Kontron IP Network Server NSC2U

Technical Product Specification

December 2009

Rev 1.1

Contents

Revision History

Date	Revision	Description
December 2009	004	Kontron version, Rev 1.1
April 2007	003	In "Overview" chapter, updated "Cooling System" section. In "Overview" chapter, added shipping weight information to the "Physical Specifications" section. In "Cables and Connectors" chapter, added "Front NIC 4x Ethernet PCI Card Cable" and "External Front Panel 4x GbE NIC Connectors" sections. Also updated "DC Power Input for DC-Input Power Supply" section. In "SAS Front Panel (SFP) Board" chapter, updated "Hardware RAID" and "Software RAID" sections to describe required prerequisites for each RAID type. Also, added reference to document that describes hardware RAID setup.
March 2007	002	In "System Overview" chapter, updated "PCI/PCI Express Subsystem" section. In "Cables and Connectors" chapter, added sections for AC and DC power input connectors. In new SFP Board chapter, added "Features" and "SysCon Board Connector" sections. In "SysCon Board Functional Description" section, added footnote on the use of a mini-SD card up to 512 Mbytes.
February 2007	001	Initial version of document

1 Introduction

This document provides an overview of the Kontron IP Network Server NSC2U, including information about the chassis hardware, cables, connectors, system boards, power subsystem, and regulatory requirements.

1.1 Document Structure and Outline

This document is organized into the following chapters:

- Chapter 1, "Introduction" — Provides an overview of this document.
- Chapter 2, "System Overview" — Provides an overview of the Kontron IP Network Server NSC2U chassis hardware.
- Chapter 3, "Cables and Connectors" — Describes the cables and connectors used to interconnect the system board set and the server system components. Also describes external, user-accessible connectors.
- Chapter 4, "SAS Front Panel (SFP) Board" — Describes the specifications of the front panel I/O board and describes the main functions of the board. Also, describes special features including support for RAID, debug facility, "power good" circuit and reset control and provides pinout information for SFP board connectors.
- Chapter 5, "SAS Backplane" — Describes the specifications of the SAS backplane that provides support for the SAS hard disk drives and the optional optical disk drive.
- Chapter 6, "PCI Riser Cards" — Describes the specifications of the PCI riser cards.
- Chapter 7, "Power Subsystem" — Describes the specifications of the power subsystem, including AC-input and DC-input power supply modules.
- Chapter 8, "Regulatory Specifications" — Describes system compliance to regulatory specifications.

A glossary of terms and a list of useful references on related subjects is provided at the end of the manual.

1.2 Related Information

The following documents are referenced in this document and provide additional information:

- *Intel® Server Board S5000PAL Technical Product Specification*
- *25-GS0009 Boards and Systems Environmental Governing Specification*
- *Intel® Embedded Server RAID Technology II, Intel® Integrated Server RAID, and Intel® RAID Controllers SRCSAS18E and SRCSAS144E Software User's Guide*

2 System Overview

This chapter describes the features of the Kontron IP Network Server NSC2U.

This chapter is organized into the following sections.

2.1 Product Overview

The Kontron IP Network Server NSC2U is a compact, high-density, rack mount server system with support for selected dual-core and quad-core processor models from the Intel® Xeon® 5000 sequence, and up to 32 Gbytes of DDR2-667 FBD ECC DIMM memory. The NSC2U Server supports high availability features such as hot-swappable SAS disk drives, redundant hot-swappable power supply modules and memory mirroring. The scalable architecture of the NSC2U Server supports a variety of operating systems.

Figure 1 shows the IP Network Server NSC2U assembled and Figure 2 shows the IP Network Server NSC2U with the top cover and front bezel removed.

Figure 1. Kontron IP Network Server NSC2U with Top Cover On

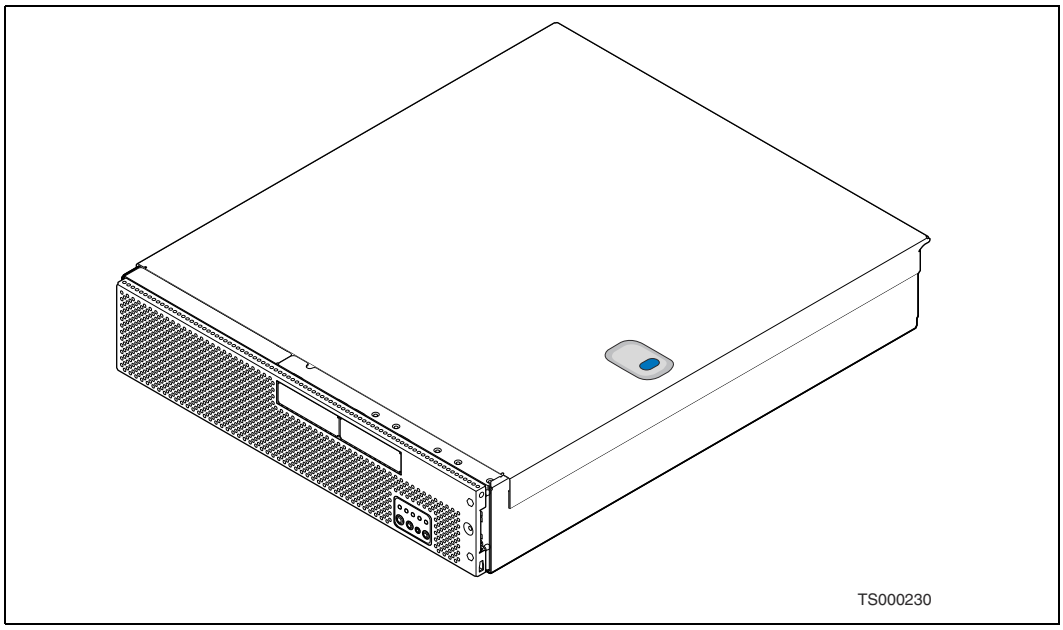
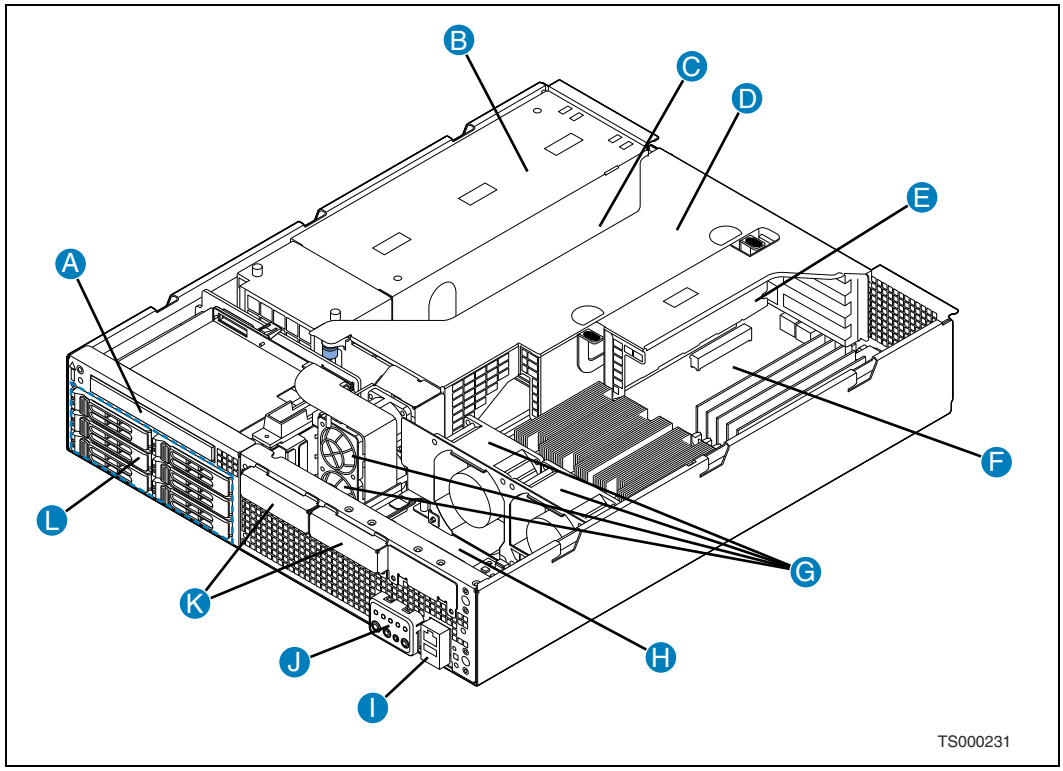


Figure 2. Kontron IP Network Server NSC2U with Top Cover Removed



Item	Description	Item	Description
A	Optical drive (optional)	G	System fans
B	Power supply cage (contains one power supply module with provision for an optional second module)	H	SAS Front Panel (SFP) board; can include optional VSSD board (which provides local memory storage)
C	Provision for PCI-X* and PCI Express* (PCIe*) full-height and full-length add-in cards	I	RJ45 COM2 and USB port 2 connectors
D	Riser card assembly (containing riser cards for both full-height and low-profile add-in cards)	J	Control panel and status indicators
E	Provision for two PCI Express low-profile add-in cards	K	Two slots for 4x GbE NIC ports (optional)
F	Intel® Server Board T5000PAL	L	Hot-swappable SAS disk drives (up to six)

2.1.1 Features

Table 1 provides a list and brief description of the features of the IP Network Server NSC2U.

Table 1. IP Network Server NSC2U Feature List

Feature	Description	
Compact, high-density system	Rack mount server with a height of 2U (3.5 inches, 8.9 cm) and a depth of 20.0 inches (50.8 cm)	
Configuration flexibility	One- or two-way capability in low-profile and cost/value-effective packaging Stand-alone system Selected dual-core and quad-core processor models from the Intel® Xeon® 5000 sequence (one or two) †	
Serviceability	Rear access to hot-swappable power supplies Front access to hot-swappable SAS disk drives Front access to optional optical drive Ability to swap the entire drive bay as a unit	
Availability	Two hot-swappable 600W power supplies in a redundant (1+1) configuration Disk subsystem configurable as hardware or software RAID Memory sparing and memory mirroring configurations supported	
Manageability	Remote management Emergency management port (serial and LAN) IPMI 2.0 compliant Remote diagnostics support Optional Intel® Remote Management Module (RMM) providing GCM support	
Upgradeability and investment protection	Designed to support selected dual-core and quad-core processor models from the Intel® Xeon® 5000 sequence † Multi-generational chassis Intel® 64 architecture support (formerly known as Intel® Extended Memory 64 Technology or Intel® EMT64)	
System-level scalability	Supports up to 32 Gbytes FB-DIMM memory in non-mirrored mode Supports up to 16 Gbytes FB-DIMM memory in mirrored mode Supports selected dual-core and quad-core processor models from the Intel® Xeon® 5000 sequence (one or two) † Two full-height/full length x4 PCI Express slots One full-height/full length 64-bit x 133 MHz PCI-X slot Two low-profile/half length x4 PCI Express slots Six internal hot-swappable 2.5 inch SAS disk drives One optical drive (optional)	
Front panel	Switches: • Power switch • Reset switch • NMI switch • ID switch	LEDs: • ID LED • NIC activity LED • Main power LED • HDD activity LED • Status LED
† To get a list of compatible processors for the NSC2U Server, see http://us.kontron.com/support/.		

Table 1. IP Network Server NSC2U Feature List (Continued)

Feature	Description	
I/O	Front panel: • Serial B port (RJ45) • USB 2.0 port • Four or eight GbE ports (optional)	Rear panel: • Dual PS/2 ports for keyboard and mouse • Serial B port (RJ45) • Two USB 2.0 ports • GCM 100 Mbps management port • Two RJ45 NIC connectors for 10/100/1000 Mbps connections • Video connector
Internal connection options	Internal connectors/headers: • One 44-pin ATA/100 connector (power and I/O) for optical drive • One Intel® Remote Management Module (Intel® RMM) connector • One Intel® I/O Expansion Module connector supporting either: - Dual GbE NIC module (optional) - External SAS module (optional)	
Add-in card support	One full-height riser slot supporting 2U PCI-X and PCI Express (PCIe) add-in cards One low-profile riser slot supporting PCIe add-in cards	
† To get a list of compatible processors for the NSC2U Server, see http://us.kontron.com/support/.		

In the IP Network Server NSC2U, the Intel® Server Board T5000PAL server board is mounted horizontally toward the rear of the chassis behind the system fan array.

Up to six, 2.5-inch, hot-swappable, SAS-technology hard drives can be mounted in the drive bays, which are located in the left, front area of the chassis behind the front bezel. Figure 2 shows the location of the SAS drive trays.

Note: It is also possible to swap the entire drive bay as a unit should the unit need to be moved to another system for any reason.

The system has two slots for optional 4x GbE NIC ports. The slots are located near the center of the front of the chassis. Each slot can be configured with one of the following:

- blank panel
- 4x GbE NIC ports, with RJ45 connectors

Note: The RJ45 4x GbE NIC ports are internally cabled to an optional Intel® PRO/1000 AT Quad Port Bypass Adapter configured in the full-height/full length PCIe riser card.

The SAS Front Panel (SFP) board is located in front of the CPU fan array and provides the user interface on the system front panel for system management.

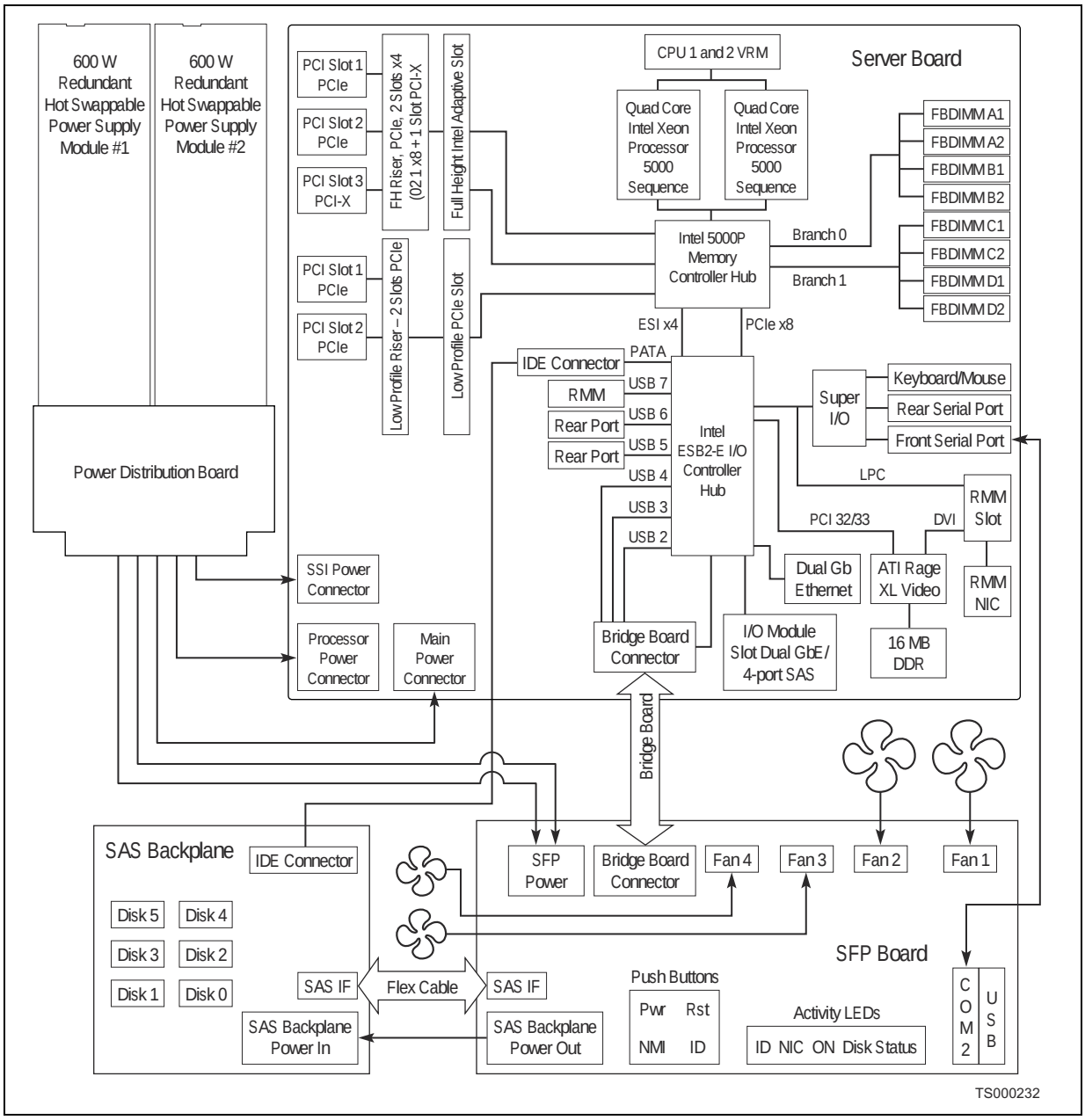
The power supply modules are installed at the left-rear of the chassis. Two hot-swappable 600W power supply modules can be installed for a 1+1 redundant configuration. A filler module for the empty power supply location is supplied for systems without redundancy.

