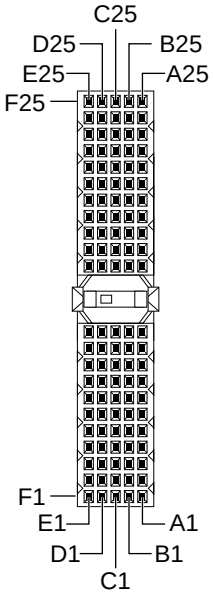


FIGURE A-2 J1 Connector

TABLE A-1 shows the J1/P1 connector pin assignments

TABLE A-1 J1/P1 Connector Pin Assignments

Pin #	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
25	GND	+5V	REQ64#	ENUM#	+3.3V	+5V	GND
24	GND	AD[1]	+5V	+5Va	AD[0]	ACK64#	GND
23	GND	+3.3V	AD[4]	AD[3]	+5V	AD[2]	GND
22	GND	AD[7]	GND	+3.3V	AD[6]	AD[5]	GND
21	GND	+3.3V	AD[9]	AD[8]	M66EN	C/BE[0]#	GND
20	GND	AD[12]	GND	+5Va	AD[11]	AD[10]	GND
19	GND	+3.3V	AD[15]	AD[14]	GND	AD[13]	GND
18	GND	SERR#	GND	+3.3V	PAR	C/BE[1]#	GND
17	GND	+3.3V	IPMB SCL	IPMB SDA	GND	PERR#	GND
16	GND	DEVSEL#	GND	+5Va	STOP#	LOCK#	GND
15	GND	+3.3V	FRAME#	IRDY#	BD_SEL	TRDY#	GND
14	Key						Key
13	Key						Key

TABLE A-1 J1/P1 Connector Pin Assignments *(Continued)*

Pin #	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
12	Key						Key
11	GND	AD[18]	AD[17]	AD[16]	GND	C/BE[2]#	GND
10	GND	AD[21]	GND	+3.3V	AD[20]	AD[19]	GND
9	GND	C/BE[3]#	IDSEL	AD[23]	GND	AD[22]	GND
8	GND	AD[26]	GND	+5Va	AD[25]	AD[24]	GND
7	GND	AD[30]	AD[29]	AD[28]	GND	AD[27]	GND
6	GND	REQ0#	GND	+3.3V	CLK0	AD[31]	GND
5	GND	BRSVP	BRSVP	RST#	GND	GNT0#	GND
4	GND	IPMB_PWR	HEALTHY_out	+5Va	intp	ints	GND
3	GND	INTA#	INTB#	INTC#	+5V	INTD#	GND
2	GND	tck	+5V	tms	tdo	tdi	GND
1	GND	+5V	-12V	trst	+12V	+5V	GND

Note:

1. For the Netra CP2140 board V(O/O) is +5V.
2. JTAG tck/tms/tdo/tdi/trst and ints/intp not supported on CP2140.

TABLE A-2 Signal Definitions

AD[0..63]:	cPCI interface 64-bit multiplexed address and data bus
INT[A-D]:	cPCI interface interrupt requests
REQ64#:	cPCI interface request 64-bit transfer
ENUM#:	PICMG 2.1 R1.0 Hot-swap signal - provided to inform System Host that a board has been freshly inserted or is about to be extracted
ACK64#:	cPCI interface 64-bit acknowledge transfer
M66EN#:	Routed to IChip2, 66MHz enable - not supported
SERR#:	cPCI interface System Error for reporting address/data parity errors on the special cycle command
PAR:	cPCI interface even Parity across AD[31..0] and C/BE[3..0]
C/BE[0..7]#:	cPCI Bus Command and Byte Enables multiplexed on the same PCI pins
IPMB_SCL:	Independent Platform Management Bus Clock - see cPCI System Management Specification PICMG 2.9 R1.0

TABLE A-2 Signal Definitions *(Continued)*

IPMB_SDA:	Independent Platform Management Bus Data - see cPCI System Management Specification PICMG 2.9 R1.0
PERR#:	Parity Error used for reporting of data parity errors
DEVSEL#:	cPCI interface signal Device Select.
STOP#:	cPCI interface signal indicates the current device is requesting the master to stop the current transaction
LOCK#:	cPCI interface signal indicates an operation to a bridge that may require multiple transactions to complete - not supported
FRAME#:	cPCI interface signal indicates the beginning and duration of an access
IRDY#:	cPCI interface signal - Initiator Ready indicate s the bus master s ability to complete the current data phase of the transaction
BD_SEL#:	PICMG 2.1 R1.0 Hot-swap signal - pulled up on the CP2140 unit and driven low to enable power on
TRDY#:	cPCI interface signal Target Ready indicates the selected device s ability to complete the current data phase of the transaction
IDSEL:	cPCI interface signal - Initialization Device Select used as a chip select during read and write transactions
REQ[0..7]#:	cPCI interface signal - request indicates to the arbiter that an agent desires use of the cPCI bus.
GNT[0..7]#:	cPCI interface signal - grant indicates to the agent that the access to the bus has been granted.
CLK[0..7]:	Driven by the SBC - provides timing for all transactions
IPMB_PWR:	Battery back-up power - see CompactPCI System Management Specification PICMG 2.9 R1.0
HEALTHY_OUT:	Radial signal used to acknowledge the health of the board -signals that the board is suitable to be released form reset and allowed onto the bus - see PICMG 2.1 R1.0 Hot-swap Specification.
INTP:	Non-cPCI interrupt, legacy IDE - not supported, 1Kohm pullup provided
INTS:	Non-cPCI interrupt legacy IDE - not supported
TCK, TMS, TDO, TDI:	JTAG signals, not supported - unconnected.

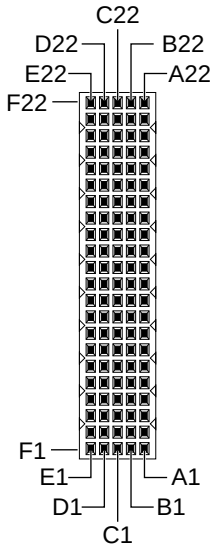


FIGURE A-3 Netra CP2140 Board J2 Connector

See for J2/P2 connector pin assignments.

TABLE A-3 J2/P2 Connector Pin Assignments

Pin #	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
22	GND	GA4	GA3	GA2	GA1	GA0	GND
21	GND	CLK6	GND	BRSVP	BRSVP	BD_OFF_OUT	GND
20	GND	CLK5	GND	ALTSYSEN _L	GND	BD_OFF_IN	GND
19	GND	GND	GND	I2C_SDA	I2C_SCK	ALERT	GND
18	GND	BRSVP	BRSVP	BRSVP	GND	BRSVP	GND
17	GND	BRSVP	GND	PRST#	REQ6#	GNT6#	GND
16	GND	BRSVP	BRSVP	DEG#	GND	BRSVP	GND
15	GND	BRSVP	GND	FAL#	REQ5#	GNT5#	GND
14	GND	AD[35]	AD[34]	AD[33]	GND	AD[32]	GND
13	GND	AD[38]	GND	+5Va	AD[37]	AD[36]	GND
12	GND	AD[42]	AD[41]	AD[40]	GND	AD[39]	GND
11	GND	AD[45]	GND	+5Va	AD[44]	AD[43]	GND
10	GND	AD[49]	AD[48]	AD[47]	GND	AD[46]	GND

TABLE A-3 J2/P2 Connector Pin Assignments *(Continued)*

Pin #	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
9	GND	AD[52]	GND	+5Va	AD[51]	AD[50]	GND
8	GND	AD[56]	AD[55]	AD[54]	GND	AD[53]	GND
7	GND	AD[59]	GND	+5Va	AD[58]	AD[57]	GND
6	GND	AD[63]	AD[62]	AD[61]	GND	AD[60]	GND
5	GND	C/BE[5]#	64_EN_L	+5Va	C/BE[4]#	PAR64	GND
4	GND	RSS_L	BRSVP	C/BE[7]#	GND	C/BE[6]#	GND
3	GND	CLK4	GND	GNT3#	REQ4#	GNT4#	GND
2	GND	CLK2	CLK3	SYSEN#	GNT2#	REQ3#	GND
1	GND	CLK1	GND	REQ1#	GNT1#	REQ2#	GND

Note:

1. For CP2140 V(I/O) is +5V.

TABLE A-4 Signal Definitions

GA[0..4]:	Geographical Addressing signals for unique slot identification
BRSVP:	Reserve pins - leave unconnected on backplane
BD_OFF_OUT:	Pulse Reset out used for dual host failover - dual host function not supported, leave unconnected on backplane
ALTSYSEN_L:	PICMG Redundant System Slot Spec 2.13 - Alternate System Controller Enable signal - dual host function not supported, leave unconnected on backplane
BD_OFF_IN:	Pulse Reset in used for dual host failover - dual host function not supported, leave unconnected on backplane
I2C_SDA:	In a dual host system, Inter-Host I2C Bus Data - dual host function not supported, leave unconnected on backplane
I2C_SCK:	In a dual host system, Inter-Host I2C Bus Clock - dual host function not supported, leave unconnected on backplane
ALERT:	cPCI System Management Specification PICMG 2.9 R1.0 signal input to the SMC
PRST#:	Backplane Push Button Reset input to the SMC
DEG#, FAL#:	Power Subsystem status signals input to the SMC
64_EN_L:	PICMG Hot-swap Spec 2.1 R1.0 signal - used to designate 64-bit capability for the slot into which the board is plugged

TABLE A-4 Signal Definitions

GA[0..4]:	Geographical Addressing signals for unique slot identification
PAR64:	cPCI interface signal even parity bit that protects AD[32..63] and C/ BE[7..4]#
SYSEN#:	System Slot identification, grounded on the cPCI slot so the board can identify installation into the system slot.
RSS#:	PICMG Redundant System Slot Spec 2.13 - Redundant System Slot identification in dual host systems - not supported, leave unconnected on backplane

FIGURE A-4 shows the Netra CP2140 Board J3 Connector.

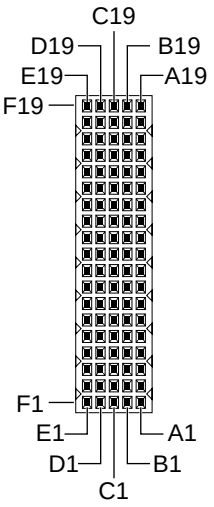


FIGURE A-4 Netra CP2140 Board J3 Connector

TABLE A-5 shows the J3/P3 connector pin assignments.

TABLE A-5 J3/P3 Connector Pin Assignments

Pin #	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
19	GND	PMC-1	PMC-2	PMC-3	PMC-4	PMC-5	GND
18	GND	PMC-6	PMC-7	PMC-8	PMC-9	PMC-10	GND
17	GND	PMC-11	PMC-12	PMC-13	PMC-14	PMC-15	GND
16	GND	PMC-16	PMC-17	PMC-18	PMC-19	PMC-20	GND
15	GND	*PMC-21*	PMC-22	PMC-23	PMC-24	PMC-25	GND
14	GND	PMC-26	PMC-27	PMC-28	PMC-29	PMC-30	GND
13	GND	PMC-31	PMC-32	PMC-33	PMC-34	PMC-35	GND
12	GND	PMC-36	PMC-37	PMC-38	PMC-39	PMC-40	GND
11	GND	PMC-41	PMC-42	PMC-43	PMC-44	PMC-45	GND
10	GND	PMC-46	PMC-47	PMC-48	PMC-49	PMC-50	GND
9	GND	PMC-51	PMC-52	PMC-53	PMC-54	PMC-55	GND
8	GND	PMC-56	PMC-57	PMC-58	PMC-59	PMC-60	GND
7	GND	PMC-61	PMC-62	PMC-63	PMC-64	VCC	GND
6	GND	BD_SEL_5#	HEALTHY_5#	PCI_RST_5#	BRSVP	BRSVP	GND
5	GND	BD_SEL_4#	HEALTHY_4#	PCI_RST_4#	BRSVP	BRSVP	GND
4	GND	BD_SEL_3#	HEALTHY_3#	PCI_RST_3#	BRSVP	BRSVP	GND
3	GND	BD_SEL_2#	HEALTHY_2#	PCI_RST_2#	PCIB_RST_L	PCI_RST_6#	GND
2	GND	BD_SEL_1#	HEALTHY_1#	PCI_RST_1#	EP_5V	HEALTHY_6#	GND

TABLE A-6 Signal Definitions

PMC[63..0]	PMC/PIM I/O signals
BD_SEL[0..6]#:	PICMG Hot-swap Spec 2.1 R1.0 Radial board select bi-directional signals
HEALTHY[0..6]#:	PICMG Hot-swap Spec 2.1 R1.0 Radial board healthy input signals
PCI_RST[0..6]:	PICMG Hot-swap Spec 2.1 R1.0 Radial PCI reset output signals

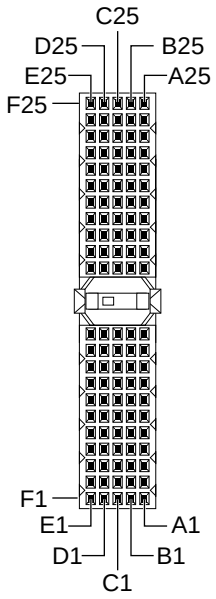


FIGURE A-5 Netra CP2140 Board J4/P4 Connector

TABLE A-7 shows the J4/P4 connector pin assignments.

TABLE A-7 J4/P4 Connector Pin Assignments

Pin #	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
25	GND	MIIA_CRS	MIIA_COL	MIIA_MDIO_L	MIIA_TX_ERS	+5V	GND
24	GND	MIIA_RX_DV	MIIA_RX_ER	MIIA_TX_CLKI	GND	BP_MCA_INT_L	GND
23	GND	MIIA_RXD1	MIIA_RXD2	GND	MIIA_RXD3	MII_RX_CLK	GND
22	GND	GND	MIIA_TXD0	MIIA_TX_EN	MIIA_MDC	MIIA_RXD0	GND
21	GND	MIIA_TXD3	GND	MIIA_TXD2	GND	MIIA_TXD1	GND
20	GND			LOCAL_I2C_INT_L	GND	FR/BK_SEL	GND
19	GND	MIIB_COL	MIIB_MDIO_L	MIIB_TX_ER			GND
18	GND	MIIB_RX_CLK	MIIB_RX_DV	MIIB_RX_ER	MIIB_TX_CLKI	MIIB_CRS	GND
17	GND	MIIB_RXD0	GND	MIIB_RXD1	MIIB_RXD2	MIIB_RXD3	GND
16	GND	MIIB_TXD1	MIIB_TXD0	MIIB_TX_EN	MIIB_MDC	GND	GND
15	GND	GND	+5V	+5V	MIIB_TXD3	MIIB_TXD2	GND

TABLE A-7 J4/P4 Connector Pin Assignments *(Continued)*

Pin #	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
14	KEY						KEY
13	KEY						KEY
12	KEY						KEY
11	GND	BP_TYPE0	BP_TYPE1	I2C_SDA	GND	GND	GND
10	GND	SMC_TX	SMC_RX	BP_PWROFF	(I2C_pwr)	+12V	GND
9	GND	GND	GND	I2C_SCL	TRM_PWR1	TRM_PWR2	GND
8	GND	SCDPH_L	SCD<15>_L	SCD<14>_L	SCD<13>_L	SCD<12>_L	GND
7	GND	SCD<4>_L	SCD<3>_L	SCD<2>_L	SCD<1>_L	SCD<0>_L	GND
6	GND	GND	SCDPL_L	SCD<7>_L	SCD<6>_L	SCD<5>_L	GND
5	GND	GND	RSV-MCU-use	+5V	+5V	RSV-MCU-use	GND
4	GND	SRST_L	ACK_L	BSY_L	GND	ATN_L	GND
3	GND	I/O_L	REQ_L	C/D_L	SEL_L	MSG_L	GND
2	GND	Term_Disable	SCD<11>_L	SCD<10>_L	SCD<9>_L	SCD<8>_L	GND
1	GND	RSV-MCU-use	RSV-MCU-use	+3.3V	-12V	GPIO1-RSV-MCU-use	GND

Note:

1.The PWROFF signal goes active high when OBP power off command is issued.

TABLE A-8 Signal Definitions

BP_MCA_INT_L:	Reserved for MC system use
LOCAL_I2C_INT_L:	I2C interrupt signals for CP2140 I2C devices
BP_TYPE[0..1]:	Intended to indicate backplane type (HA, FHS, Non-HA, etc) - not supported
SMC_TX/RX:	SMC tty signals
BP_PWROFF:	When OS level init 5 is executed - system is halted and this signal asserted logic level high
I2C_PWR:	I2C power for CP2140 local I2C devices
I2C_SCL/SDA:	CP2140 local I2C clock/data

TABLE A-9 MII Signals

MII_RXD<0:3>:	Receive data
MII_TXD<0:3>:	Transmit data
MII_RX_CLK:	Receive clock
MII_TX_CLKI:	Transmit clock
MII_TX_EN:	Transmit enable
MII_CRS:	Carrier sense
MII_COL:	Collision detect
MII_RX_ER:	Receive error
MII_TX_ER:	Transmit error
MII_RX_DV:	Receive frame detect
MII_MDIO:	Transceiver management data (external)

TABLE A-10 SCSI single-ended levels - SCSI-A on J4 and SCSI-B on J5

ATN:	Attention - Active low n BSY: Busy - Active low
C/D:	Command or Data - Active low
I/O:	Input or output data direction
MSG:	Message phase indicator - active low
ACK:	Acknowledge - Active low
SCD<0:15>:	SCSI data lines - Active low
SCDPHSCSI :	parity high byte; provides parity for SCD[8:15] - Active low
SCDPLSCSI:	parity low byte; provides parity for SCD[0:7] - Active low
SEL:	Select - Active low
REQ:	Request - Active low
SRST:	SCSI bus reset - Active low
TRM_PWR:	Termination power for external SCSI terminator

FIGURE A-6 shows the Netra CP2140 Board J5/P5 Connector.

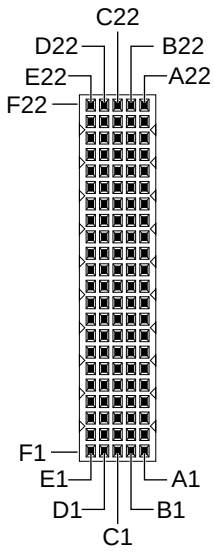


FIGURE A-6 Netra CP2140 Board J5/P5 Connector

TABLE A-11 shows the Netra CP2140 board J5/P5 Connector Pin Assignments.