The system contains a fan array consisting of two 80×38 mm fans (CPU fans) and two 56×40 mm fans (PCI fans) to cool the server board, PCI riser assembly and other components. The two 80×38 mm fans are installed directly behind the SFP board in front of the server board. The two 56×40 mm fans are located to the left of the SFP board. A fan failure is indicated by one of the fault LEDs on the SFP board.

The front bezel can be customized to meet OEM industrial design requirements. The bezel design allows adequate airflow to cool the system components. The front bezel is removed to access the drive trays.

Figure 3 shows a block diagram of the IP Network Server NSC2U, depicting major system components and the interconnections between them.

Figure 3. IP Network Server NSC2U Block Diagram

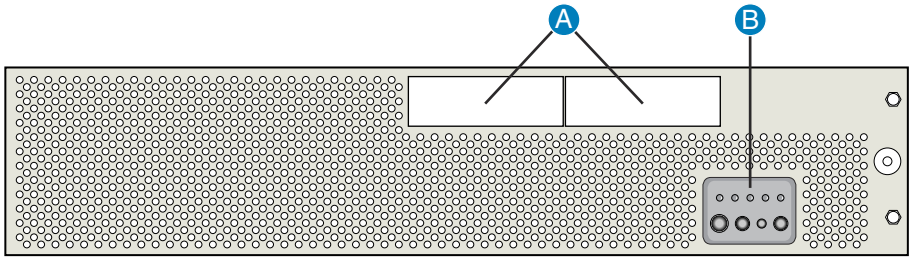


2.2 External Chassis Features

2.2.1 NSC2U System Front View

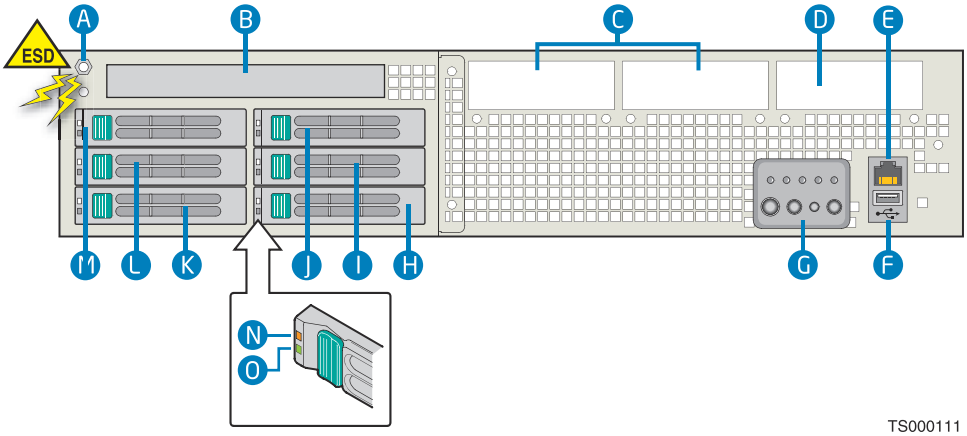
Figure 4 shows the front of the IP Network Server NSC2U system with the bezel installed. Figure 5 shows the front of the system with the bezel removed. Removing the bezel provides access to the hot-swappable SAS disk drives and the optical drive.

Figure 4. Front View of the NSC2U System (Bezel Installed)



Item	Description	Item	Description
A	Two slots for 4x GbE NIC ports (optional); filler panels shown in illustration	B	Front panel control switches and status LEDs (see Figure 6 for details)

Figure 5. Front View of NSC2U System (Bezel Removed)



Item	Description	Item	Description
A	Anti-static connection point	H	Hard drive bay 0
B	Optical drive (optional) or filler panel if no drive is installed.	I	Hard drive bay 2
C	Two slots for 4x GbE NIC ports (optional); filler panels shown in illustration	J	Hard drive bay 4
D	Optional slot for future design use	K	Hard drive bay 1
E	Front-panel serial port connector (RJ45)	L	Hard drive bay 3

Item	Description	Item	Description
F	USB port 2 connector	M	Hard drive bay 5
G	Front panel control switches and status LEDs (see Figure 6 for details)	N	Drive fault indicator (one per hard drive)
		O	Drive activity indicator (one per hard drive)

2.2.2 Front Panel Features

The front panel features of the IP Network Server NSC2U are shown in Figure 6 and described in Table 2. All front panel control switches and status LEDs are located on the SFP board.

Figure 6. IP Network Server NSC2U Front Panel Details

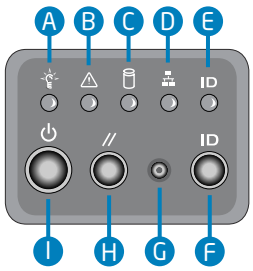


Table 2. IP Network Server NSC2U Front Panel Features

Item	Feature	Description
	Front Panel LEDs	
A	Main power LED (green)	When continuously lit, indicates the presence of power supply DC output power in the server. The LED turns off when the main output power from the power supply is turned off or the power source is disrupted.
B	System Status (green/amber)	Indicates system status as follows: • Steady green indicates system in standby or ready for operation. • Blinking green indicates degraded operation (e.g., power supply non-redundancy, part of system memory mapped out by BIOS). • Blinking amber indicates one or more non-critical fault conditions. • Steady amber indicates one or more critical fault conditions.
C	HDD Activity/Fault LED (green/amber)	Indicates HDD activity when green, or an HDD fault when amber. This is an aggregated indication for all hard disk drives (up to six) in the system. Each hard disk contains its own activity and fault indicators.
D	NIC activity LED (green)	Indicates NIC activity when lit
E	System ID LED (blue)	Indicates system identity LED can be toggled remotely or by front-panel ID switch for identification purposes
	Front Panel Switches	
F	ID switch	Toggles system ID LED
G	NMI switch	Asserts NMI to the server board
H	Reset switch	Resets the system
I	Power switch	Toggles the system power

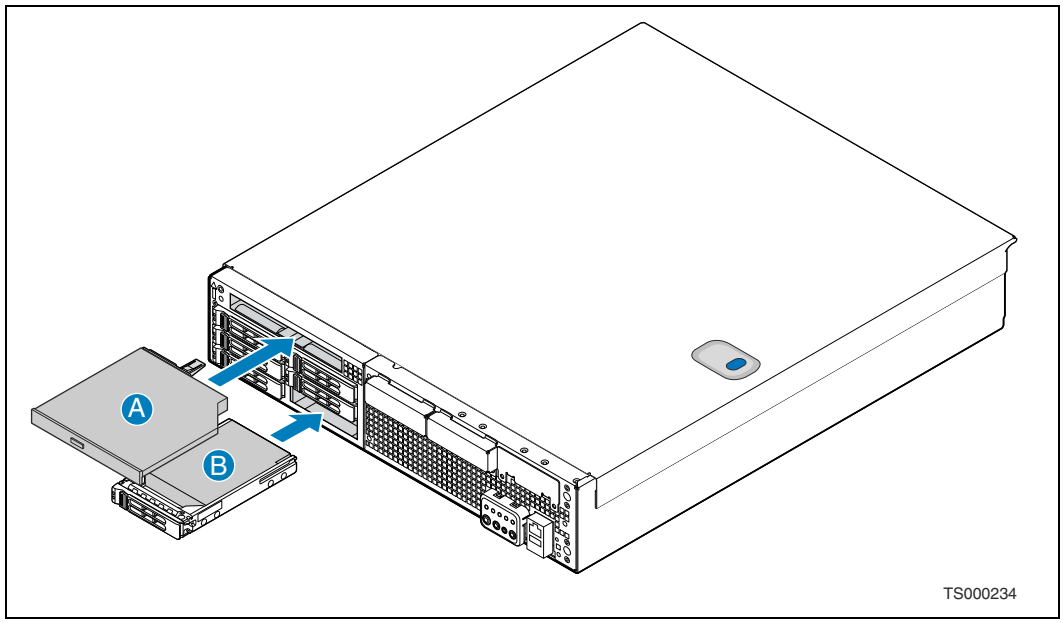
2.2.3 Hard Drives and Optical Drive

The IP Network Server NSC2U chassis can include up to six hot-swappable hard drives (item B in Figure 7) that are accessible from the front of the chassis and provision for an optional front-accessible optical drive (item A in Figure 7).

SAS 2.5-inch hard disk drives are mounted in removable drive trays that latch into the drive bay subassembly. The SAS drives are hot-swappable. The optical drive, which is **not** hot-swappable, is mounted in a slot above the hard drives.

Removal of the front bezel is required to access the SAS drives. To remove the optical drive, the top cover must be removed in addition to the front bezel.

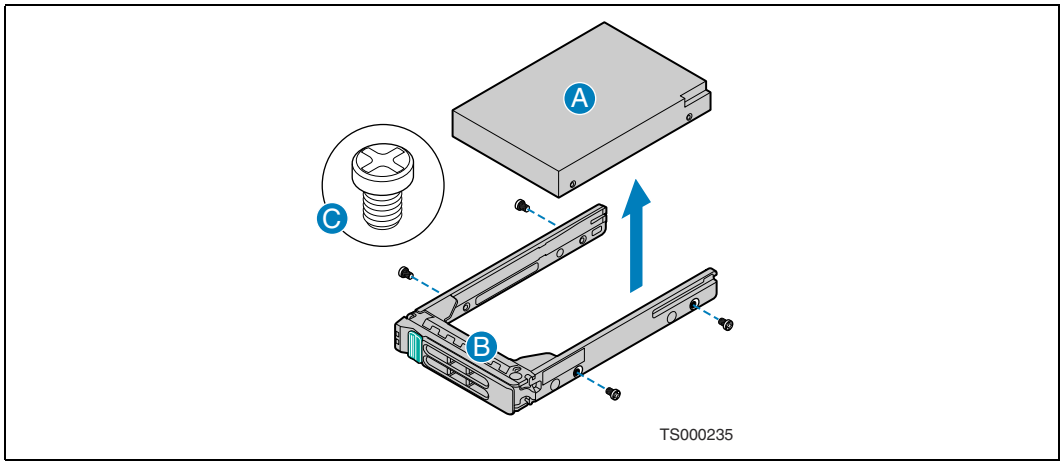
Figure 7. Hard Drive and Optical Drive



2.2.3.1 Hard Drive Tray Assembly

Each hard drive used in the system is a hot-swappable unit. A hard drive is removed from the system by pressing the green button on the front of the hard drive tray and pulling the hard drive tray out of the system. As indicated in Figure 8, the hard drive (A) can be separated from the hard drive tray (B) by removing the four screws (C).

Figure 8. Hard Drive Tray Assembly



2.2.3.2 Optical Drive

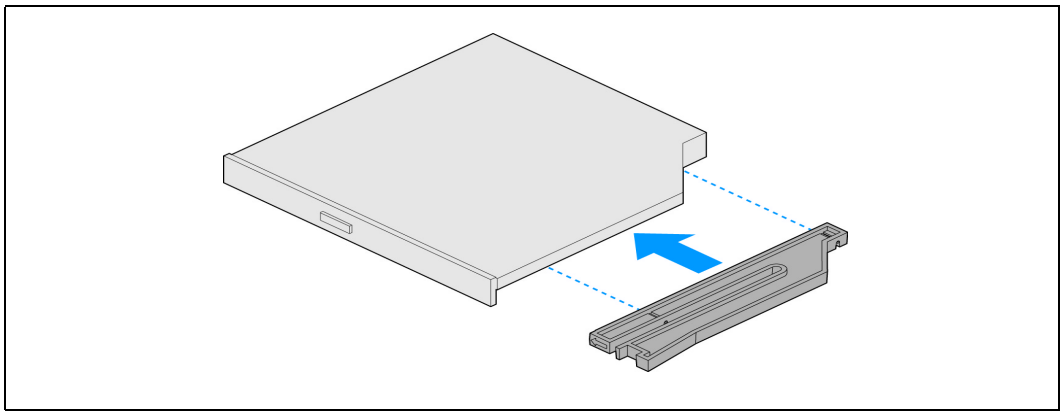
The IP Network Server NSC2U can support an optional 0.5 inch (12.7 mm) slim-line optical drive. If the optical drive is not installed, a blank filler unit is installed.

When installing an optical drive, the top cover and the front bezel of the chassis must be removed. The blank filler unit is removed by releasing the engagement tab from the SAS backplane and sliding the filler unit out through the front wall of the chassis, as implied in Figure 7.

The engagement tab must be removed from the blank filler panel and attached to the optical drive using the two mounting screws as shown in Figure 9. The optical drive can then be installed through the front wall of the chassis. The engagement tab holds the optical drive firmly in position when fully installed.

Note: The optical drive or blank filler unit can be inserted or removed only when the system is powered off.

Figure 9. Optical Drive and Retention Mechanism



2.2.4 NSC2U System Chassis Rear Panel

Figure 10 shows the rear of the IP Network Server NSC2U system and Table 3 describes the main components.

Figure 10. NSC2U Rear View

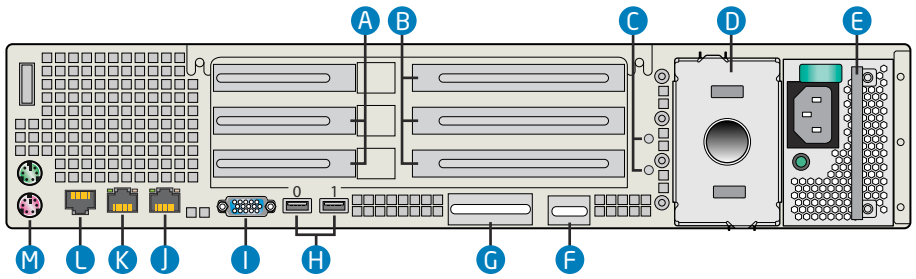


Table 3. Rear Panel Components

Item	Description	Item	Description
A	Low-profile PCI Express add-in cards (or filler panels)	H	USB 0 and USB 1 port connectors
B	Full-height PCI-X/PCI Express add-in cards (or filler panels)	I	Video connector
C	Ground studs (used for DC-input system)	J	GbE NIC #2 connector
D	Power supply 2 slot; filler panel shown	K	GbE NIC #1 connector
E	Power supply 1 †	L	RJ45 serial port connector
F	GCM port connector (optional) ††	M	PS/2 keyboard and mouse connectors
G	I/O expansion module connector (optional) †††		

† In Figure 10, the power supply shown is an AC-input module. DC-input modules are also available.
†† If GCM is not present, a filler panel occupies this space.
††† May be either an external SAS port connector or a Gigabit Ethernet port connector. If neither of the optional modules is installed, a filler panel occupies this space.

2.3 Internal Chassis Features

2.3.1 T5000PAL

The NSC2U Server uses the Intel® Server Board T5000PAL server board. The T5000PAL server board is very similar to the S5000PAL server board as documented in the *Intel® Server Board S5000PAL Technical Product Specification* with a few modifications to optimize its use in telecommunications servers.

Most modifications do not change the physical or functional characteristics of the board, with the exception of a serial header J1H2 which has been added to accommodate the connection of the front panel serial port cable (see Figure 14, "IP Network Server NSC2U System Interconnect Block Diagram" on page 27).

2.3.2 PCI/PCI Express Subsystem

The IP Network Server NSC2U incorporates a PCI riser assembly that supports installation of PCI-X and PCI Express add-in boards. The assembly includes two riser cards that provide a total of five standard interface slots for add-in boards by connecting to two special slots on the Intel® Server Board T5000PAL.

One of the riser card slots is a PCI super slot that contains all the signals necessary to support both PCI-X and PCI Express (PCIe) expansion slots. The riser card that connects to the super slot supports the connection of full-height PCI-X or PCIe add-in cards. For PCI-X add-in cards, the super slot riser card implements a 64-bit PCI-X slot with bus speeds of 66 MHz, 100 MHz, or 133 MHz. For PCIe cards, the super slot riser card implements a ×8 link interface that can be used with one or two add-in cards that implement x1 or x4 interfaces or a single x8 card. See Table 45, "Full-Height Riser Card Configurations and Throughput" on page 73 for the supported configurations.

The second riser card slot supports PCIe only. The low-profile riser card that plugs into this slot supports the connection of low-profile PCIe add-in cards only and implements two ×4 link interfaces. Up to two low-profile PCIe add-in cards can be installed. See Table 46, "Low-Profile Riser Card Configurations and Throughput" on page 74 for the supported configurations.

Add-in cards are inserted into the riser assembly when the assembly is removed from the chassis. Figure 11 shows the removal of the riser assembly (A) from the chassis. The guide forks (B) help align the riser assembly with alignment pins on the server chassis when reinstalling the riser assembly.

Figure 12 shows the installation of a full-height PCI-X or PCIe add-in card (A) into the full-height riser card (B) and the installation of a low-profile PCIe add-in card (E) into the low-profile riser card (F). The full-height PCI-X or PCIe add-in cards are supported by a retainer clip (C) which is held in the locked position by a captive screw (D).

After the add-in cards are installed, the riser assembly is plugged back into the system and the I/O brackets of all the add-in cards are accessible through the rear panel of the server chassis.

Figure 11. Removing and Installing the PCI Riser Assembly

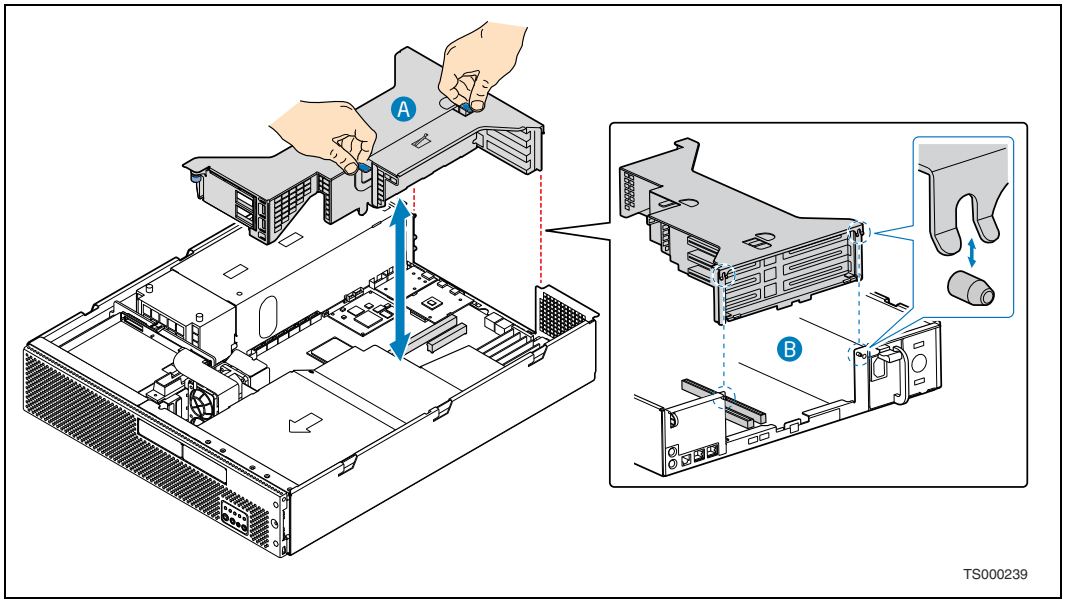
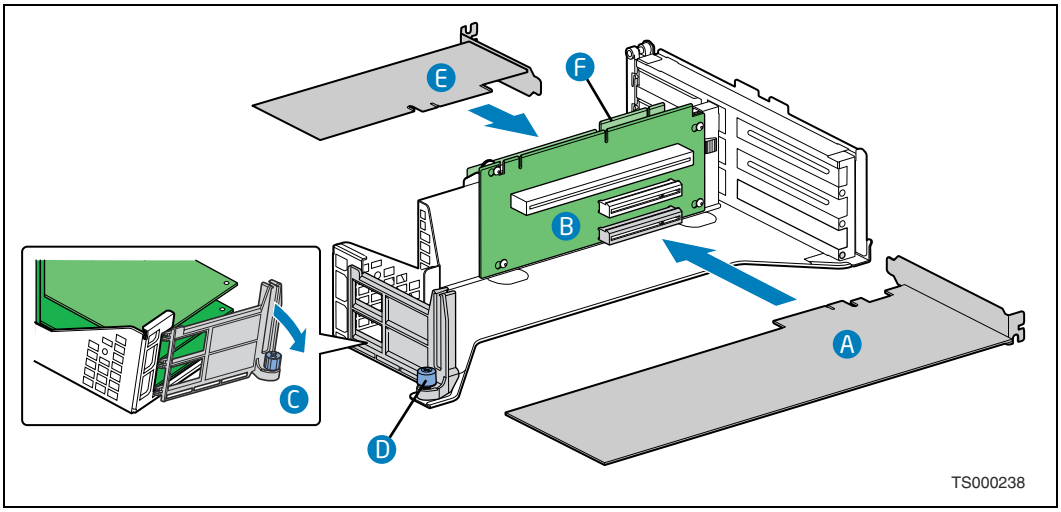


Figure 12. Installing Add-in Cards in PCI Riser Assembly



2.3.3 Power Subsystem

The power subsystem for the IP Network Server NSC2U consists of up to two hot-swappable Power Supply Units (PSUs) and a Power Distribution Board (PDB). The system can be configured and operated with either AC-input or DC-input PSUs located at the left, rear of the chassis. The power supply modules dock into a common PDB.

The system can contain up to two PSUs and can be configured as follows:

- two PSUs installed, (1+1) power redundancy for maximally loaded system
- one PSU installed, non-redundant for maximally loaded system

When the system is configured with two power supply modules, the hot-swap feature allows the user to replace a failed PSU without interrupting system operation. To ensure that all components remain within specification under all system environmental conditions, two minutes is the recommended maximum duration for PSU hot-swap operations.

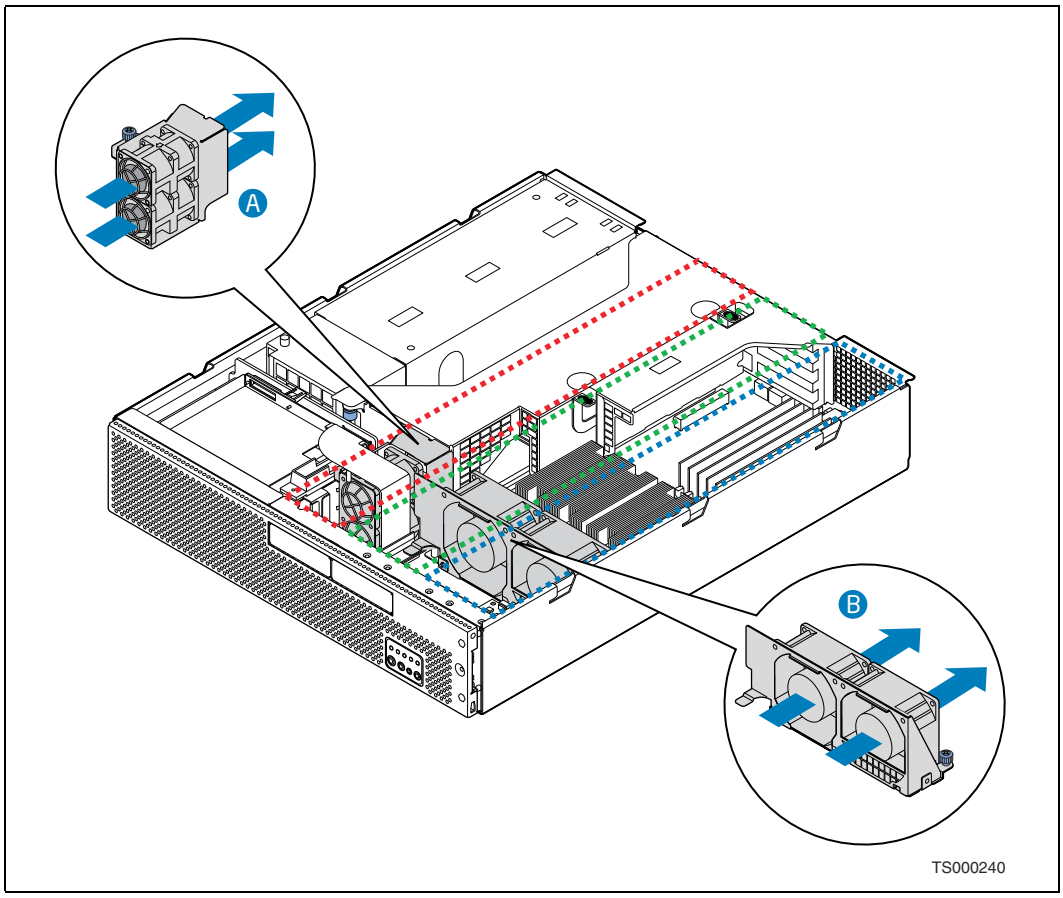
Refer to Chapter 7, "Power Subsystem" for more detailed information on the power subsystem.

Note: When the system is configured with one power supply module, this module must be installed in slot 1, that is, the right slot when the installer is facing the rear of chassis.

2.3.4 Cooling Subsystem

All system components except the power supply cage, which is cooled by fans integrated into the PSUs, are cooled by two sets of fans mounted near the middle of the chassis as shown in Figure 13.

Figure 13. Cooling Fans



The IP Network Server NSC2U system comes in a non-redundant, four-fan configuration that consists of two 80×38 mm fans and two 56x40 mm dual, counter-rotating fan assemblies. Each fan provides a tachometer signal output to allow the server board to monitor the fan speeds. Each fan has an associated fan-failure LED on the SFP board to help isolate a fan failure.

There are three cooling areas (domains) in the NSC2U Server system:

- domain 1 - CPU 1 and memory; see area outlined in blue in Figure 13
- domain 2 - CPU 2, chipset, and any low-profile PCIe add-in cards; see area outlined in green in Figure 13
- domain 3 - any full length PCI-X or PCIe add-in cards; see area outlined in red in Figure 13

2.3.4.1 CPU 1 and Memory Cooling Area

One of the system's big fans provides cooling for domain 1, outlined in blue in Figure 13. This fan facilitates the flow of air through the front bezel over the SFP, through the fan, and over the server board, CPU 1, memory, and ultimately out through the rear of the chassis.

2.3.4.2 CPU 2 and Chipset Cooling Area

One of the system's big fans provides cooling for domain 2, outlined in green in Figure 13. This fan facilitates the flow of air through the front bezel over the SFP, through the fan, and over the server board, CPU 2, chipset and any low-profile PCIe add-in cards, and ultimately out through the rear of the chassis.

2.3.4.3 PCI Cooling Area

The two 40×40×56 mm dual-rotor fans (A in Figure 13) facilitate the flow of air through the front bezel, through the fans, over the server board and any full-length PCI-X or PCIe add-in cards, and ultimately out through the rear of the chassis.

2.3.4.4 Hard Disk Drive and Power Supply Cooling

Airflow to cool the hard disk drives is provided by the fans that are integrated into the PSUs. The airflow is adequate even with a single PSU installed as long as a filler panel is installed in the other PSU slot.

2.3.4.5 Fan Speed Control

The server board contains Pulse Width Modulation (PWM) circuits, which control the 12 Vdc fan voltage to provide quiet operation when system ambient temperature is low and there are no fan failures. There is one PWM circuit for each cooling domain, resulting in one PWM being connected to each of the two 80×38 mm fans and the other PWM connected to the two dual-rotor 56×40 mm fans. Based on the ambient temperature, monitored by the front panel sensor, the fan speeds (PWM duty cycle) are set per Table 4.

Table 4. Fan Speed Settings

Temperature (°C)	CPU1 Fan PWM DC (%)	CPU2 Fan PWM DC (%)	PCI Fans PWM DC (%)
0 - 28	46	46	46
29	47	47	47
30	48	48	48
31	53	53	53
32	58	58	58
33	63	63	63
34	68	68	68
35	73	73	73
36	78	78	78
37	84	84	84
38	89	89	89
39	95	95	95
40	100	100	100

2.3.4.6 Cooling Summary

The four-fan cooling subsystem of the NSC2U Server is sized to provide cooling for:

- up to two server board processors
- up to 32 Gbytes of FB DIMM memory
- up to six SAS hard drives
- up to five PCI add-in cards consuming a maximum of 25W for each full-height PCI-X/PCIe add-in cards and 10W for each low-profile PCIe add-in card

The cooling subsystem is designed to meet acoustic and thermal requirements at the lower fan speed settings. At the higher fan speed settings, thermal requirements are met for the maximum ambient temperatures, but acoustic requirements are not met. The environmental specifications are summarized in Section 2.5.1, "Environmental Specifications" on page 23.

2.4 Server Management

Refer to the *Intel® Server Board S5000PAL Technical Product Specification* for a detailed description of the Server Management design and its features.

The Server Management sub-system provided by the IP Network Server NSC2U consists of:

- a micro-controller
- communication buses
- sensors
- system BIOS
- server management firmware

Standard on-board platform instrumentation is provided by the Baseboard Management Controller (BMC) component of the ESB2-E.

Table 5 summarizes the supported features:

Table 5. Server Management Features

Element	Supported (Yes/No)
IPMI Messaging, Commands, and Abstractions	Yes
Baseboard Management Controller (BMC)	Yes
Sensors	Yes
Sensor Data Records (SDRs) and SDR Repository	Yes
FRU Information	Yes
Autonomous Event Logging	Yes
System Event Log (SEL)	Yes 3,276 entries
BMC Watchdog Timer, covering BIOS and run-time software	Yes
IPMI Channels, and Sessions	Yes
Emergency Management Port (EMP) - IPMI Messaging over Serial/Modem. This feature is also referred to as Direct Platform Control (DPC) over serial/modem.	Yes
Serial/Modem Paging	Yes

Table 5. Server Management Features (Continued)

Element	Supported (Yes/No)
Serial/Modem Alerting over PPP using the Platform Event Trap (PET) format	Yes
DPC (Direct Platform Control) - IPMI Messaging over LAN (available via both on-board network controllers) Available over dedicated management port (ESB2 NIC 1)	Yes
LAN Alerting using PET	Yes
Platform Event Filtering (PEF)	Yes
Intelligent Chassis Management Bus (ICMB) - IPMI messaging between chassis	Yes
PCI SMBus support	Yes
Fault Resilient Booting	Yes
BIOS logging of POST progress and POST errors	Yes
Integration with BIOS console redirection via IPMI v2.0 Serial Port Sharing	Yes
Access via web browser	No Requires Remote Management Module (RMM)
SNMP access	Yes
Telnet access	No
DNS support	Yes
DHCP support (dedicated NIC only)	Yes
Memory Sparing/Mirroring sensor support	Yes
Alerting via Email	Yes
Keyboard, Video, Mouse (KVM) redirection via LAN	No Requires Remote Management Module (RMM)
High speed access to dedicated NIC	Yes

2.5 Specifications

2.5.1 Environmental Specifications

The IP Network Server NSC2U system is tested to the environmental specifications indicated in Table 6.