TABLE A-11 J5/P5 Connector Pin Assignments

Pin #	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
22	GND	BKRST_IN_L	GND	DIAG_L_OC	+5V	BP_XIR_L	GND
21	GND	KBDDAT	KBDCLK	KBDVCC	AUXDATA	AUXCLK	GND
20	GND	+5V	UBS1_P	USB1_N	KBDGND	INT_2#	GND
19	GND	STB_L	GND	VCC	INT_0#	INT_1#	GND
18	GND	AFD_L	USB2_P	USB2_N	GND	+5V	GND
17	GND	PD<2>	INIT_L	PD<1>	ERR	PD<0>	GND
16	GND	PD<6>	PD<5>	PD<4>	PD<3>	SLIN_L	GND
15	GND	SLCT	PE	BUSY_L	ACK_L	PD<7>	GND
14	GND	RTSA	CTSA	RIA	GND	DTRA	GND
13	GND	DCDA	+5V	RXDA	DSRA	TXDA	GND
12	GND	RTSB	CTSB	RIB	+5V	DTRB	GND
11	GND	DCDB	GND	RXDB	DSRB	TXDB	GND
10	GND	TR0_L	WPROT_L	RDATA_L	HDSEL_L	DSKCHG_L	GND
9	GND	MTR1_L	DIR_L	STEP_L	WDATA_L	WGATE_L	GND
8	GND	DRVDENS1	INDEX_L	MTR0_L	DS1_L	DS0_L	GND
7	GND	DRATE0	SC2D<2>_L	SC2D<1>_L	SC2D<0>_L	DRVDENS0	GND
6	GND	SC2D<6>_L	GND	SC2D<5>_L	SC2D<4>_L	SC2D<3>_L	GND
5	GND	SC2D<10>_L	SC2D<9>_L	SC2D<8>_L	SC2DPL_L	SC2D<7>_L	GND
4	GND	SC2D<13>_L	SC2D<12>_L	GND	MSEN0	SC2D<11>_L	GND
3	GND	Term_Disable	SC2DPH_L	SC2D<15>_L	MSEN1	SC2D<14>_L	GND
2	GND	I/O2_L	REQ2_L	C/D2_L	SEL2_L	MSG2_L	GND
1	GND	BKRST_OUT_L	SRST2_L	ACK2_L	BUSY2_L	ATN2_L	GND

TABLE A-12 Miscellaneous

BKRST_IN_L:	Backplane reset input to SMC
BKRST_OUT_L:	Backplane test output from SMC
BP_XIR_L:	Push button reset system input. Active low
DIAG_LOC:	Diagnostic / Alarm output from SMC

TABLE A-13 USB Signals

USB1_P / N:	USB (Universal Serial Bus) signal pair - RIO-A
USB2_P / N:	USB (Universal Serial Bus) signal pair - RIO-B
INT[0..2]:	cPCI interface signal interrupts, not supported

TABLE A-14 Parallel Port

ACK_L:	Pulsed by peripheral to acknowledge data sent
BUSY:	Indicates a printer cannot accept more data
ERR_L:	Peripheral detected an error
PD[7..0]:	Parallel data lines
PE:	Paper end - indicates printer is out of paper
AFD_L:	auto feed - causes printer to line feed
INIT_L:	initializes the peripheral
SLIN_L:	select in - selects the peripheral
STB_L:	data strobe - indicates data is valid
SLCT:	select, peripheral indicates it is selected

TABLE A-15 Serial COM Ports (A and B), RS 232 Levels

CTS:	clear to send
DCD:	Data Carrier Detected
DSR:	Data Set Ready
DTR:	Data Terminal Ready
RI:	Ring Indicator
RTS:	Request to Send
RXD:	Serial Receive Data
TXD:	Serial Transmit Data

TABLE A-16 Floppy Disk Drive, TTL Levels

DSKCHG_L:	indicates the drive door has been opened
DIR_L:	controls direction of the head during step operations
DRATE[0]:	reflects the value of the data transfer but in the DSR or CCR
DRVDENS[1..0]:	disk density select communication in rev1.0, resvd in 1.1 n DS[1..0]: drive selects
HDSEL_L:	selects top or bottom side head
INDEX_L:	indicates the beginning of a track
MSEN[1..0]:	used for sensing density of the media
RDATA_L:	data read
STEP_L:	step, pulses move head in or out
TR0_L:	indicates the is positioned above track 00
WDATA_L:	write data to drive
WGATE_L:	enables head write circuitry of drive
WPROT_L:	indicates a disk is write-protected

TABLE A-17 Keyboard / Auxiliary Device Signals

AUXCLK:	Clock for PS/2 auxiliary device (mouse) - TTL levels, active high
AUXDAT:	Serial data line for PS/2 auxiliary device (mouse) - TTL levels, active high
KBDCLK:	Clock for PC/AT or PS/2 keyboard - TTL levels, active high
KBDDAT:	Serial data line for PC/AT or PS/2 keyboard - TTL levels, active high

A.1.1 Mini Din 8-Pin Connector

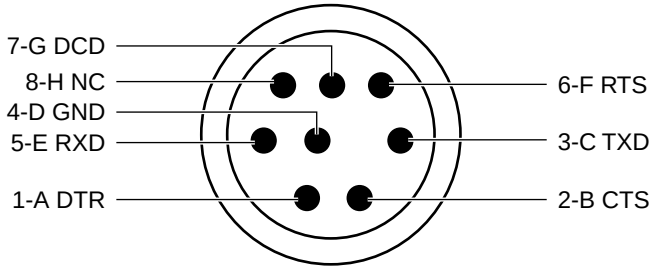


FIGURE A-7 Serial Connector- Mini Din 8-Pin Front Panel TTYA Diagram

TABLE A-18 shows the Mini Din 8-pin connector pinouts.

TABLE A-18 Serial Mini Din 8-pin Connector Pinouts

Pin	Signal Name	Pin	Signal Name
1	FP_SER_A_DTR	5	FP_SER_A_RXD
2	FP_SER_A_CTS	6	FP_SER_A_RTS
3	FP_SER_A_TXD	7	FP_SER_A_DCD
4	FP_SER_A_GND	8	GND

A.1.2 RJ45 Connector

The twisted pair Ethernet connector is a RJ45 connector. The controller auto-negotiates to either 10Base-T or 100Base-T. The pinout shown in TABLE A-19 applies to all of the Ethernet.

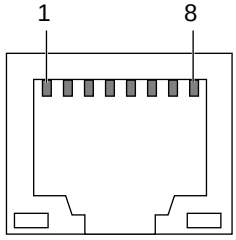


FIGURE A-8 RJ45 Ethernet Connector Diagram

TABLE A-19 shows the Netra CP2140 board front panel Ethernet connector.

TABLE A-19 Netra CP2140 Board Front Panel Ethernet Connector Pinout

Pin #	Description
1	TXD+
2	TXD-
3	RXD+
4	4T_D3P
5	4T_D3P
6	RXD-
7	4T_D4P
8	4T_D4P

A.1.3 PMC Connectors

FIGURE A-9 shows the PMC connectors: J3001, J3002, and J3003.

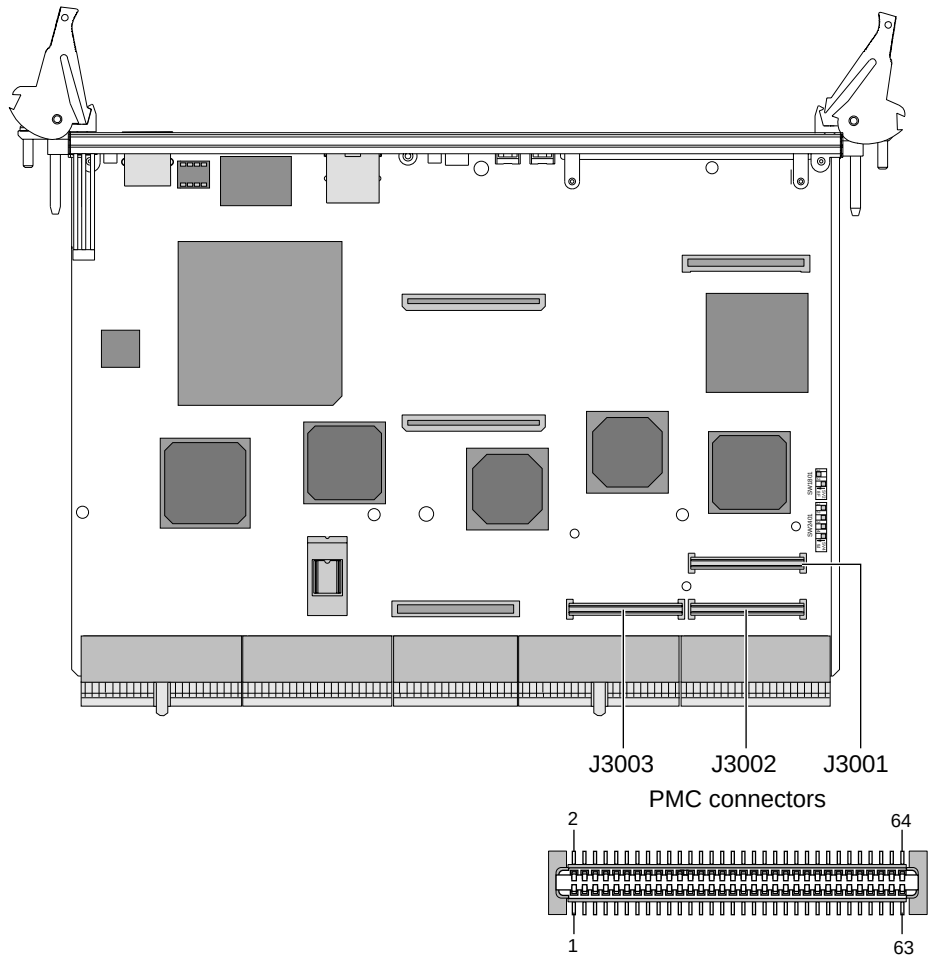


FIGURE A-9 J3001-J3003 Connectors

TABLE A-20 shows the connector pinouts for the J3001 connector.