Table 6. Environmental Specifications Summary

Environment	Specification
Temperature, operating	10°C to 35°C (50°F to 95°F)
Temperature, non-operating	-40°C to 70°C (-40°F to 158°F)
Humidity, operating	5% to 85%
Humidity, non-operating	50% to 90%, non-condensing with a maximum wet bulb of 28°C (at temperatures from 25°C to 35°C) as per *25-GS0009 Boards and Systems Environmental Governing Specification*
Altitude	0 to 1,800 m (0 to 5,900 ft.) @ 40°C, temperature derated by 1°C for each additional 300m (985 ft.)
Vibration, non-operating	2.2 Grms, 10 minutes per axis on all three axes as per *25-GS0009 Boards and Systems Environmental Governing Specification*

Table 6. Environmental Specifications Summary (Continued)

Environment	Specification
Shock, operating	Half-sine 2 G, 11 ms pulse, 100 pulses in each direction, on each of the three axes as per *25-GS0009 Boards and Systems Environmental Governing Specification*
Shock, non-operating	Trapezoidal, 25 G, 170 inches/second delta V, three drops in each direction, on each of the three axes as per *25-GS0009 Boards and Systems Environmental Governing Specification*
Electrostatic discharge (ESD)	Tested to ESD levels up to 15 kilovolts (kV) air discharge and up to 8 kV contact discharge without physical damage as per *25-GS0009 Boards and Systems Environmental Governing Specification*
Acoustic	Sound power: < 7.0 BA at ambient temperatures at 23 ± 2°C measured per *25-GS0009 Boards and Systems Environmental Governing Specification*
RoHS	Complies with RoHS Directive 2002/95/EC

2.5.2 Physical Specifications

Table 7 provides the physical dimensions of the IP Network Server NSC2U.

Table 7. Physical Dimensions

Dimension	Value
Height	3.45 inches (87.6 mm)
Width	17.14 inches (435.3 mm)
Depth	20.0 inches (508 mm)
Front clearance	2.0 inches (76 mm)
Side clearance	1.0 inches (25 mm)
Rear clearance	3.6 inches (92 mm)

Table 8 provides the shipping weigh8s of the IP Network Server NSC2U server and associated major components.

Table 8. Shipping Weights

Description	Weight (kg)	Weight (lbs)
Kontron IP Network Server NSC2U, Base Model 0 Includes 600W **AC Power Supply** (does not include processor, memory, HDD)	15.8	35.0
Kontron IP Network Server NSC2U, Base Model 0 Includes 600W **DC Power Supply** (does not include processor, Memory, HDD)	15.8	35.0
Kontron IP Network Server NSC2U, standard packaging	3.6	8.0
TIGI2U AC Power Supply Module	1.6	3.5
TIGI2U DC Power Supply Module	1.6	3.5
NSC2U CPU heatsink with hardware	1.1	2.5
Quad Copper GbE Bypass NIC in Front, single board	0.34	0.75
Quad Copper GbE Bypass NIC, single board	0.34	0.75
NSC2U Quad NIC-in-Front cable assembly with copper escutcheon and mounting hardware spare	0.23	0.50

Table 8. Shipping Weights (Continued)

Description	Weight (kg)	Weight (lbs)
eUSB SSD board, with cable	0.09	0.20
RAID5 kit: RAID memory, hardware RAID key, cable for battery backup	0.34	0.75
RAID battery backup kit	0.23	0.50
Intel® Remote Management Module 2 (RMM2) - single pack	0.15	0.33
I/O Module (four port external SAS)	0.11	0.25
I/O Module (dual copper NIC ports)	0.11	0.25
NSC2U Bezel (unpainted)	0.34	0.75
TIGW1U SAS HDD carrier	0.11	0.25
Generic 2.5-inch hard disk drive	0.23	0.50
Generic DIMMs (quantity of 2)	0.11	0.25

3 Cables and Connectors

This chapter describes interconnections between the various components of the Kontron IP Network Server NSC2U and provides overview diagrams as well as tables describing the signals and pin-outs for the system connectors. Refer to the *Intel® Server Board S5000PAL Technical Product Specification* or the system board sections of this manual for connector signal descriptions and pin-outs not listed in this section.

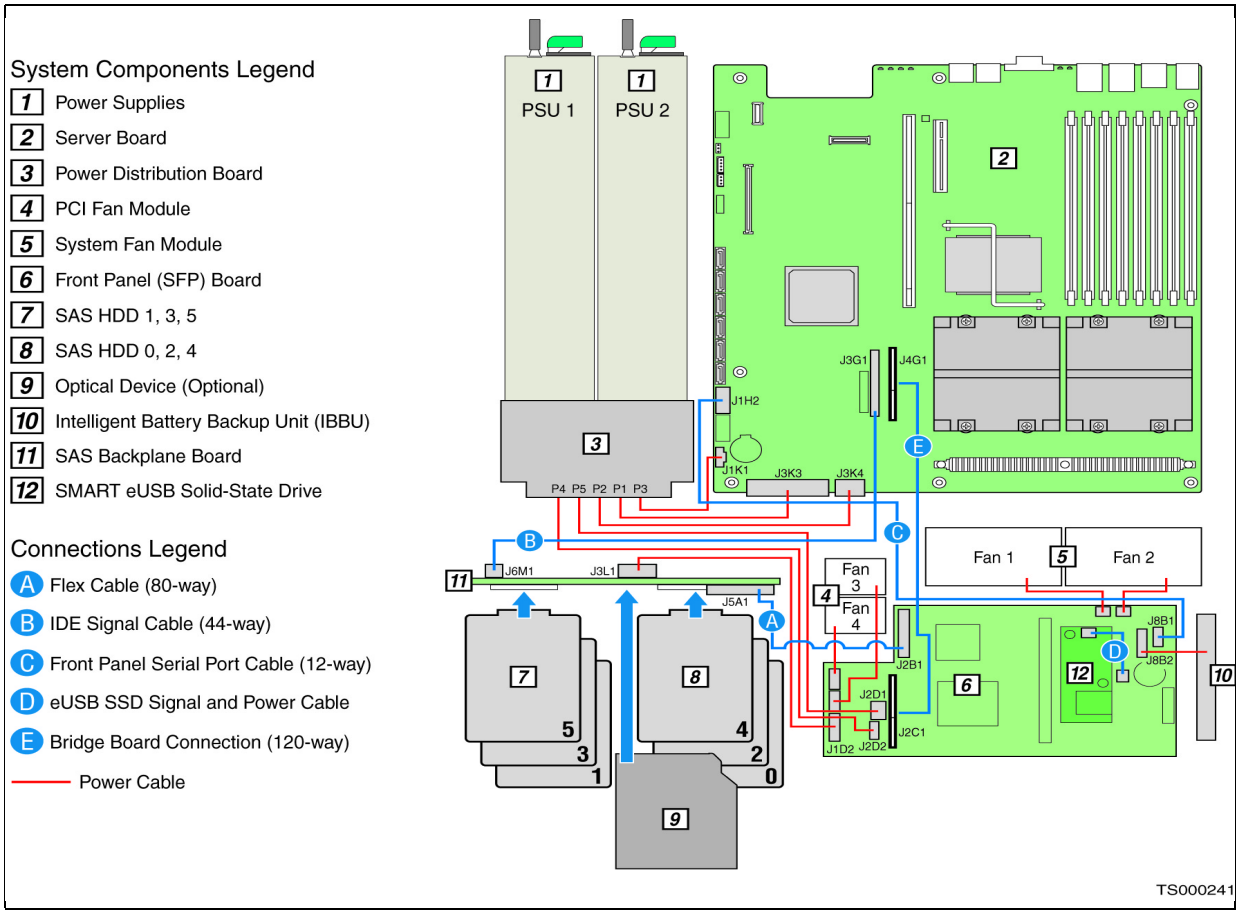
The information contained in this chapter is organized into the following sections:

- System Interconnect Block Diagram
- Cable and System Interconnect Descriptions
- User-Accessible Interconnects

3.1 System Interconnect Block Diagram

Figure 14 is a block diagram showing the interconnection of system components in the IP Network Server NSC2U.

Figure 14. IP Network Server NSC2U System Interconnect Block Diagram



3.2 Cable and System Interconnect Descriptions

The Kontron IP Network Server NSC2U uses the following internal cables:

- Flex Circuit
- IDE Signal Cable
- SAS Backplane Power Cable
- SMART eUSB SDD Board Signal and Power Cable
- SAS RAID Battery Power Cable
- Front Panel Serial Port Cable
- Front NIC 4x Ethernet PCI Card Cable

3.2.1 Flex Circuit

The flex circuit is an impedance-controlled flexible circuit with 80 signal connections that interconnect J5A1 on the SAS backplane and J2B1 on the SFP Board.

Figure 15 shows the flex circuit cable. Table 9 lists the pin-out for the SFP board connector.

Figure 15. Flex Circuit Cable

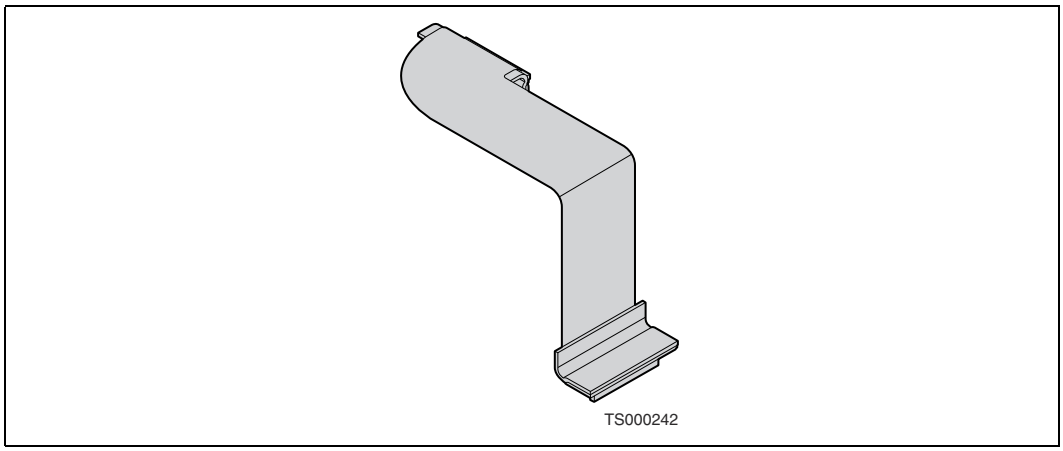


Table 9. Front Panel Flex Connector Pin-Out (Sheet 1 of 2)

Pin #	Front Panel Signal	Pin #	Front Panel Signal
1	FP_FLEX _PRES1	2	SMB_SAS_3V3_SCL
3	IPMB_I2C_SCL	4	SMB_SAS_3V3_SDA
5	IPMB_I2C_SDA	6	NC_FLEX_CONN_6
7	NC_FLEX_CONN_7	8	SGPIO_CLOCK_R
9	GROUND	10	SGPOI_LOAD_R
11	NC_SAS7_C_TX_N	12	GROUND
13	NC_SAS7_C_TX_P	14	GROUND
15	GROUND	16	NC_SAS7_C_RX_N
17	GROUND	18	NC_SAS7_C_RX_P
19	NC_SAS6_C_TX_P	20	SGPIO_DATAOUT0_R
21	NC_SAS6_C_TX_N	22	GROUND
23	GROUND	24	NC_SAS6_C_RX_N
25	GROUND	26	NC_SAS6_C_RX_P
27	SAS5_C_TX_N	28	SGPIO_DATAOUT1_R
29	SAS5_C_TX_P	30	GROUND
31	GROUND	32	SAS5_C_RX_N
33	GROUND	34	SAS5_C_RX_P
35	SAS4_C_TX_P	36	NC_FP_PWR_ENABLE
37	SAS4_C_TX_N	38	GROUND
39	GROUND	40	SAS4_C_RX_P

Table 9. Front Panel Flex Connector Pin-Out (Sheet 2 of 2)

Pin #	Front Panel Signal	Pin #	Front Panel Signal
41	GROUND	42	SAS4_C_RX_N
43	SAS3_C_TX_N	44	GROUND
45	SAS3_C_TX_P	46	GROUND
47	GROUND	48	SAS3_C_RX_N
49	GROUND	50	SAS3_C_RX_P
51	SAS2_C_TX_N	52	GROUND
53	SAS2_C_TX_P	54	GROUND
55	GROUND	56	SAS2_C_RX_N
57	GROUND	58	SAS2_C_RX_P
59	SAS1_C_TX_N	60	LED_HDD_ACT_R_L
61	SAS1_C_TX_P	62	GROUND
63	GROUND	64	SAS1_C_RX_N
65	GROUND	66	SAS1_C_RX_P
67	SAS0_C_TX_P	68	LED_HDD_FLT_R_L
69	SAS0_C_TX_N	70	GROUND
71	GROUND	72	SAS0_C_RX_N
73	NC_FLEX_CONN_73	74	SAS0_C_RX_P
75	NC_DIFF2_P	76	GROUND
77	NC_DIFF2_N	78	NC_FLEX_CONN_78
79	GROUND	80	FP_FLEX_PRES1

3.2.2 IDE Signal Cable

The IDE Signal cable is a standard 2×22 position, 0.05 inch centers, 28 AWG ribbon cable that interconnects J3G1 on the Intel® Server Board T5000PAL and J6M1 on the SAS Backplane for use by the optical device (optional).

Figure 16 illustrates the physical details of the cable assembly, with all dimensions in inches. Table 10 lists the pin-out for J3G1 connector on the server board.

Figure 16. IDE Signal Cable Physical Details

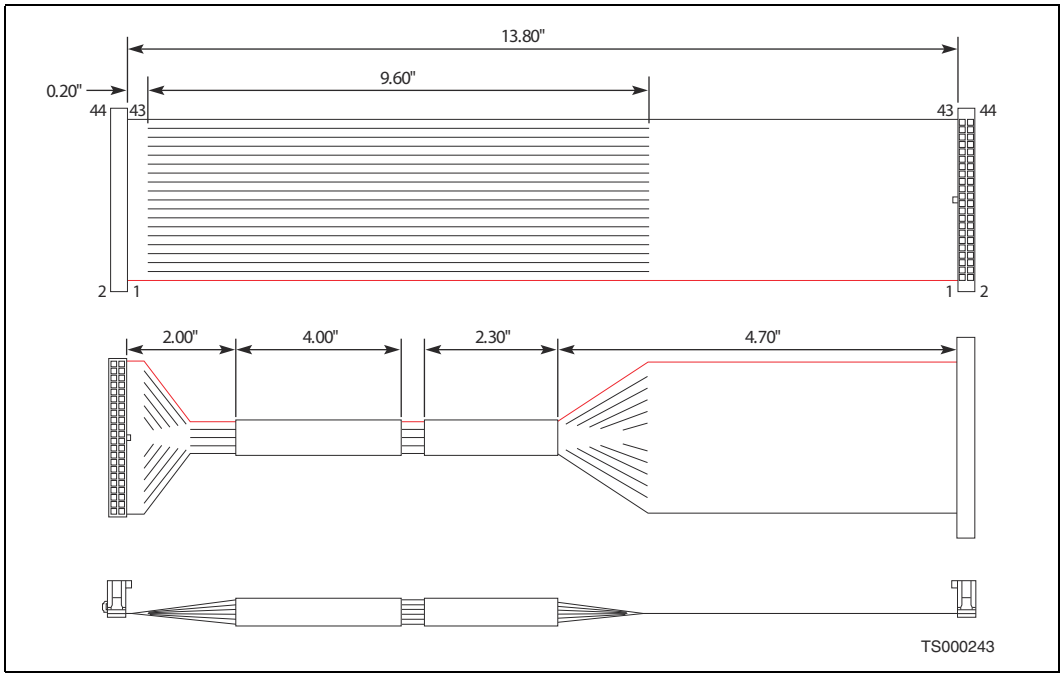


Table 10. IDE Signal Cable Connector J3G1 Pin-out

Pin #	Signal Name	Pin #	Signal Name
1	RST_IDE_L	2	GROUND
3	RIDE_DD <15..0> 7	4	RIDE_DD <15..0> 8
5	RIDE_DD <15..0> 6	6	RIDE_DD <15..0> 9
7	RIDE_DD <15..0> 5	8	RIDE_DD <15..0> 10
9	RIDE_DD <15..0> 4	10	RIDE_DD <15..0> 11
11	RIDE_DD <15..0> 3	12	RIDE_DD <15..0> 12
13	RIDE_DD <15..0> 2	14	RIDE_DD <15..0> 13
15	RIDE_DD <15..0> 1	16	RIDE_DD <15..0> 14
17	RIDE_DD <15..0> 0	18	RIDE_DD <15..0> 15
19	GROUND	20	NC
21	RIDE_DDREQ	22	GROUND
23	RIDE_DIOW_N	24	GROUND
25	RIDE_DIOR_N	26	GROUND
27	RIDE_DIORDY	28	IDE_CSEL
29	RIDE_DDACK_N	30	GROUND
31	IRQ_IDE	32	RIDE_P32
32	RIDE_P32	32	RIDE_P32
33	RIDE_DA1	34	IDE_PRI_CBLSNS
35	RIDE_DA0	36	RIDE_DA2

Table 10. IDE Signal Cable Connector J3G1 Pin-out (Continued)

Pin #	Signal Name	Pin #	Signal Name
37	RIDE_DCS1_N	38	RIDE_DCS3_N
39	LED_IDE_L	40	GROUND
41	NC_44P_IDE_P41	42	NC_44P_IDE_P42
43	NC_44P_IDE_P43	44	NC_44P_IDE_P44

3.2.3 SAS Backplane Power Cable

The SAS Backplane power cable is a 2x6 20 AWG conductor discrete wire harness that interconnect J3L1 on the SAS Backplane and J1D2 on the SFP Board.

Figure 17 shows the SAS Backplane power cable (all dimensions are in inches). Table 11 gives the connector pin-out.

Figure 17. SAS Backplane Power Cable

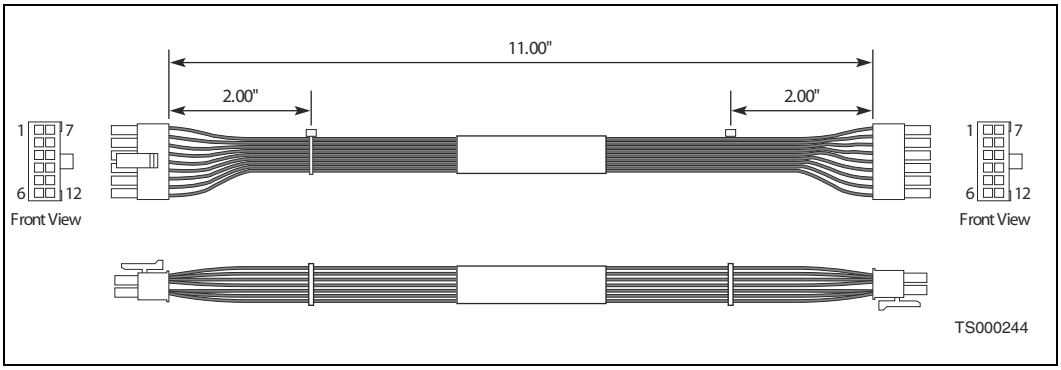


Table 11. SAS Backplane Power Cable Connections

Pin #	Signal	Wire Number	Pin #	Signal	Wire Number
1	PV5	1	7	P5V	2
2	PV5	3	8	P5V	4
3	P12V	5	9	P3V3	6
4	P12V	7	10	GND	8
5	GND	9	11	GND	10
6	GND	11	12	GND	12

3.2.4 SMART eUSB SDD Board Signal and Power Cable

The optional SMART eUSB SDD board connects to the SFP board with a single signal and power cable to the interposer board. The physical details of this cable are shown in Figure 18 (all dimensions in inches), and the pin-out of the connectors is given in Table 12.

Figure 18. Interposer Board Signal and Power Cable Physical Details

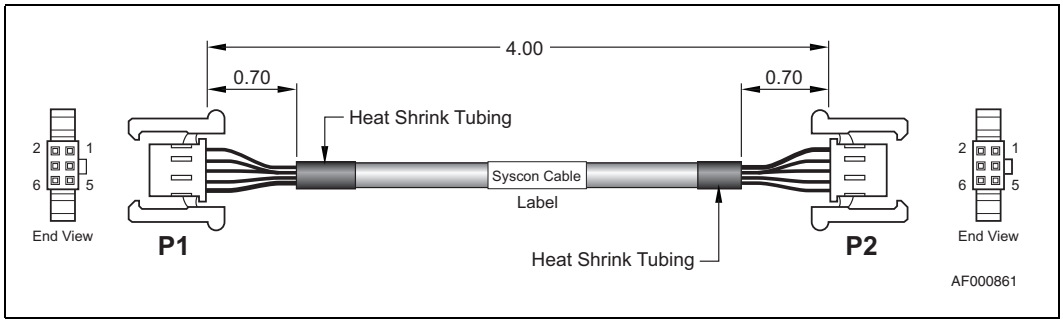


Table 12. 2X3 Connector Pin-Out

Pin #	Signal
1	GND
2	Keyed (no connect)
3	SYSCON_USB_P
4	SYSCON_PWR
5	SYSCON_USB_N
6	GND

3.2.5 SAS RAID Battery Power Cable

The SAS RAID battery power cable connects J8B2 on the SFP board to the corresponding connector on the Intelligent Battery Backup Unit (IBBU).

Figure 19 shows the SAS RAID battery power cable (all dimensions are given in inches). Table 13 gives the connection for the 1x20 connector (P2).

Figure 19. SAS RAID Battery Power Cable Physical Details

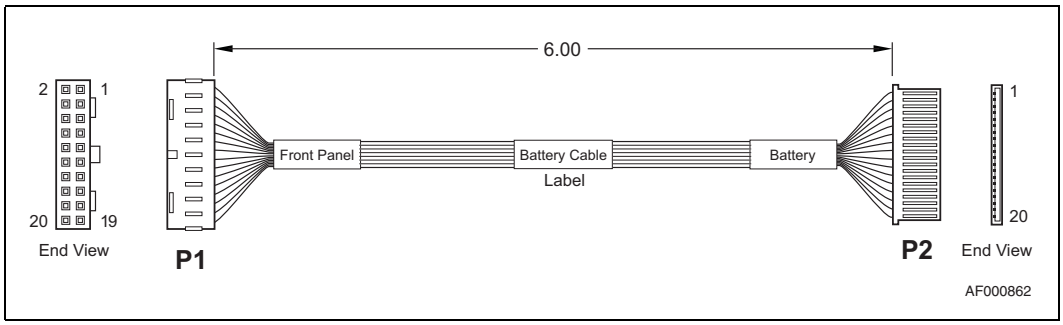


Table 13. Battery Backup Unit Power Cable Connector

Pin #	Signal Name
1	12V
3	NC
2	GND
4	GND
5	VBAT_RAID
6	GND
7	3.3V
8	GND
9	VBAT_RAID
10	GND
11	RESET_N
12	GND
13	SCK
14	GND
15	SDA
16	PFAIL_N
17	DDR_SEL
18	BBE
19	BBSTROBE
20	STATUS

3.2.6 Front Panel Serial Port Cable

The front panel serial port cable connects J1H2 on the Intel® Server Board T5000PAL to J8B1 on the SFP board.

Figure 20 shows the front panel serial port cable, with all dimensions in inches. Table 14 gives the cable connector pin-out.

Figure 20. Front-Panel Serial Port Cable Physical Details

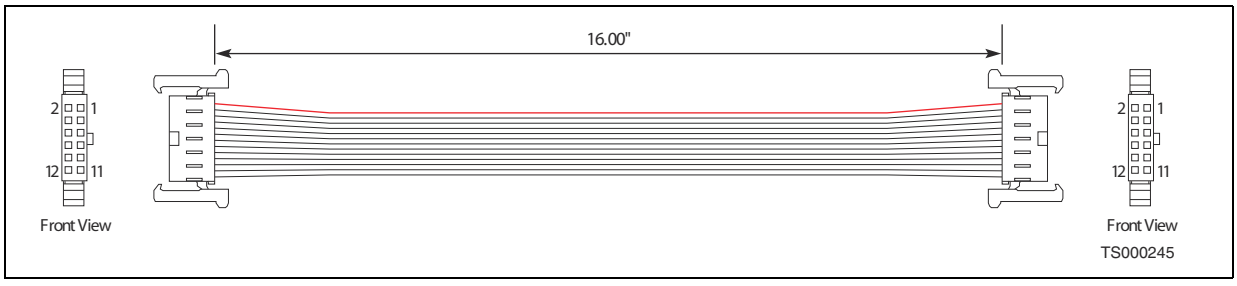


Table 14. Front Panel Serial Cable Connections

Pin #	Signal Name	Pin #	Signal Name
1	EMP_DCD_L	2	EMP_DSR_N
3	EMP_SIN	4	EMP_RTS_N
5	EMP_SOUT	6	EMP_CTS_N
7	EMP_DTR_N	8	NC_EMP_RI_N
9	EMP_INUSE_L	10	NC_5V_STBY
11	GND	12	NC (key)

3.2.7 Front NIC 4x Ethernet PCI Card Cable

This cable routes the four Ethernet ports on the optional Intel® PRO/1000 AT Quad Port Bypass Adapter to the front panel. The cable consists of four port cables and a LED cable as shown in Figure 21. The RJ45 connectors corresponding to each port are color coded as indicated in Table 15. The LED cable pin-out is given in Table 16.

Note: The maximum length of Ethernet cable runs that connect to front panel 4x GbE NIC ports is 50m.

Figure 21. Front NIC 4x Ethernet PCI Card Cable Physical Details

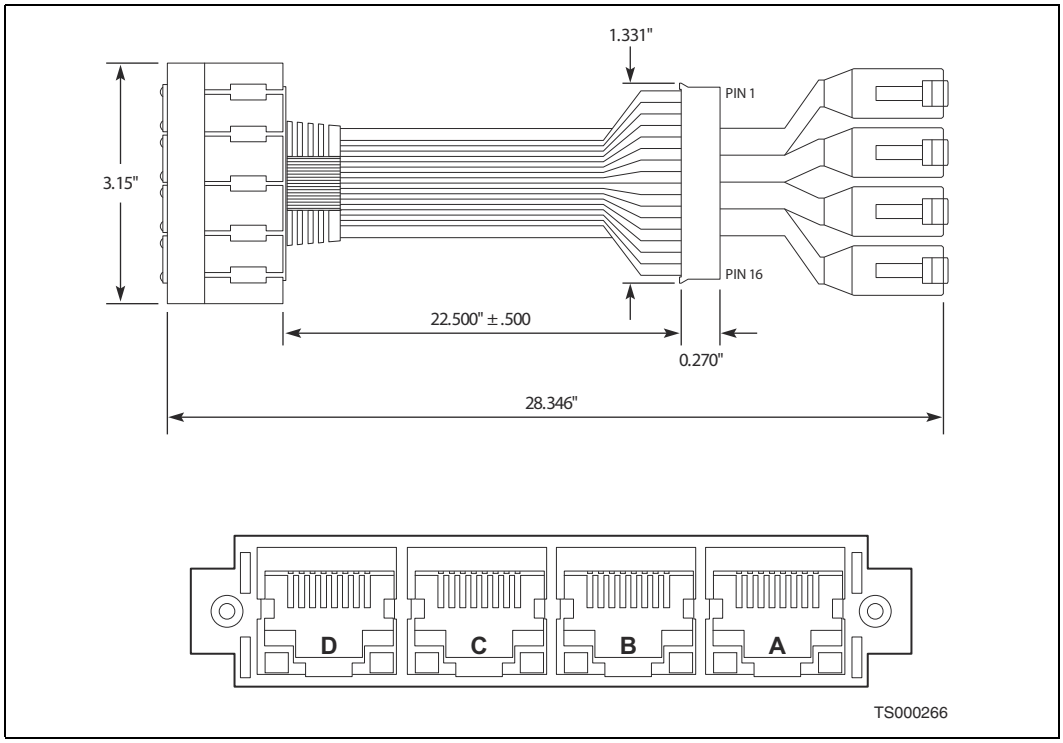


Table 15. Front NIC 4x Ethernet PCI Card Cable Port Connectors

Port	Connector Color
A	Red
B	White
C	Blue
D	Yellow

Table 16. Front NIC 4x Ethernet PCI Card Cable LED Cable Connector Pin-Out

Pin #	Port LED Signal
1	Port A bi-color LED, green + / orange –
2	Port A bi-color LED, green – / orange +
3	Port A green LED +
4	Port A green LED –
5	Port B bi-color LED, green + / orange –
6	Port B bi-color LED, green – / orange +
7	Port B green LED +
8	Port B green LED –
9	Port C bi-color LED, green + / orange –
10	Port C bi-color LED, green – / orange +
11	Port C green LED +
12	Port C green LED –
13	Port D bi-color LED, green + / orange –
14	Port D bi-color LED, green – / orange +
15	Port D green LED +
16	Port D green LED –

3.3 User-Accessible Interconnects

3.3.1 Keyboard and Mouse Ports

Two stacked PS/2 ports are provided to support both a keyboard and a mouse. Each port can support either a mouse or keyboard. Table 17 details the pin-out of the PS/2 connector.

Figure 22. Keyboard and Mouse Connectors

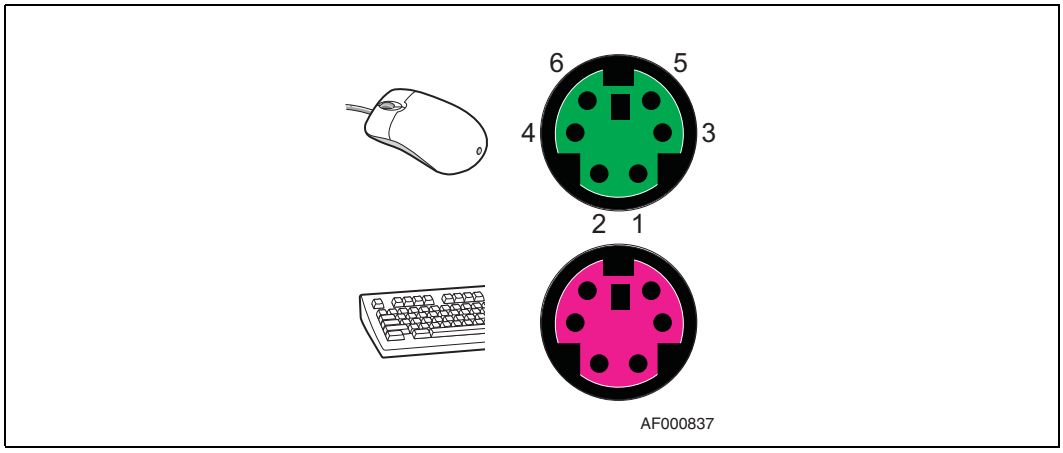


Table 17. Keyboard and Mouse Port Pin-Out

Pin #	Signal
1	KEYDAT (keyboard data)
2	MSEDAT (mouse data)
3	GND (ground)
4	Fused Vcc (+5V)
5	KEYCLK (keyboard clock)
6	MSECLK (mouse clock)

3.3.2 Serial Port B

Two serial port connectors are provided, one on the front panel and one at the rear I/O, both using 8-pin RJ45 connectors. Both the front and rear serial port connectors connect to COM2. The user may connect to either the front or the rear serial port connector, but never to both. Figure 23 shows the serial port connector. Table 18 gives the pinout for the rear panel port and Table 19 gives the pinout of the front panel port.

An RJ45 connector is used to allow convenient connection to serial port concentrators, which typically use RJ45 connectors. For applications that require a DB-9 serial port connection, an adapter cable must be used.

Note that the connector pin-out differs slightly between the front-panel and rear-panel connectors, specifically in relation to Pin 6 and Pin 7.