TABLE A-20 PMC J3001 Connector Pinouts

Pin	Voltage	Pin	Voltage
1	TCK	2	-12V
3	GND	4	INTA
5	INTB	6	INTC
7	BUSMODE1	8	+5V
9	INTD	10	PCI_RSVD

TABLE A-20 PMC J3001 Connector Pinouts

Pin	Voltage	Pin	Voltage
11	GND	12	PCI_RSVD
13	CLK	14	GND
15	GND	16	GNT
17	REQ	18	+5V
19	V(I/O)	20	AD31
21	AD28	22	AD27
23	AD25	24	GND
25	GND	26	CBE3
27	AD22	28	AD21
29	AD19	30	+5V
31	V (IO)	32	AD17
33	FRAME	34	GND
35	GND	36	IRDY
37	DEVSEL	38	+5V
39	GND	40	LOCK
41	SDONE	42	SBO
43	PAR	44	GND
45	V (IO)	46	AD15
47	AD12	48	AD11
49	AD9	50	+5V
51	GND	52	CBE0
53	AD6	54	AD5
55	AD4	56	GND
57	V (IO)	58	AD3
59	AD2	60	AD1
61	AD0	62	+5V
63	GND	64	REQ64

A.1.4 PMC J3002 Connector

TABLE A-21 PMC J3002 Connector Pinouts

Pin	Voltage	Pin	Voltage
1	+12V	2	TRST
3	TMS	4	TD0
5	TD1	6	GND
7	GND	8	PCI_RSVD
9	PCI_RSVD	10	PCI_RSVD
11	BUSMODE2	12	+3.3V
13	RST	14	BUSMODE3
15	+3.3V	16	BUSMODE4
17	PCI_RSVD	18	GND
19	AD30	20	AD29
21	GND	22	AD26
23	AD24	24	3.3V
25	IDSEL	26	AD23
27	+3.3V	28	AD20
29	AD18	30	GND
31	AD16	32	CBE2
33	GND	34	PMC_RSVD
35	TRDY	36	+3.3V
37	GND	38	STOP
39	PERR	40	GND
41	+3.3V	42	SERR
43	CBE1	44	GND
45	AD14	46	AD13
47	GND	48	AD10
49	AD8	50	+3.3V
51	AD7	52	PMC_RSVD
53	+3.3V	54	PMC_RSVD
55	PMC_RSVD	56	GND

TABLE A-21 PMC J3002 Connector Pinouts

Pin	Voltage	Pin	Voltage
57	PMC_RSVD	58	PMC_RSVD
59	GND	60	PMC_RSVD
61	ACK64	62	+3.3V
63	GND	64	PMC_RSVD

A.1.5 PMC J3003 Connector

TABLE A-22 PMC J3003 Connector Pinouts

Pin	Voltage	Pin	Voltage
1	IO1	2	IO2
3	IO3	4	IO4
5	IO5	6	IO6
7	IO7	8	IO8
9	IO9	10	IO10
11	IO11	12	IO12
13	IO13	14	IO14
15	IO15	16	IO16
17	IO17	18	IO18
19	IO19	20	IO20
21	IO21	22	IO22
23	IO23	24	IO24
25	IO25	26	IO26
27	IO27	28	IO28
29	IO29	30	IO30
31	IO31	32	IO32
33	IO33	34	IO34
35	IO35	36	IO36
37	IO37	38	IO38
39	IO39	40	IO40
41	IO41	42	IO42

TABLE A-22 PMC J3003 Connector Pinouts

Pin	Voltage	Pin	Voltage
43	IO43	44	IO44
45	IO45	46	IO46
47	IO47	48	IO48
49	IO49	50	IO50
51	IO51	52	IO52
53	IO53	54	IO54
55	IO55	56	IO56
57	IO57	58	IO58
59	IO59	60	IO60
61	IO61	62	IO62
63	IO63	64	IO64

FIGURE A-10 shows the location of memory module connectors J0601 and J0602, respectively.

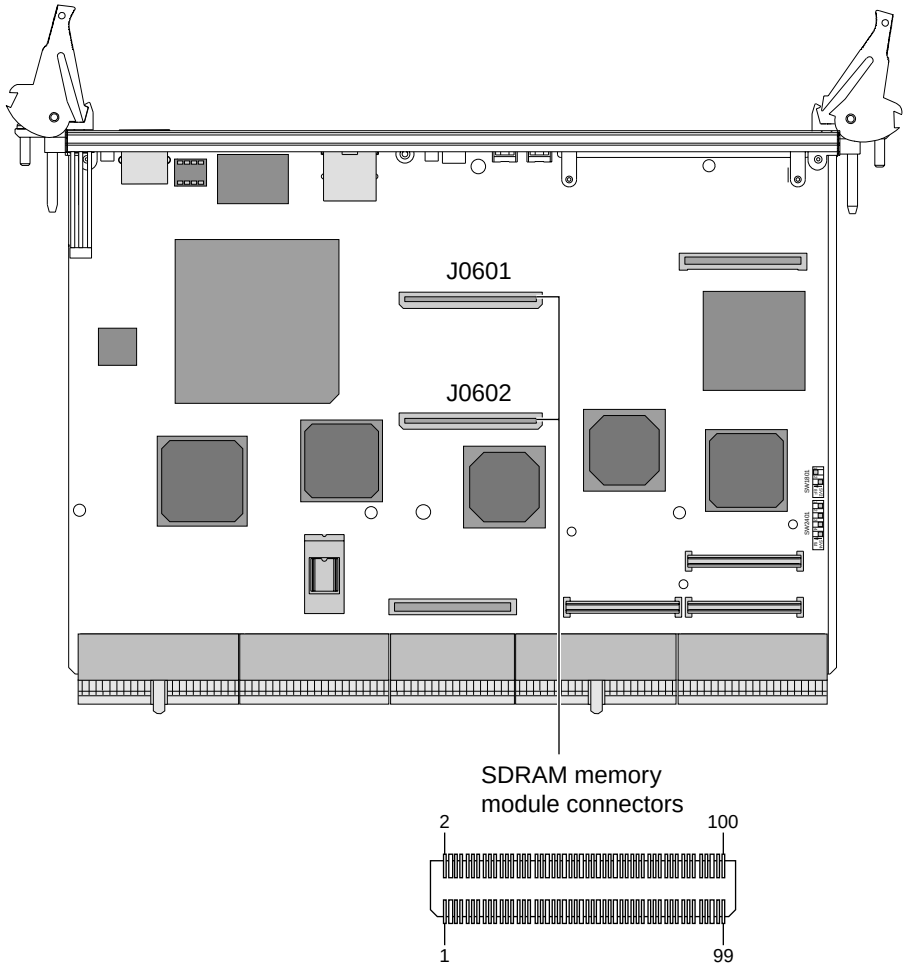


FIGURE A-10 Memory Module Connectors J0601 and J0602

A.2 Memory Module Connector Pinout

TABLE A-23 and TABLE A-24 show the memory module connector 1 and 2 pinouts.

TABLE A-23 Memory Module Connector 1 Pinout (Bottom Side)

Pin #	Front Side	Pin #	Front Side	Pin #	Back Side	Pin #	Back Side
99	VDD_3.3V	49	AB3	100	VSS	50	DQ9
97	DQ43	47	AA2	98	DQ0	48	DQ10
95	DQ42	45	VSS	96	DQ1	46	VDD_3.3V
93	DQ41	43	AB2	94	DQ2	44	DQ11
91	VSS	41	AA1	92	VDD_3.3V	42	DQ12
89	DQ40	39	AB1	90	DQ3	40	DQ13
87	DQ35	37	VDD_3.3V	88	DQ4	38	VSS
85	VDD_3.3V	35	AA0	86	VSS	36	DQ14
83	DQ34	33	AB0	84	DQ5	34	DQ15
81	DQ33	31	VSS	82	DQ6	32	VDD_3.3V
79	DQ32	29	CK3	80	DQ7	30	CK1
77	VSS	27	VDD_3.3V	78	VDD_3.3V	28	VSS
75	CK2	25	S1	76	CK0	26	S0
73	VSS	23	S5	74	RAS0	24	S4
71	NC	21	DQ27	72	RAS2	22	DQ16
69	VDD_3.3V	19	DQ26	70	VSS	20	DQ17
67	AA6	17	VSS	68	CAS0	18	VDD_3.3V
65	AB6	15	DQ25	66	CAS2	16	DQ18
63	AA5	13	DQ24	64	WE0	14	DQ19
61	VSS	11	ALERT	62	VDD_3.3V	12	DQ20
59	AB5	9	VDD_3.3V	60	WE2	10	VSS
57	AA4	7	SA2	58	CKE0	8	DQ21
55	AB4	5	SA1	56	CKE2	6	DQ22
53	VDD_3.3V	3	NC	54	VSS	4	DQ23
51	AA3	1	VDD_3.3VI^2C	52	DQ8	2	VDD_3.3V

TABLE A-24 Memory Module Connector 2 Pinout (Bottom Side)