On the front-panel serial port connector, Pin 6 is used as a serial port selection input. Grounding the EMP_INUSE_L signal that appears on Pin 6 disables the rear-panel serial port connection so that only the front-panel connection is active. This feature allows users to plug into and use the front-panel connector without regard for whether anything is connected to the rear-panel connector.

On the rear-panel serial port connector, Pin 7 can be configured by means of a jumper on the server board to carry either the DSR (Data Set Ready) signal or the DCD (Data Carrier Detect) signal as required by a particular serial port concentrator. (The front-panel serial port connector always carries the DSR signal on Pin 7.) The default jumper

configuration selects the DSR signal, which conforms to the Cisco* serial port standard. Refer to the *Intel® Server Board S5000PAL Technical Product Specification* for details about this jumper or if you need to change the DSR/DCD configuration.

Figure 23. Serial Port Connector

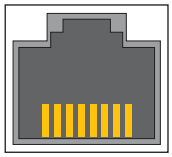


Table 18. Rear Panel Serial Port (RJ45) Connector Pinout

Pin #	Signal	Description
1	RTS	Request To Send
2	DTR	Data Terminal Ready
3	TXD	Transmit Data
4	GND	
5	RI	Ring Indicator
6	RXD	Receive Data
7†	DSR or DCD	Data Set Ready or Data Carrier Detect
8	CTS	Clear to Send
Note:	† A jumper block on the server board determines whether DSR or DCD is routed to pin 7. The server board has the jumper block preconfigured with DSR enabled.	

The front panel board includes an RJ45 connector, which is the COM2 port. This RJ45 connector is accessible from behind the front bezel.

Table 19. Front Panel Serial Port (RJ45) Connector Pinout

Pin #	Signal	Description
1	RTS	Request To Send
2	DTR	Data Terminal Ready
3	TXD	Transmit Data
4	GND	Ground
5	In Use	When grounded, indicates that the COM2 port is routed to the front panel RJ45 connector.
6	RXD	Receive Data
7	DSR	Data Set Ready
8	CTS	Clear to Send

3.3.3 Video Port

The video port interface is a standard VGA-compatible, 15-pin connector. On-board video is supplied by an ATI Rage XL video controller with 16 Mbytes of on-board video SGRAM. Figure 24 shows the video connector and Table 20 gives the pinout.

Figure 24. Video Connector

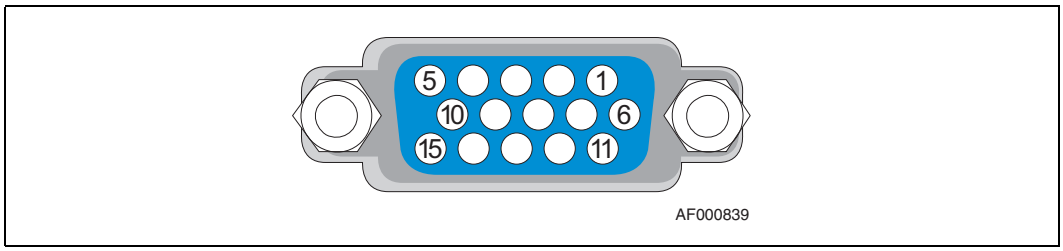


Table 20. Video Connector Pin-Out

Pin #	Signal
1	Red (analog color signal R)
2	Green (analog color signal G)
3	Blue (analog color signal B)
4	No connection
5	GND
6	GND
7	GND
8	GND
9	Fused Vcc (+5V)
10	GND
11	No connection
12	DDCDAT
13	HSYNC (horizontal sync)
14	VSYNC (vertical sync)
15	DDCCLK

3.3.4 Universal Serial Bus (USB) Interface

The Intel® Server Board T5000PAL provides USB port support. USB ports 0 and 1 are brought out at the rear of the unit on the server board, and USB ports 2 and 3 are routed to the SFP board. USB port 2 is brought to the front of the system and is accessible when the front bezel is removed. USB port 3 is used internally.

The built-in USB ports permit direct connection of up to three USB peripherals without the need for an external hub. If more devices are required, an external hub can be connected to any of the built-in ports. Figure 25 shows an external USB connector and Table 21 gives the pinout.

Figure 25. External USB Connector

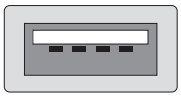


Table 21. USB Connector Pin-Out

Pin #	Signal
1	Fused Vcc (+5V w/over-current monitor of ports 0, 1, 2, and 3)
2	DATAL0 (differential data line paired with DATAH0)
3	DATAH0 (differential data line paired with DATAL0)
4	GND

3.3.5 Ethernet Connectors

The Intel® Server Board T5000PAL provides two NIC RJ45 connectors oriented side by side on the back edge of the board and accessible at the rear I/O panel. Figure 26 shows the Ethernet connector and Table 22 gives the pinout, which is identical for each connector.

For each Ethernet connector there are two status indicator LEDs integrated in the same assembly as the connector itself, a green LED to the left of the connector and a bi-color LED to the right of the connector.

The green LED indicates the connection status for each port. If the port is connected to a network but there is no current activity, the green LED is continuously illuminated. When there is activity on the connected network the green LED blinks.

The bi-color LED indicates the connection speed of the network connection. If the bi-color LED is not lit but the green LED is either lit or blinking, the port's connection speed is 10 Mbps. If the bi-color LED shows a solid green indication, the port's connection speed is 100 Mbps. If the bi-color LED shows a solid amber indication, the port's connection speed is 1 Gbps.

Figure 26. Ethernet Connectors

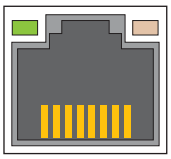


Table 22. Ethernet Connector Pin-Out

Pin #	Signal Name	Description
1	BI_DA+	Bi-directional pair A, +
2	BI_DA–	Bi-directional pair A, –
3	BI_DB+	Bi-directional pair B, +
4	BI_DC+	Bi-directional pair C, +
5	BI_DC–	Bi-directional pair C, –
6	BI_DB–	Bi-directional pair B, –
7	BI_DD+	Bi-directional pair D, +
8	BI_DD–	Bi-directional pair D, –

3.3.6 External Front Panel 4X GbE NIC Connectors

Up to two optional Intel® PRO/1000 AT Quad Port Bypass Adapters (PCI add-in cards) can be installed in the IP Network Server NSC2U. A cable assembly routes the four Ethernet ports to a connector that attaches to the front panel. Figure 21, "Front NIC 4x Ethernet PCI Card Cable Physical Details" on page 34 shows the front panel Ethernet connectors.

Note: The maximum length of Ethernet cable runs that connect to front panel 4x GbE NIC ports is 50m.

3.3.7 External SAS 4X Hard Disk Drive Connector

The IP Network Server NSC2U provides an external SAS 4X hard drive connector. The SAS 4X external connector is illustrated in Figure 27, and the pin-out for the connector is shown in Table 23.

Figure 27. External SAS 4X Hard Disk Drive Connector

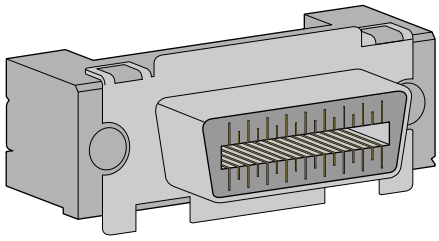


Table 23. External SAS 4X Hard Disk Drive Connector Pin-Out

Pin	Signal	Pin	Signal
S1	SAS_RX4_P	S2	SAS_RX4_N
S3	SAS_RX5_P	S4	SAS_RX5_N
S5	SAS_RX6_P	S6	SAS_RX6_N
S7	SAS_RX7_P	S8	SAS_RX7_N
S9	SAS_TX7_N	S10	SAS_TX7_P

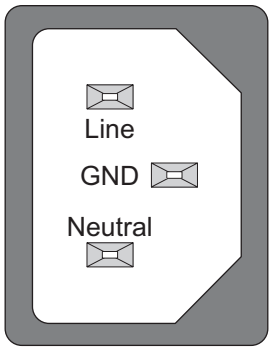
Table 23. External SAS 4X Hard Disk Drive Connector Pin-Out (Continued)

Pin	Signal	Pin	Signal
S11	SAS_TX6_N	S12	SAS_TX6_P
S13	SAS_TX5_N	S14	SAS_TX5_P
S15	SAS_TX4_N	S16	SAS_TX4_P
G1	GND	G2	GND
G3	GND	G4	GND
G5	GND	G6	GND
G7	GND	G8	GND
G9	GND		

3.3.8 AC Power Input for AC-Input Power Supply

A single IEC320-C13 receptacle is provided at the rear of each AC-input power module installed in the system. The use of an appropriately sized power cord and AC main is recommended. See Chapter 7, "Power Subsystem", for system voltage, frequency, and current draw specifications.

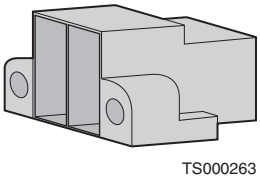
Figure 28. AC Power Input Connector



3.3.9 DC Power Input for DC-Input Power Supply

A pluggable DC power terminal block is used to provide the DC-input power connection to each of the DC-input power supply modules that are configured in the DC power supply cage. It is recommended to use appropriately sized power wire and DC main.See Chapter 7, "Power Subsystem" for system DC voltage and current draw specifications.

Figure 29. DC Power Input Connector



4 SAS Front Panel (SFP) Board

This chapter describes the basic functions and interface requirements of the SAS Front Panel (SFP) system board designed for the Kontron IP Network Server NSC2U.

This chapter is organized in the following sections:

4.1 Features

SFP Board features include:

- four switches to control power-on, reset, NMI, and the system ID
- one system status LED that indicates the presence of DC power in the system
- two system activity LEDs that indicate power-on and NIC activity
- one dual-color, hard drive LED that indicates activity/fault status for all internal SAS drives
- one system ID LED that can be controlled remotely or by the system ID switch
- one RS-232 front panel port
- one USB2.0 front panel port
- one USB2.0 interface to the eUSB SSD board, which provides local memory storage
- a single flex cable connection to the SAS backplane to support the interface to six independent 2.5-inch SAS hard drives
- a socket for a hardware RAID key, required to enable hardware RAID
- a socket for a DDR2 mini-DIMM that provides data caching for hardware RAID

- a connector for the Intelligent Battery Backup Unit (IBBU) that allows the contents of the DDR2 mini-DIMM to be preserved if power falls below specifications.
- four fan connectors to provide power, control, and monitoring for the four cooling fans
- four fan fault LEDs (not visible on front panel; for diagnostics purposes only)

4.2 Overview

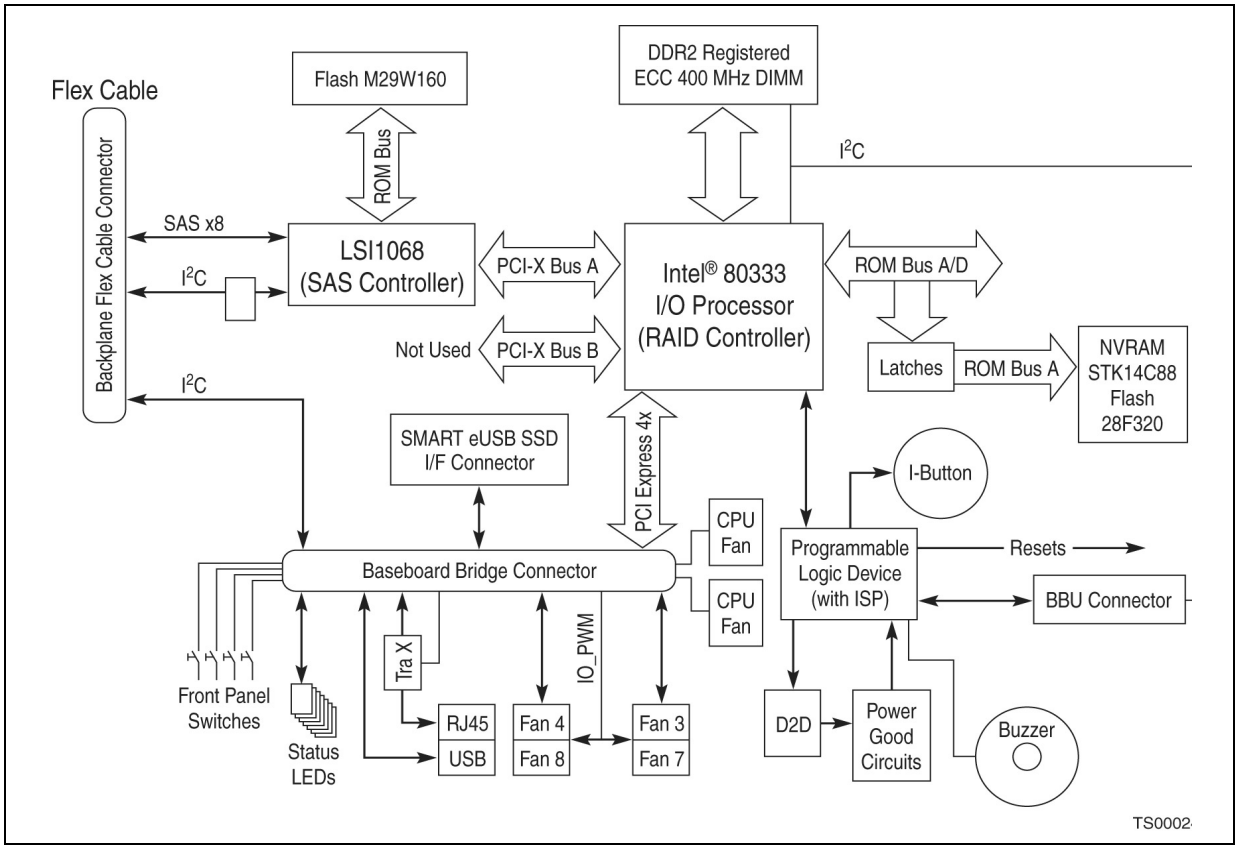
The SAS Front Panel (SFP) provides SAS support for the Kontron IP Network Server NSC2U host system. The SFP board adds SAS support to the host system and provides support for hardware RAID 0/1/10/5 and software RAID 0/1/10.

The NSC2U Server SFP provides the following main categories of functions for the system:

- Cascaded Power Conversion
  - +12V to +1.8V
  - +12V to +1.5V
  - +1.8V to +1.2V
  - +3.3V to +1.35V
  - 5V_stby to 3.3V_stby
  - 5V_stby to VbatRaid
  - +1.8V to VbatRaid
- Six SAS ports (to SAS Backplane)
  - 3.0 Gbps link rate
  - 1.5 Gbps link rate
- RAID 0/1/10 support
  - LSI Logic* LSISAS1068, which provides RAID 0/1/10
- RAID 5 support
  - hardware support via the Intel® 80333 I/O processor device
  - Intelligent Battery Back-up Unit (IBBU) connector; provides power for DIMM in the case of power failure
  - hardware RAID key socket; a hardware RAID key is required to enabling RAID 5 support
  - DDR2 SDRAM DIMM socket; supports up to 1 Gbyte memory modules
- Buzzer
  - audible indication of drive failure

Figure 30 presents the functional block diagram of the SAS Front Panel board.

Figure 30. SAS Front Panel Board Functional Block Diagram



4.3 Component Location

Figure 31 shows the placement of the major components and connectors on the SFP board. Figure 32 show the locations of front panel LED indicators, switches and connectors.