Pin #	Front Side	Pin #	Front Side	Pin #	Back Side	Pin #	Back Side
99	VSS	49	DQ62	100	VDD_3.3V	50	AB10
97	DQ71	47	DQ61	98	DQ47	48	AA9
95	DQ70	45	VDD_3.3V	96	DQ46	46	VSS
93	DQ69	43	DQ60	94	DQ45	44	AB9
91	VDD_3.3V	41	DQ59	92	VSS	42	AA8
89	DQ68	39	DQ58	90	DQ44	40	AB8
87	DQ67	37	VSS	88	DQ39	38	VDD_3.3V
85	VSS	35	DQ57	86	VDD_3.3V	36	AA7
83	DQ66	33	DQ56	84	DQ38	34	AB7
81	DQ65	31	VDD_3.3V	82	DQ37	32	VSS
79	DQ64	29	CK4	80	DQ36	30	CK6
77	VDD_3.3V	27	VSS	78	VSS	28	VDD_3.3V
75	CK5	25	S3	76	CK7	26	S2
73	RAS1	23	S7	74	BAA1	24	S6
71	RAS3	21	DQ55	72	BAB1	22	DQ31
69	VSS	19	DQ54	70	VDD_3.3V	20	DQ30
67	CAS1	17	VDD_3.3V	68	BAA0	18	VSS
65	CAS3	15	DQ53	66	BAB0	16	DQ29
63	WE1	13	DQ52	64	AA12	14	DQ28
61	VDD_3.3V	11	DQ51	62	VSS	12	LCLK-I
59	WE3	9	VDD_3.3V	60	AB12	10	VSS
57	CKE1	7	DQ50	58	AA11	8	LCLK-O
55	CKE3	5	DQ49	56	AB11	6	SDA
53	VSS	3	DQ48	54	VDD_3.3V	4	SCK
51	DQ63	1	VDD_3.3V	52	AA10	2	VSS

A.3 SMC Switch Settings for HA and Non-HA Systems

The switches on the CP2140 SMC Module serve two purposes:

- Establish backplane type (HA or non-HA)
- Select Boot Device (Boot Flash or SMC config block setting)

SW0501.Switch1 is for HA / Non-HA settings and SW0501.Switch2 is for flash device selection based on SMC settings.

A.3.1 Setting Non-HA Systems

If you have a non-HA system, set the SMC module switch settings *before* powering on the Netra CP2140 board unit.

- SW0501.Switch1 ---> Closed (switch is set in the direction of the arrow)
- SW0501.Switch2 ---> Closed (switch is set in direction of arrow)

See FIGURE A-11 for the location of SW0501 on the Netra CP2140 board.

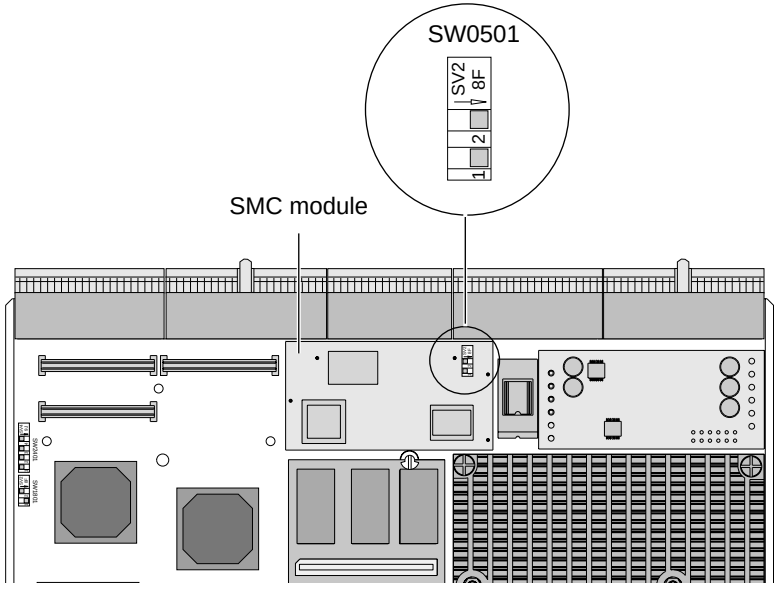


FIGURE A-11 Setting Switches to Closed Position

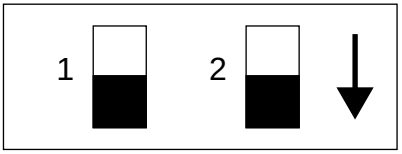


FIGURE A-12 SW0501 Position for non-HA Systems

A.3.2 Setting HA Systems

If the user has a HA system, set the SMC switch settings *before* powering on the CP2140 unit as follows:

- SW0501.Switch1 ---> Open (switch is set *opposite* to arrow direction)
- SW0501.Switch2 ---> Closed (switch is set in direction of arrow)

See FIGURE A-13 for location of SW0501.

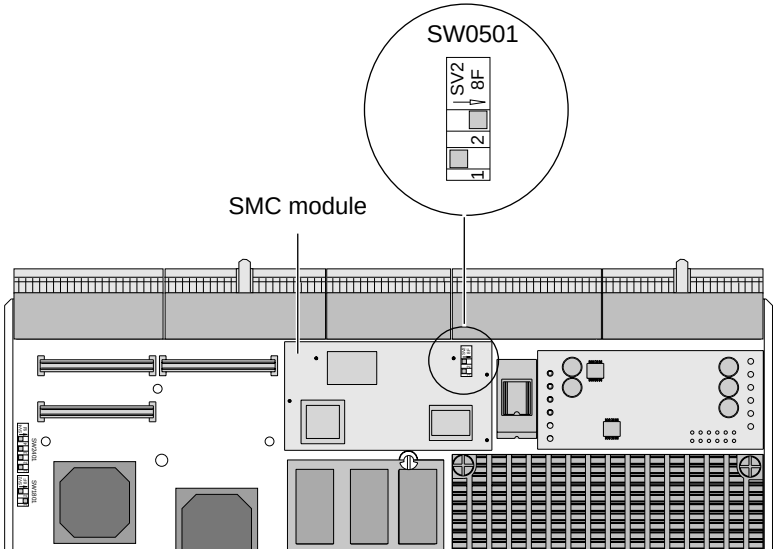


FIGURE A-13 Location of SW0501 on SMC Module

FIGURE A-14 shows how to set switch positions for HA systems.

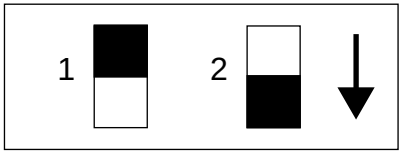


FIGURE A-14 SW0501 Switch Setting for HA Systems

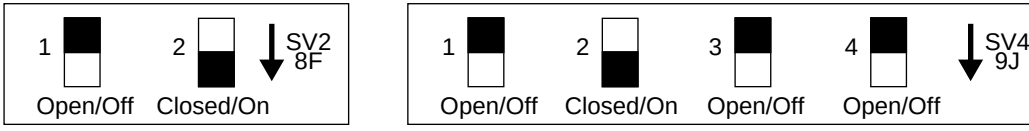
A.4 SCSI and Flash Switch Settings

Two sets of switches on the Netra CP2140 board perform two different functions:

- SW1801 for flash device selection
- SW2401 for SCSI termination

The positions of these switches determine the flash device selection and SCSI termination. If a switch is moved in the direction of the arrow, it is closed (ON). If a switch is moved in the opposite direction of the arrow, it is open (OFF). FIGURE A-15 shows switches and the switch setting legend.

Note – The default for both the SW2401 and SW1801 switches is Open/Off.



SW1801 flash device selection switches

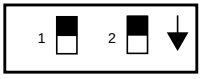
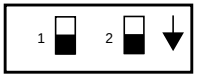
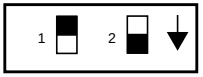
SW2401 SCSI device selection switches

FIGURE A-15 Switch Setting Legend

A.4.1 Flash Device Selection Switches

The position of the two SW1801 switches determines the flash device selection on the board. TABLE A-26 describes the flash device selection.

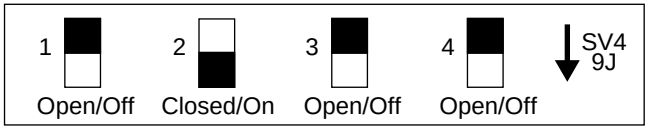
TABLE A-25 Flash Device Switch Setting (SW1801)

Position Switch No. 1	Position Switch No. 2	Description
Open	Open	 OBP 1 MB boot flash selected (default) Should never be user adjusted
Closed	Closed	 User flash 1 selected
Open	Closed	 User flash 1 and 2 selected

A.4.2 SCSI Termination Switches

Four SW2401 SCSI termination switches are located on the board.

The SCSI switches operate independently from each other and can be set to Open or Closed position. FIGURE A-16 shows an example of SCSI termination switch settings.



SW2401 SCSI device selection switches

FIGURE A-16 SCSI Termination Switch Setting Example

TABLE A-26 describes the SCSI termination switch setting.

TABLE A-26 SCSI Termination Switch Setting (SW2401)

Position	Switch 1	Switch 2	Switch 3	Switch 4
Open	Termination power supplied for SCSI Bus A.	Termination power supplied for SCSI Bus B.	Termination enabled for SCSI Bus A.	Termination enabled for SCSI Bus B.
Closed	Termination power not supplied for SCSI Bus A.	Termination power not supplied for SCSI Bus B.	Termination disabled for SCSI Bus A.	Termination disabled for SCSI Bus B.

See FIGURE A-17 for the location of flash device, SCSI, and SMC FPGA (SW0501) switches.

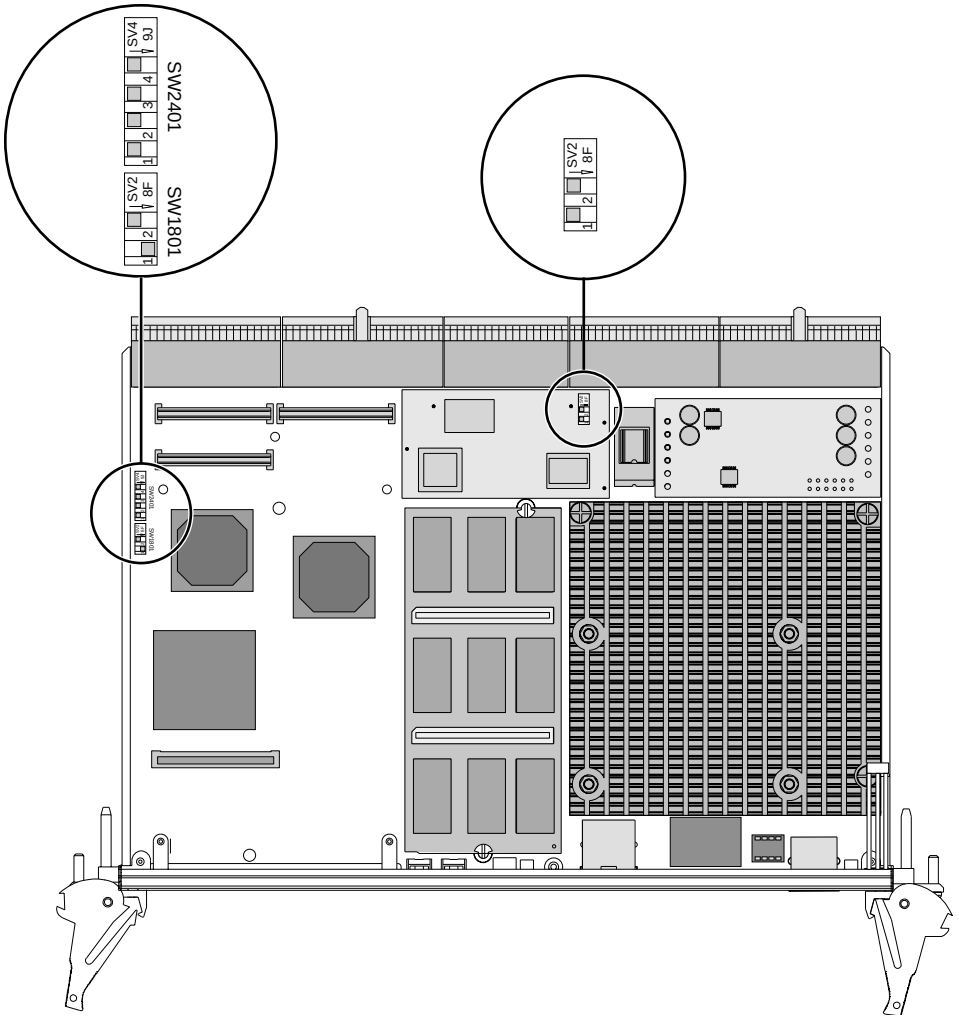


FIGURE A-17 SCSI Switch Selections and SMC on the Netra CP2140 Board

APPENDIX **B**

Mechanical Drawings

This appendix provides mechanical drawings for the CP2140.

FIGURE B-1 shows the mechanical drawing of the front panel.

FIGURE B-2 shows the mechanical dimensions of the CP2140.

FIGURE B-3 and FIGURE B-4 show the mechanical dimensions of the CP2140 board with heatsink and memory modules.