Figure 31. SFP Board Component Locations

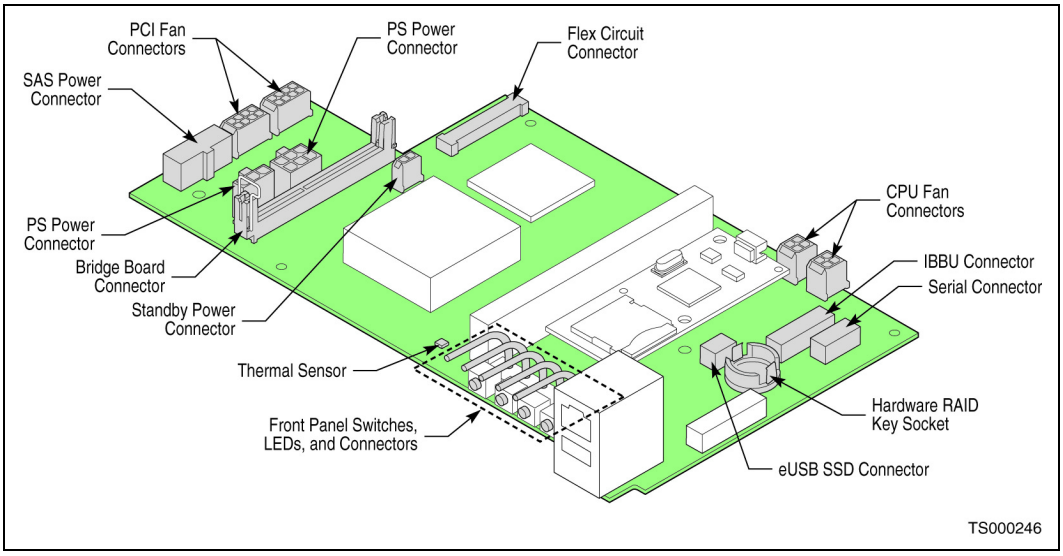
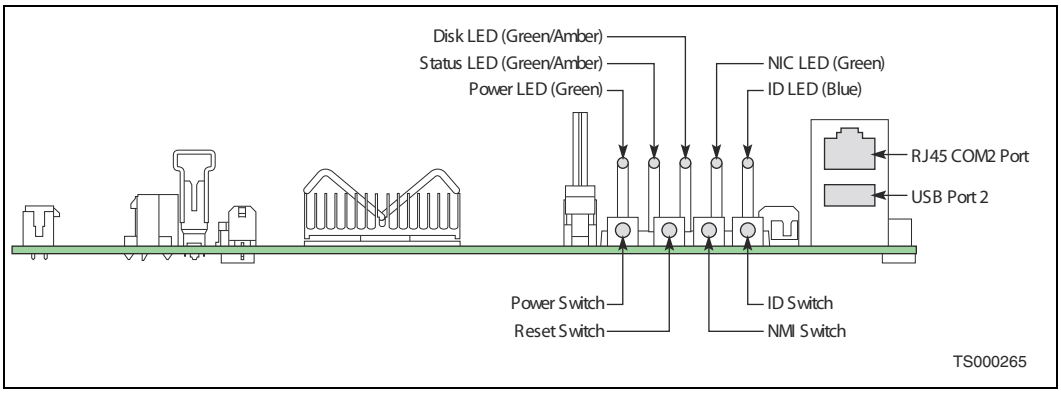


Figure 32. SFP Board LED Indicators, Switches and Front Panel Connectors



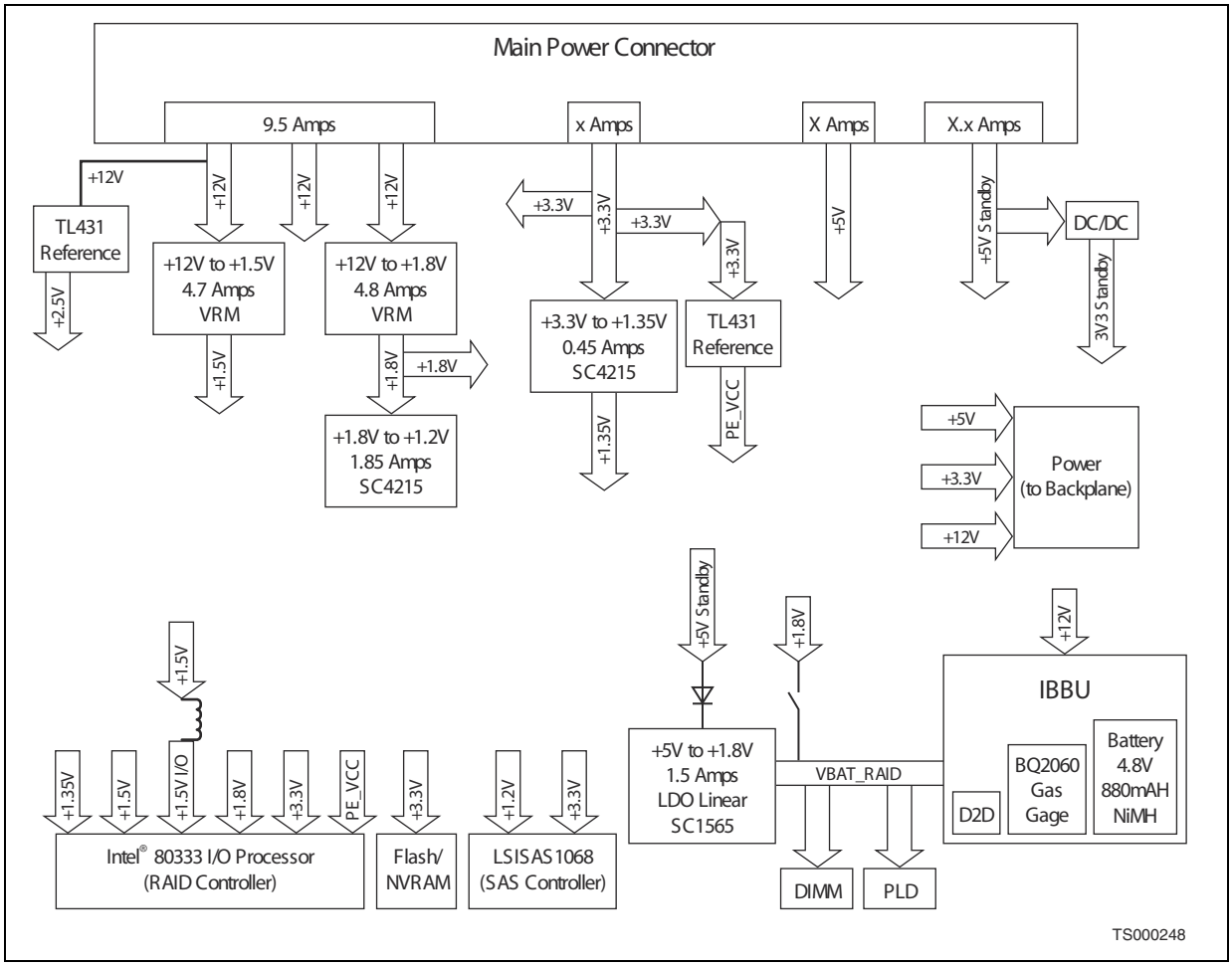
4.4 Power Distribution

This section details the SFP power distribution. This consists of power provided by the Power Distribution Board (PDB) and the D2D and linear on-board regulators:

- the +12V board input is cascaded to +1.8V, +1.5V, +1.35V, +1.2V and passed through to the backplane.
- the +3.3V board input is converted to +1.35V and passed through to the backplane.
- the +5V_Standby board input is converted to +3V_Standby and VBAT_RAID (1.8V_Standby).
- the +5V board input is passed through to the backplane.

Figure 33 shows the power conversion and distribution functions.

Figure 33. SFP Board Power Conversion



4.4.1 Battery Backup Power Control

The battery backup power controller determines the appropriate source for the VBAT_RAID power rail from several possible sources, and activates that source according to the following rules:

- During normal operation, the 1.8V power rail supplies VBAT_RAID.
- If main system power is turned off and standby power is available, the 5V to 1.8V linear regulator supplies VBAT_RAID.
- If all system power fails and the DDR DIMM has critical data stored, the Intelligent Battery Backup Unit (IBBU) supplies VBAT_RAID.

4.4.2 12V to 1.8V VRM

The 12V to 1.8V VRM converts the +12V supply to +1.8V. The generated +1.8V is used by the Intel® 80333 I/O processor, LSISAS1068, DDR2, and PLD.

- output rated at +1.8V ±2% at a maximum of 6A continuous
- over current protection

- voltage regulation starts when the input voltage exceeds ~7.9V
- DOSA standard footprint
- D2D can be inhibited with the ENABLE_P1V8_N signal (controlled by the PLD)

4.4.3 12V to 1.5V VRM

The 12V to 1.5V VRM converts the +12V supply to +1.5V. The generated +1.5V is used by the Intel® 80333 I/O processor.

- output rated at +1.5V ±2% at a maximum of 6A continuous
- over current protection
- voltage regulation starts when the input voltage exceeds ~7.9V
- DOSA standard footprint
- D2D can be inhibited with the ENABLE_P1V5_N signal (controlled by the PLD)

4.4.4 3.3V to 1.35V DC-to-DC Linear Converter

The 3.3V to 1.35V D2D converts the +3.3V supply to +1.35V. The generated +1.35V is used by the Intel® 80333 I/O processor.

- output rated at +1.35V ±2% at a maximum of 3A continuous
- over current and over temperature protection
- D2D can be inhibited with the P1V35_ENABLE_N signal (controlled by the PLD)

4.4.5 1.8V to 1.2V DC-to-DC Linear Converter

The 1.8V to 1.2V D2D converts the +1.8V supply to +1.2V. The generated +1.35V is used by the LSISAS1068.

- output rated at +1.2V ±2% at a maximum of 3A continuous
- over current and over temperature protection
- D2D can be inhibited with the P1V2_ENABLE_N signal (controlled by the PLD)

4.5 I/O Processor Subsystem

This section provides a detailed description of the IP Network Server NSC2U SFP board I/O processor (Intel® 80333 I/O processor) subsystem. The I/O Processor subsystem has two major functions:

- acts as a PCI-X* to PCI Express* bridge
- provides RAID 5 functionality

4.5.1 PCI-X to PCI Express Bridge

The I/O processor acts as PCI-X to PCI Express bridge. This allows the SFP board to attach to the server board's PCI Express interface and use existing PCI-X SAS controllers.

4.5.2 RAID Controller

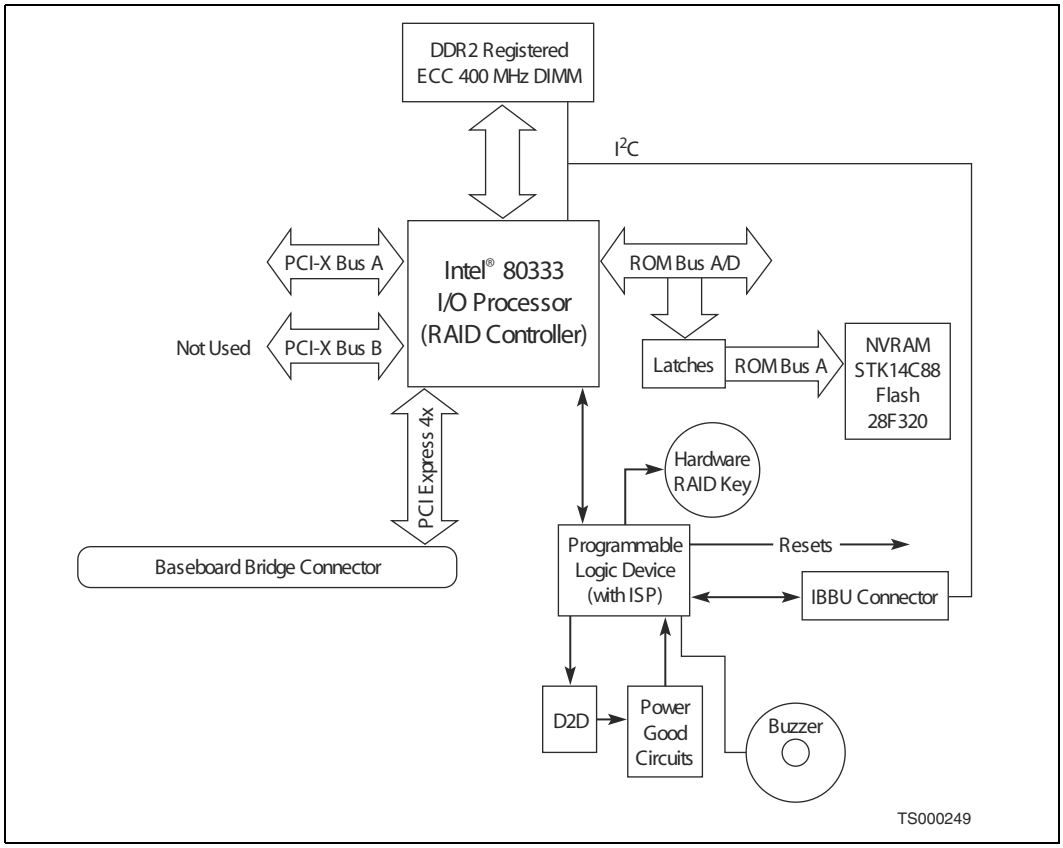
The I/O processor adds hardware RAID capabilities to the IP Network Server NSC2U SFP board.

When in RAID mode, the following parts of the I/O processor subsystem interact:

- DDR2
- Intel® 80333 I/O processor
- flash memory
- hardware RAID key
- PCI-X buses

The following topics describe each part and its role.

Figure 34. I/O Subsystem Block Diagram



4.5.3 I/O Processor

The IP Network Server NSC2U SFP architecture is based around the Intel® 80333 I/O processor. The 500 MHz core of the 80333 processor controls:

- two, 133 MHz, 64-bit, PCI-X buses
- a x8 PCI Express interface
- a ROM bus
- a DDR2, 400 MHz SDRAM bus

The 80333 processor also provides two UARTs, I^2C bus, and GPIOs.

In PCI-X to PCI Express bridge mode, the 80333 processor is seen by the system as a bridge. This allows the LSISAS1068 to provide SAS support and software RAID support for the system.

In hardware RAID mode, the 80333 processor provides transparent hardware support for RAID 0/1/10/5. The 80333 processor provides virtual disk arrays for the system to use. These disk arrays can be in any of the supported RAID modes. The 80333 processor's DDR2 connector provides flexible cache support. The cache support can speed up transaction timing, depending on the cache configuration. When in RAID mode, the 80333 processor boots from flash memory and loads configuration information from the NVRAM.

4.5.4 Flash Memory

A 32 Mbit flash memory contains the executable code for the 80333 processor and is only used when the 80333 processor is in hardware RAID 5 mode.

4.5.5 NVRAM

The NVRAM is 256 Kbits of accessible static RAM. The NVRAM is used to store the 80333 processor's configuration information and disk drive RAID configuration information.

4.5.6 PCI-X Buses

The PCI-X bus interface is 64 bits and runs at 133 MHz. Only one of the 80333 processor's PCI-X buses is used. The LSISAS1068 is the only device on the 80333 processor's PCI-X bus.

4.5.7 PCI Express Bus

The PCI Express bus interfaces the 80333 processor to the system via the Baseboard Bridge Adapter. The PCI Express bus is a x4 configuration. The 80333 processor also supports x1 and x8 modes.

4.5.8 DDR2 Bus

The 80333 processor's DDR2 bus runs at 400 MHz and supports 256 Mbit, 512 Mbit, and 1 Gbit registered DIMMs. The DDR2 bus is used to provide data caching when the 80333 processor is operating in hardware RAID mode.

4.5.9 Intelligent Battery Backup Unit (IBBU)

The battery backup allows the contents of the DIMM to be preserved if power drops below specifications. The DIMM uses the VBAT_RAID 1.8V supply as supplied by either P1V8, P5_STBY, or the RAID smart battery (battery backup module).

Under normal operation, full power (P1V8) is applied to VBAT_RAID and is converted from 12V to 1.8V by a separate PWM-controlled switching regulator. If this rail drops out, VBAT_RAID is powered from the system power supply standby rail (P3V3_STBY) through a SC1565 LDO regulator. If P3V3_STBY_PWRGD is deasserted, the RAID battery takes over as the VBAT_RAID source (if cache data is present in the DIMM).