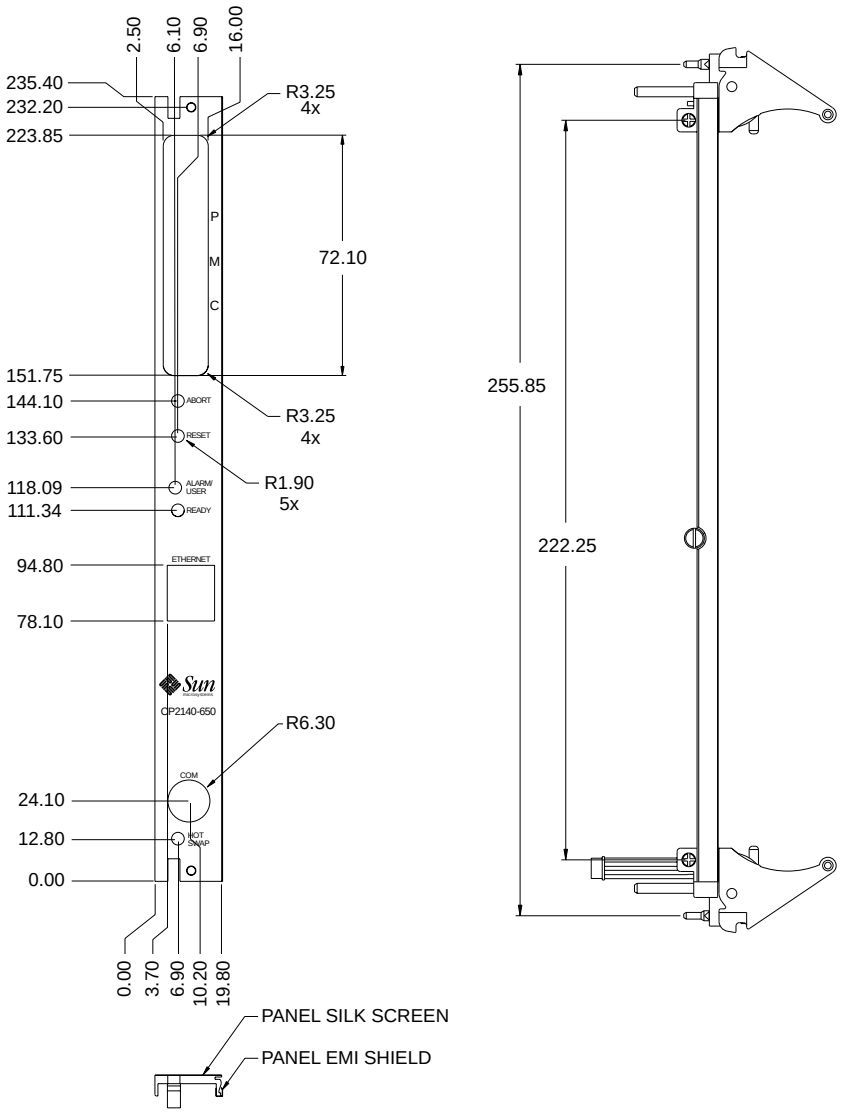


FIGURE B-1 Mechanical Drawing of the Netra CP2140 Board Front Panel

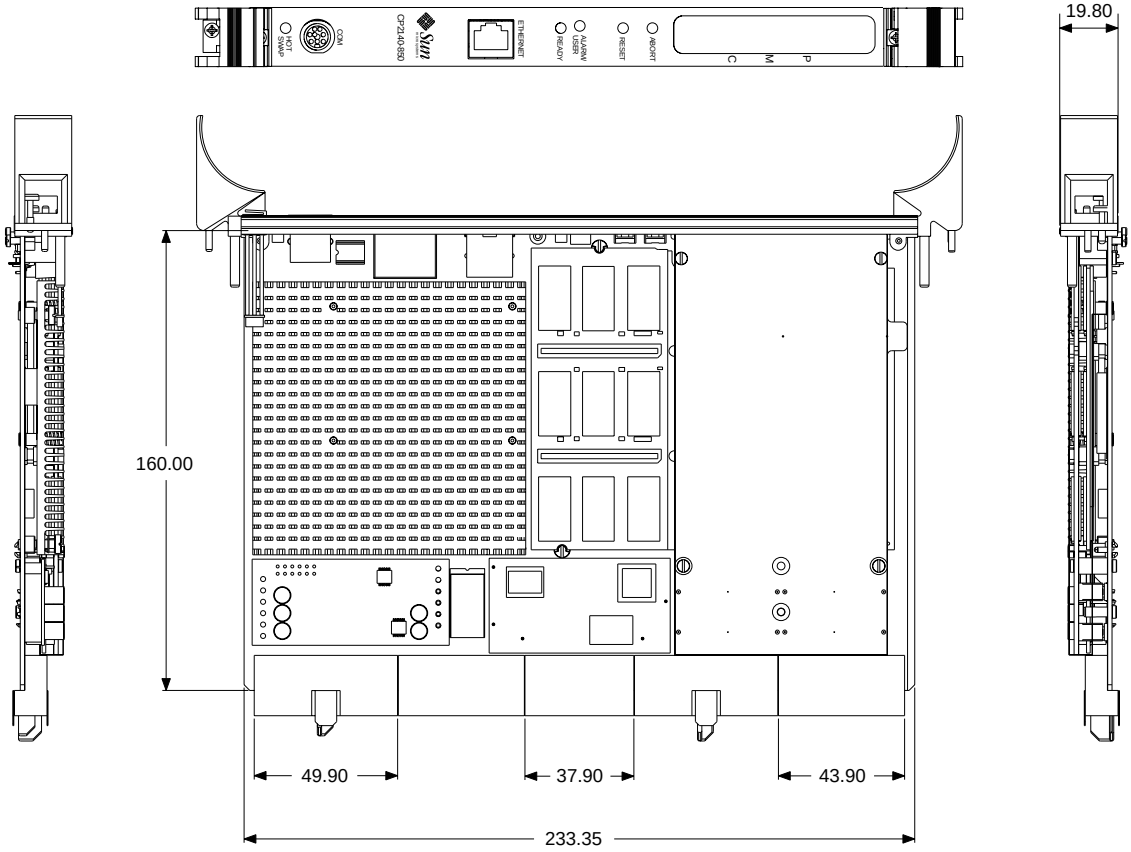


FIGURE B-2 Mechanical Dimensions of the Netra CP2140 Board

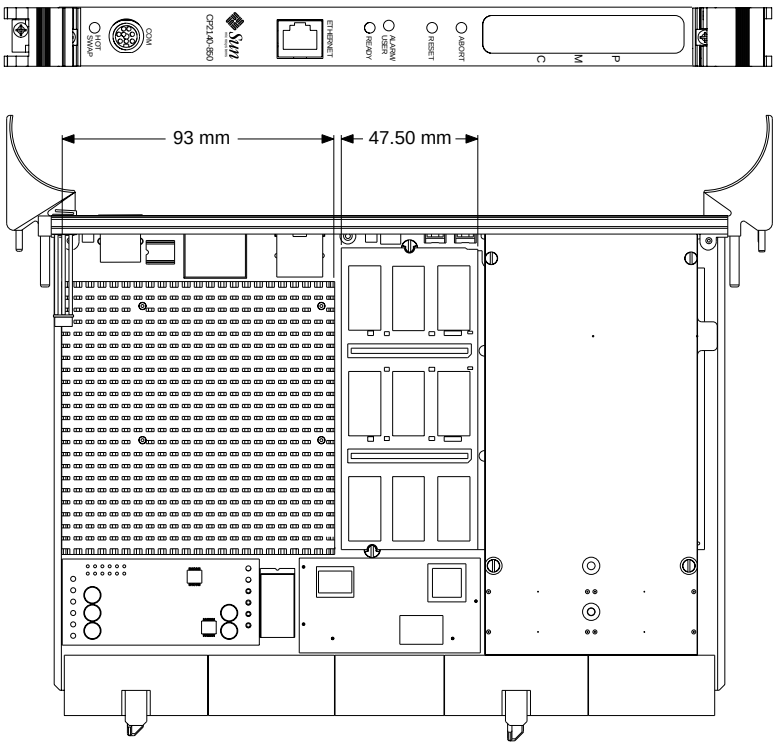


FIGURE B-3 Netra CP2140 Board Mechanical Dimensions of the Heat sink and Single-wide Memory Module

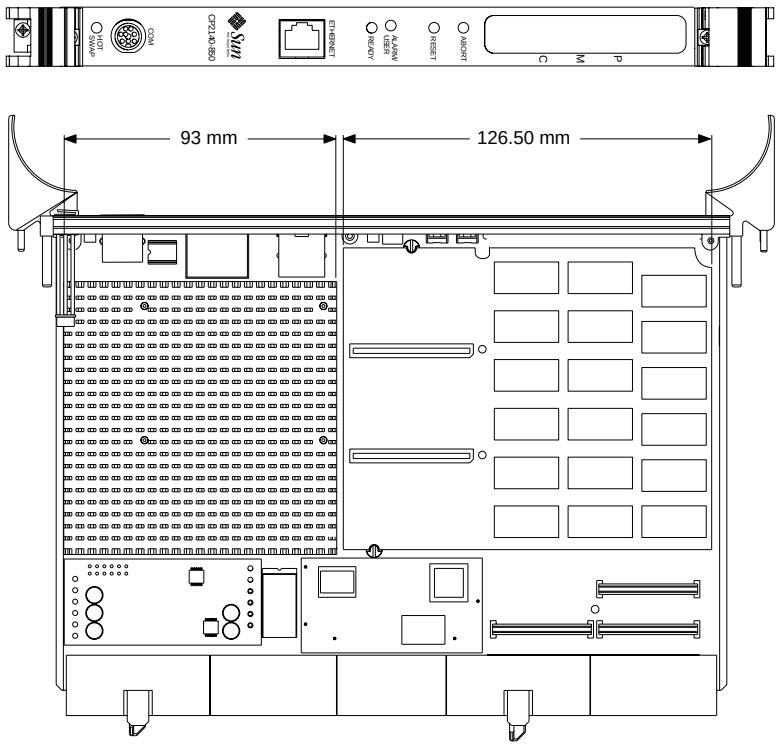


FIGURE B-4 Netra CP2140 Board Mechanical Dimensions of the Heat sink and Double-wide Memory Module

APPENDIX **C**

SunVTS

This appendix describes the SunValidation Test Suite (SunVTS), a comprehensive software package that tests and validates the Netra CP2140 board by verifying the configuration and function of most hardware controllers and devices on the motherboard. SunVTS software is used to validate a system during development, production, inspection, troubleshooting, periodic maintenance and system or subsystem stressing. SunVTS software can be tailored to run on various types of systems, ranging from desktops to servers with modifiable test instances and processor affinity features.

You can perform high-level system testing using the appropriate version of SunVTS. For detailed information on SunVTS support, visit the following web sites:

`http://www.sun.com/oem/products/vts/index.html`

The following provides some information on distribution of SunVTS software:

- SunVTS software can be downloaded from the following URL:

  `http://www.sun.com/oem/products/vts/index.html`

- Ensure that the SunVTS software version is compatible with the Solaris operating environment version being used.

  Solaris 8 2/02 operating environment is compatible with SunVTS 4.6 package.

- Information on the version of the SunVTS software installed can be found in the file:

  `/opt/SUNWvts/bin/.version`

- The SunVTS packages are also located on the *Solaris 8 Supplemental Software CD for Sun Computer Systems* that ships with the Solaris operating environment release.
- To obtain SunVTS documentation, contact your local customer service representative or Field Application Engineer.

APPENDIX **D**

Solaris Sun FRU ID

The Solaris Sun FRU ID information is stored on the Netra CP2140 board EEPROM (U3209) and is used to identify the board for service purposes. The Solaris Sun FRU ID is one of the standard features in the Solaris 8 2/02 operating environment and later compatible versions. The *CP2000 Supplemental 4.0 CD for Solaris 8* implements Solaris Sun FRU ID for the CP2140 board, when used with Solaris 8 update 2/02 and later compatible versions.

To access the Solaris Sun FRU ID infomation for the CP2140 board, use the **`prtfru`** command. See the prtfru(1M) man pages for futher infomation on this command. The man pages can be found on the Solaris 8 2/02 operating environment default package.

D.1 Prtfru Command

By typing in the **`prtfru`** command at the Solaris command line, the user can obtain an output with Solaris Sun FRU ID information that is similar to the example shown below. The fields that are displayed in the example are described below in TABLE D-1.

```
# prtfru
/frutree
/frutree/chassis (fru)
/frutree/chassis/CPU-slot?Label=CPU
/frutree/chassis/CPU-slot?Label=CPU/CPU-slot (container)
   SEGMENT: SD
      /ManR
      /ManR/UNIX_Timestamp32: Fri May 11 19:00:00 PDT 2001
      /ManR/Fru_Description:
      /ManR/Manufacture_Loc:
      /ManR/Sun_Part_No: 375-302
      /ManR/Sun_Serial_No: 001379
      /ManR/Vendor_Name: Sun Microsystems
      /ManR/Initial_HW_Dash_Level:
      /ManR/Initial_HW_Rev_Level:
      /ManR/Fru_Shortname: CP2140
/frutree/chassis/CPU-slot?Label=CPU/CPU-slot/c0?Label=c0
#
```

TABLE D-1 Description of Fields in Typical Prtfru Command Display Output

Field	Description
/ManR/UNIX_Timestamp32: Fri May 11 19:00:00 PDT 2001	Board manufacturing timestamp
/ManR/Fru_Description:	Description for the board field replaceable unit
/ManR/Manufacture_Loc:	Location where board is manufactured
/ManR/Sun_Part_No: 375-302	Board identification part number
/ManR/Sun_Serial_No: 001379	Board identification serial number
/ManR/Vendor_Name: Sun Microsystems	Name of the board vendor

TABLE D-1 Description of Fields in Typical Prtfru Command Display Output

Field	Description
/ManR/Initial_HW_Dash_Level:	Board identification dash number
/ManR/Initial_HW_Rev_Level:	Board identification revision number
/ManR/Fru_Shortname: CP2140	Short name for the board such as CP2140

Glossary

AP Alternate Pathing (AP) is a software-driven facility that employs both redundant hardware and redundant software driver paths between a server and a disk array or a network. If one path fails, AP ensures that the disk array or network is still available through the alternate path. For example, the alternate path can be a second port on an interface board, or an entirely separate interface board. See also Device Reconfiguration.

ASM Advanced System Monitoring

Availability The ratio of the total time that a functional unit is capable of being used to the total time that the unit is required for use.

BMC Baseboard Management Controller: The BMC is used to manage chassis environmental, configuration and service functions, and receive event data from other parts of the system. It receives data through sensor interfaces and interprets these data by using the Sensor Data Repository (SDR) to which it provides an interface. The BMC provides another interface to the System Event Log (SEL). The BMC allows Both the SDR and the SEL to be accessed from the system or from the Intelligent Platform Management Bus (IPMB). A typical function of the BMC is to measure processor temperature, power supply values, and cooling fan status. It can take some autonomous actions to preserve system integrity. For example, it might switch on a fan at a particular temperature threshold. An application interface may be provided to enable custom user-management applications to be built.
The BMC describes an abstract function, or role. It carries no definition of how it might be implemented.

Boot: The process of initializing the hardware to execute and run an operating environment such as Solaris 2.6 5/98 or subsequent compatible versions.

Checkpoint (1) A point at which information about the status of a job and the system can be recorded so that the job can later be restarted from that point. (2) A sequence of instructions in a computer program for recording the status of execution for restarting. v. to checkpoint; n. checkpointing.

CompactPCI An adaptation of the PCI bus architecture defined in the Peripheral Component Interconnect (PCI) Specification 2.1 (or later) to an electrically-compatible robust industrial form. This form specifies a Eurocard-style printed circuit board assembly (PCBA) that uses “hard metric” connectors to connect it to the enclosure backplane. CompactPCI is an open specification supported by the PCI Industrial Computers Manufacturers’ Group (PICMG).

CompactPCI Bridge The PCI bridge between the System Host processor and the CompactPCI bus. The CompactPCI bridge must reside in the system slot to provide CompactPCI clocking and arbitration that are only available from that slot. CompactPCI bridges maybe controllable by the System Management Controller to turn off clocks and arbitration.

Device Reconfiguration A process that is used in the Netra CP2140 board system to configure (add) or deconfigure (remove) device tree allocations and load or unload software driver modules while the system is running. It is analogous to *Dynamic Reconfiguration* that is used on some Sun high-end server systems with some important differences. It is not used to reconfigure memory or CPU resources and it can be used automatically in the Full Hot-Swap and HA Hot-Swap cases when the Hot-Swap framework software is prompted by the System Management Controller (when HA is available). Netra CP2140 board HA device reconfiguration can also be invoked manually from a console.

Device Tree The OpenBoot PROM probing process constructs a hierarchical representation of the hardware devices that are found on the bus, the host-bus being the root. The device tree includes several device nodes. (Ethernet is a device node.)

Dropin A code or data module which can be called by the OpenBoot PROM during system startup. It is placed in unused memory space between OpenBoot PROM and POST. User-created dropins are usually used to initialize custom user hardware. They do not require that the user possesses OpenBoot PROM source code; only the binary OpenBoot PROM image need be licensed. Dropins are used to add firmware drivers for user hardware.

Dynamic Reconfiguration Dynamic Reconfiguration (DR) is a software package that enables the administrator to (1) view a system configuration; (2) suspend or restart operations involving a port, storage device, or board; and (3) reconfigure the system (detach or attach hot-swappable devices such as disk drives or interface boards) without the need to power down the system. When DR is used with Alternate Pathing or Solstice DiskSuite™ software (and redundant hardware), the server can continue to communicate with disk drives and networks without interruption while a service provider replaces an existing device or installs a new device. DR supports replacement of a CPU/Memory, provided the memory on the board is not interleaved with memory on other boards in the system. Note that DR is used with Sun high-end server systems. See Device Configuration for the analogous process that is applied to the Netra CP2140 board.

Failover The process of transfer of function from a failed component subsystem to an alternate one while preserving the operational state of the overall system. The functions transferred may include those of control and management.

Firmware An ordered set of instructions and data that is stored in a way that is functionally independent of main storage, for example, microprograms stored in a read-only memory (ROM). The term *firmware* describes microcode in ROM. At the time they are coded, microinstructions are software. When they are put into ROM, they become part of the hardware (microcode) or a combination of hardware and software (microprograms). Usually, microcode is permanent and cannot be modified by the user but there are exceptions.

FRU Field Replaceable Unit: A part or subsystem that can be replaced in the field or at a customer site. Parts that are not FRUs are only factory replaceable.

HA High-availability: the property of a system associated with a high in-service to out-of service time ratio. This property can be engineered by reconfiguring the system "on the fly" to isolate failed elements so they can be replaced without affecting the operational condition.

Hardware On the CP2140, CPU, cables, and peripheral devices are typical examples of hardware.

heartbeat A repetitive signal passed from one system to another to communicate the state of integrity or "health" of the sending system.

Host Computer Host Computer (context-dependent): (1) A computer that usually performs network control functions and provides end-users with services such as computation and database access.
(2) The primary or controlling computer in a multi-computer installation.

Hot Swap Insertion into a running system (3 modes: basic, full and HA).

Hot-swap Controller The controller that takes care of the low-level sequencing associated with hot swap.

HS Hot-swap: The capability or property of a system element to be removed or replaced while the system hardware is nominally operating under power. This capability is usually invoked after a failure and is implemented by a sequence that steers the functions of the element to other parts of the system.

Hot-swap, as defined by PICMG, can be classified as Basic, Full, or HA.

Basic HS requires manual software sequencing to bring a card out of commission.

Full HS uses hardware enumeration signals to indicate board status. Software automatically decommissions the card. (HA hot swap is not supported in the CP2140 configuration.)

I2C Inter-Integrated Circuit Bus: a serial bus developed by Philips for inter-package communications and typically used by them in TV sets. In Sun Compact PCI systems, it is used to link card elements in a system for management communications.

ICMB Inter-chassis Management Bus: an IPMI/I2C bus (analogous to the IPMB) used to accomplish chassis-to-chassis management.

IPMB Intelligent platform management bus: a bus that carries serial communication signals that comply with the IPMI; it is used to communicate between Compact PCI PCBAs in a chassis.

IPMI Intelligent Platform Management Interface: IPMI is a protocol interface with a protocol stack that includes link, transport and session layers to provide reliability. It resides on an I^2C physical layer.

KCS interface Keyboard Control Style interface: This interface is defined in the IPMI Specification. It is one of the BMC to System Management Software (SMS) interfaces.

Nines Used as a measure of system availability: three nines > 99.9%, four nines > 99.99%, five nines > 99.999%, and six nines > 99.9999%.

Node An addressable point on a network. Each node in a Sun network has a different name. A node can connect a computing system, a terminal, or various other peripheral devices to the network.

Non-host / Satellite Peripheral slots / boards in the Compact PCI backplane.

NVRAMRC *N*on-*V*olatile *R*andom-*A*ccess *M*emory *R*un *C*ommand. This refers to the executable OpenBoot PROM script that is written in the NVRAM. Other text information or binary data may exist in the NVRAM, but is not referred as NVRAMRC.

OpenBoot PROM This refers to a firmware program that consists of executable code by the CPU. This code initializes the hardware, performs Power On Self-Test (POST) and boots the system to bring up the Solaris Operating Environment. The OpenBoot PROM, or system PROM, contains code to run POST and a suite of user-accessible subsystem hardware tests. It has a Forth interpreter for custom user routines. Under a normal boot sequence, it provides a path to a system boot device which is accessed after POST completes. “Open Firmware” is controlled by IEEE Standard 1275.

Partition The functional entity that includes a host—with a host PCI bridge—and the peripherals that it controls on the CompactPCI bus. The partition management is performed by the CompactPCI bus bridge on a compliant board. A partition is analogous to a PCI domain with the difference that partition integrity is not guaranteed for boards that do not contain 21554 bridges.

PCI domain The functional entity that includes a host—usually with a host PCI bridge—and the peripherals that it controls. The domain does not necessarily uniquely include the PCI bus because this bus can be shared by multiple

domains. For example, a second domain can comprise a second host/bridge element that controls a different set of peripherals on a shared bus. Separation and management of the domains is implemented by a controlling system mechanism that guarantees their mutual protection.

Peripheral host Also Satellite host: performs computing-intensive functions in response to commands from the system host. A peripheral host is limited to on-board I/O.

PICMG PCI Industrial Computers Manufacturers' Group

PM Peripheral Management Controller

PMC PCI Mezzanine Card

POST Power-on Self Test: a suite of tests run out of system firmware before any other code is loaded. The purpose of such testing is to check the integrity of the hardware before loading a software system.

Probing A process implemented in the firmware and software to identify onboard hardware devices and add-on cards on the CPCI back plane. The probing process creates the device-tree.

RARP Reverse Address Resolution Protocol; The protocol broadcasts a MAC (Ethernet) address and receives an IP address in response from a RARP server.

RAS Reliability, Availability and Serviceability: the general concepts associated with high in-service time systems and their simplicity of maintenance.

RCM Reconfiguration Coordination Manager

Reliability The ability of a functional unit to perform a required function under stated conditions for a stated period of time.

Satellite host See Peripheral host.

SDR Sensor Data Repository: the database that the BMC uses to determine what sensors, FRU devices, and management controllers are in the system. This database contains an account of sensor locations, properties, and associations.

Segment The extent to which a backplane and cards combination can be extended by accounting for signal loading. In Compact PCI, a segment spans a maximum of eight card slots, beyond which some bridge elements (system bridge) are needed to provide expansion into another segment.

SEL System Event Log: the database of measured values and events that is created by the BMC based upon its sensor monitoring. This database resides in the host and is accessible by high-level applications.

Serviceability The capability of performing effective problem determination, diagnosis, and repair on a data-processing system.

SMC System Management Controller: There is a System Management Controller on each card in the enclosure. One of these cards either assumes control by command or takes control after negotiation with the other System Management Controllers. The System Management Controller manages peripherals to improve the availability of the system. Through the IPMB, this entity receives information on IDs of, or problems with, cards in the system and can communicate that information with other cards or with a system host via another bus. The SC can switch the PCI bridge, PCI arbitration, and PCI clocking on or off.

Software A collection of machine readable information, instructions, data, and procedures that enable the computer to perform specific functions. Typically stored on removable media.

System Controller Host CPU board in the System Slot of the CompactPCI backplane

System Host A system host accepts interrupts and owns peripherals. It executes user applications and decides the distribution of tasks and within a system. In hot-swap systems the system host acts as a traffic router and functions to activate and deactivate peripheral cards (plug-in boards). It is not a Compact PCI requirement that the system host reside in a system slot although this is normally the case. If it resides in a peripheral slot that slot must be wired to receive peripheral interrupts from the backplane.

System Management Bus A serial bus that carries data and control signal between System Management Controllers on peripheral boards and devices. Communications on this bus use the IPMI protocol over an I2C hardware layer.

System Slot The card location in an enclosure that provides for Compact PCI clocking and arbitration. It follows that the Compact PCI bridge, which supplies these functions, must be in the system slot.

System-slot Bridge Provides clocks and arbitration. This device must be controllable from somewhere. It can be controlled from a controller. The system host need not reside on the same card but the card that performs the function of system host must be able to talk to the slot containing the system-slot bridge.

System-slot Controller The System-slot Controller is the board that contains both the System Host and the System Management Controller.

TFTP Trivial File Transfer Protocol; a reduced form of File Transfer Protocol (FTP).

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