When the 80333 processor senses power has dropped below 2.96V (Powergood deasserts) and its POWER_DELAY signal is asserted, it initiates a power fail sequence that safely puts the ROMB DIMM into self-refresh state. The POWER_DELAY circuit generates enough of a delay to allow the 80333 processor to complete its power fail

sequence. After the power fail sequence completes, additional logic (powered by VBAT_RAID) holds the DIMM's clock enable signals low to keep the DIMM in self-refresh mode. Once power is restored, data from the DIMM can be written to the disk array.

4.5.10 GPIOs

The 80333 processor has eight GPIOs that handle various input and output functions. The GPIOs are used to control the IBBU, system indicators, and debug support.

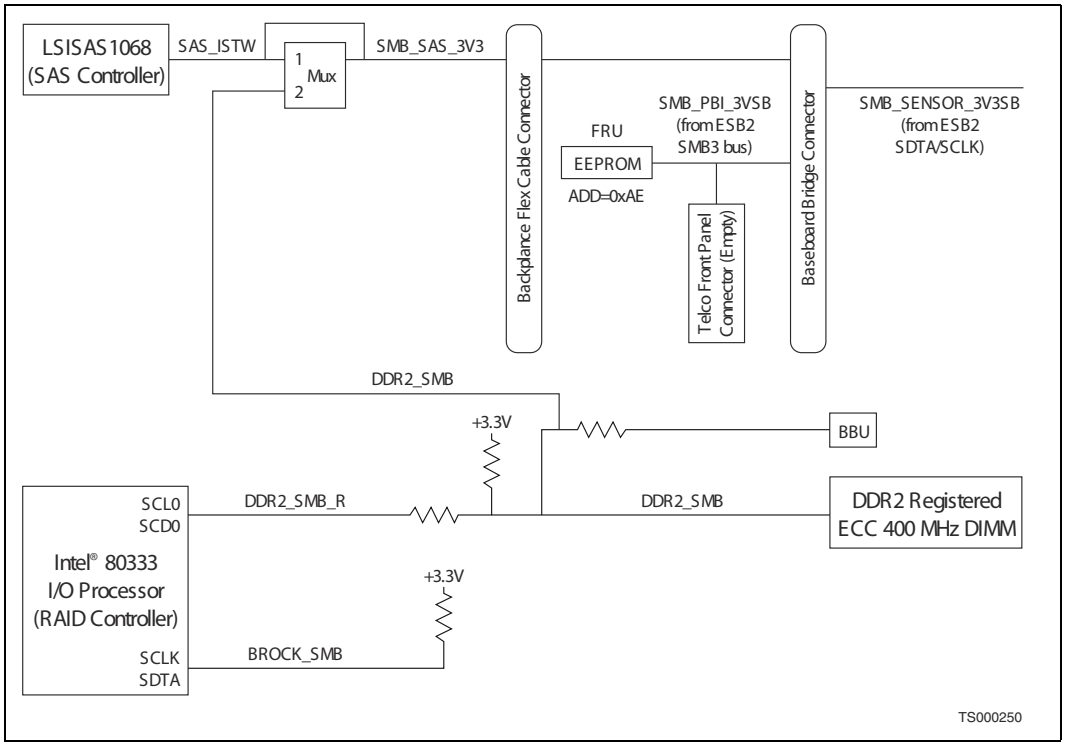
4.5.11 Hardware RAID Key

The hardware RAID key is a preprogrammed serial device used to enable hardware RAID.

4.5.12 I^2C

The 80333 processor's I^2C bus allows the processor to communicate with the system's BMC and the IBBU. The I^2C bus going to the system BMC is isolated when power is not provided to the 80333 processor.

Figure 35. I^2C Circuit

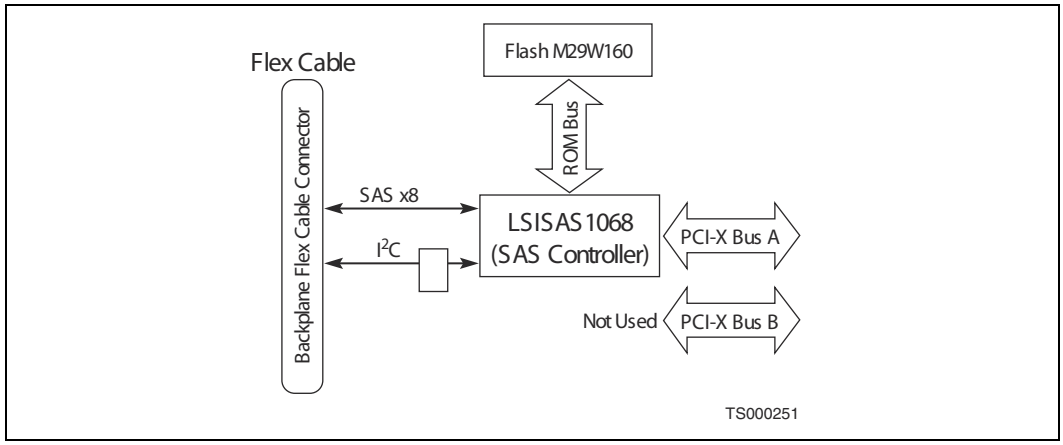


4.6 SAS Controller (LSISAS1068)

The LSISAS1068 is a PCI-X SAS controller. The LSISAS1068 provides eight, 3 Gbps SAS links.

During normal operation, the LSISAS1068 boots from its flash. The LSISAS1068 has an assigned SAS ID on the IP Network Server NSC2U.

Figure 36. LSISAS1068 Circuit



4.6.1 PCI-X Interface

The LSISAS1068 communicates with the 80333 processor over a 133 MHz, 64-bit PCI-X bus.

4.6.2 SAS Interface

The LSISAS1068 Internal SAS interface consists of eight, 3 Gbps links. The SAS interface connects to a system backplane through a flex circuit cable. All supported hardware and software RAID modes are available on the SAS interface.

4.6.3 Flash Memory

A 16-Mbit flash contains the LSISAS1068's executable code. The LSISAS1068 boots from the flash when the IP Network Server NSC2U SFP board is operating in SAS mode.

4.6.4 I^2C

The LSISAS1068's I^2C bus allows the system's BMC to communicate with the LSISAS1068.

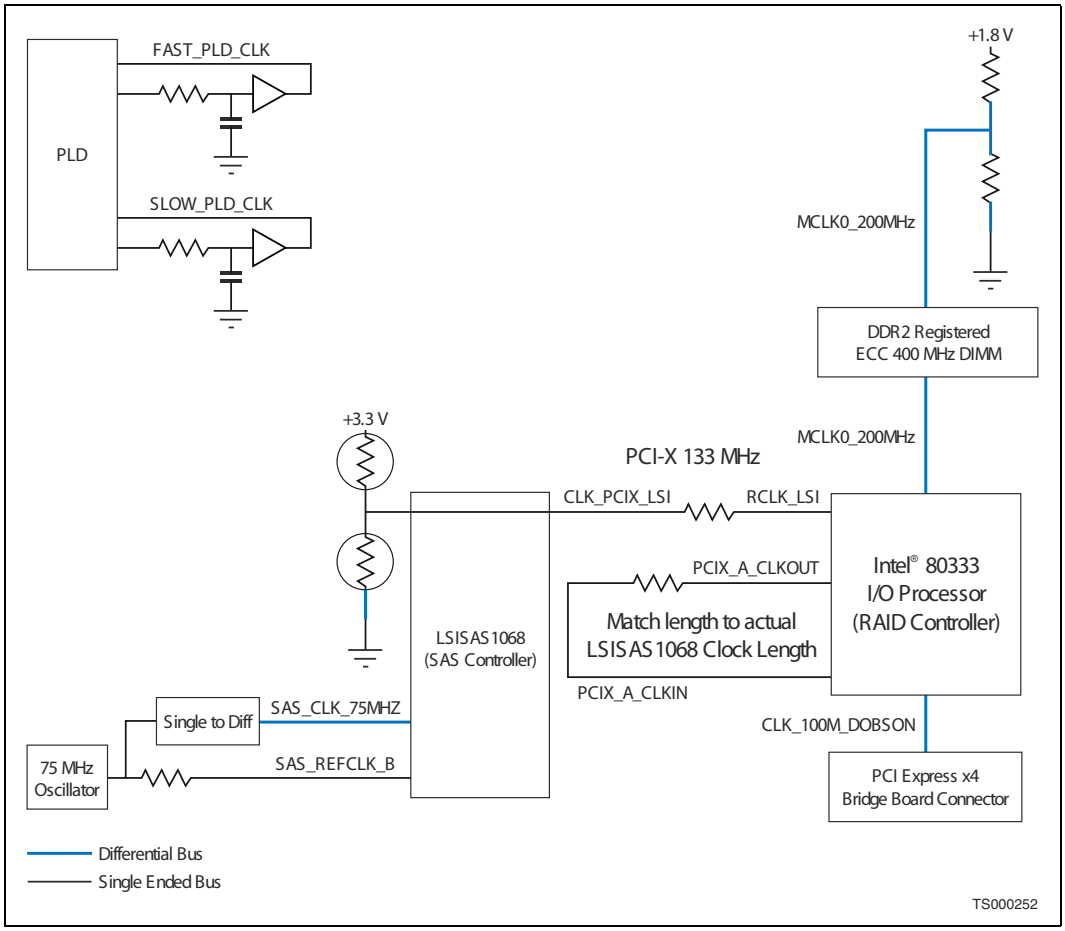
4.6.5 Indicator Buzzer

When the IP Network Server NSC2U SFP board is in RAID mode, the 80333 processor generates a series of beep codes to indicate failure modes. The 80333 processor indicates the buzzer state via a GPIO. The SFP board's PLD takes the GPIO input and creates a 2 kHz square wave to activate the buzzer.

4.7 Clock Generation/Distribution

The SFP board uses several on board clock sources and a system generated 100 MHz clock (PCI express). Figure 37 shows the clock generation and distribution circuit.

Figure 37. SFP Board Clock Generation and Distribution Circuit



4.7.1 75 MHz Sourced Clock

The LSISAS1068 uses a differential 75 MHz clock, sourced from the 75 MHz oscillator.

4.7.2 133 MHz Sourced Clock

The 80333 processor generates a 133 MHz clock for the PCI-X bus. Skew is controlled by the LSISAS1068 via a feedback circuit.

4.7.3 200 MHz Sourced Clock

The 80333 processor generates a 200 MHz clock for the DDR2 interface.

4.7.4 100 MHz Sourced Clock

The server board provides a 100 MHz clock for the 80333 processor.

4.7.5 PLD Sourced Clock

Uses an external RC circuits and Schmitt trigger to generate this clock.

4.8 Programmable Logic Device (PLD)

The PLD on the IP Network Server NSC2U SFP is used for:

- board power/reset control
- board interlock control
- buzzer control
- IBBU control
- various miscellaneous signals

The PLD can only be updated via a header (unpopulated) on the IP Network Server NSC2U SFP board.

4.8.1 Power-on/Reset

A state machine ensures that the voltage sequencing and reset logic comes up as expected.

4.8.2 Buzzer Control

The PLD uses the PLD clock and the AUDIOTRIG signal to generate a 2.4 kHz signal to drive the buzzer. AUDIOTRIG is generated from GPIO3 on the 80333 processor.

4.8.3 IBBU Control

The PLD uses the PLD clock to generate the IBBU control signals, BBE and IBBU_BBSTROBE. These signals are used to notify the IBBU that critical data (dirty) is in the DIMM and that the IBBU will have to supply VBAT_RAID if power were to fail.

4.9 Hardware RAID

The IP Network Server NSC2U SFP supports hardware RAID levels 0/1/10/5. To use hardware RAID, the following conditions are required:

- The hardware RAID key, the RAID mini-DIMM, and the IBBU must be installed.
- The desired RAID level must be selected in the BIOS.

For information on setting up hardware RAID, see the *Intel® Embedded Server RAID Technology II, Intel® Integrated Server RAID, and Intel® RAID Controllers SRCSAS18E and SRCSAS144E Software User's Guide* at http://www.intel.com/support/motherboards/server/sb/CS-022358.htm. This manual is also available on the *Deployment Assistant* CD.

4.9.1 Description

The IP Network Server NSC2U SFP board supports a RAID On MotherBoard (ROMB) solution via the 80333 processor in conjunction with the LSISAS1068 SCSI controller.

To activate this feature, a physical RAID Activation Key is available from Kontron as an option. This key contains a configuration code to unlock specific features to support the LSI Logic MegaRAID* solution.

Support for a DDR-2 DIMM serves as memory for the IOP and as a disk cache to store write data to the drives. If power to the 80333 processor drops below specifications, RAIDsmart battery maintains the contents of the DIMM by keeping the DIMM in self-refresh mode until power is restored. After power is restored, the data can be safely written to drives, maintaining the integrity of the disk array.

4.9.2 DDR-2 Support

The IP Network Server NSC2U SFP board has a single, 244-pin, DDR2 Mini-DIMM slot that can be used to add local memory for the I/O processor. This increases performance by allowing the caching of writes to the disk array. Please check with the current supported memory list. Compatible DIMMS are:

- DDR-2 400 MHz SDRAM only
- registered DIMMs only
- 72-bit ECC DIMMs only (64-bit data bus width and 8-bit ECC)

4.9.3 80333 I/O Processor NVRAM

A 32 Kbyte NVRAM component is connected to the Peripheral Bus Interface (PBI) of the 80333 processor. This NVRAM contains board and disk drive setup configuration data and other system information.

The Server Board Set SE8500HW4 uses a 32 Kbyte (32 K x 8-bit) Simtek* STK14D88 NVRAM component and is powered by the system's main +3.3V rail.

4.9.4 ROMB Battery Backup

The battery backup allows the contents of the DIMM to be preserved if power drops below specifications. See Section 4.5.9, “Intelligent Battery Backup Unit (IBBU)” on page 49 for more information.

4.10 Software RAID

The IP Network Server NSC2U SFP supports software RAID levels 0/1/10. To use software RAID the following conditions are required:

- The hardware RAID key **must not** be installed. The RAID mini-DIMM and the IBBU (which are required for hardware RAID), if installed, do not affect the ability to use software RAID.
- Software RAID must be enabled by setting the “software raid enabled” option in the BIOS.

The “software raid enabled” option sets the RAID_MODE signal necessary to distinguish between straight SAS mode and software RAID mode.

4.10.1 80333 Processor in Software RAID

The 80333 processor serves as a PCI Express* (PCIe*) to PCI-X* bridge supporting transfer rates of up to 3 Gbytes/sec. It is connected to the baseboard’s x4 PCI Express link and includes fully functional RAID support. However, the 80333 processor serves as a bridge only in software RAID mode.

4.10.2 LSISAS1068 in Software RAID

The LSISAS1068 controller resides on PCI-X bus, Channel A of the 80333 processor supporting transfer rates of up to 3 Gbps. The LSISAS1068 controller includes an Address Translation Unit (ATU) supporting transactions between PCI address space and 80333 processor address space. The LSISAS1068 controller includes its own flash ROM to support SAS only software RAID. Software RAID levels supported include 0/1/10.

4.11 Debug Features

4.11.1 UART

The IP Network Server NSC2U SFP board provides a 4-pin UART connector at location J3B1 to help in the bring up and debug of the 80333I/O processor firmware code. This connector provides connections to the GPIO0_RXD and GPIO1_TXD pins on the 80333 processor.

4.12 Power Good Circuit

"Power Good" are positive logic signals reflecting the status of various power rails.

4.12.1 Power Good Outputs

"Power Good" outputs allow the IP Network Server NSC2U SFP board to identify when to come out of reset. The worst case ranges take into account component tolerances and the range represents the smallest expected range.

Table 24. Power Good Table

Voltage	Signal Name	Voltage Range for Good Voltage
+3.3V	P3V3_STBY_PWRGD	±10% (2.97V to 3.63V)
+1.8V	P1V8_PWRGOOD	+12% /-11% (1.62V to 1.98V)
+1.5V	P1V5_PWRGOOD	±10% (1.35V to 1.64V)
+1.35V	P1V35_PWRGOOD	+9% /-10% (1.21V to 1.48V)
+1.2V	P1V2_PWRGOOD	+13%/-12% (1.06V to 1.35V)

4.12.2 Power Good Inputs

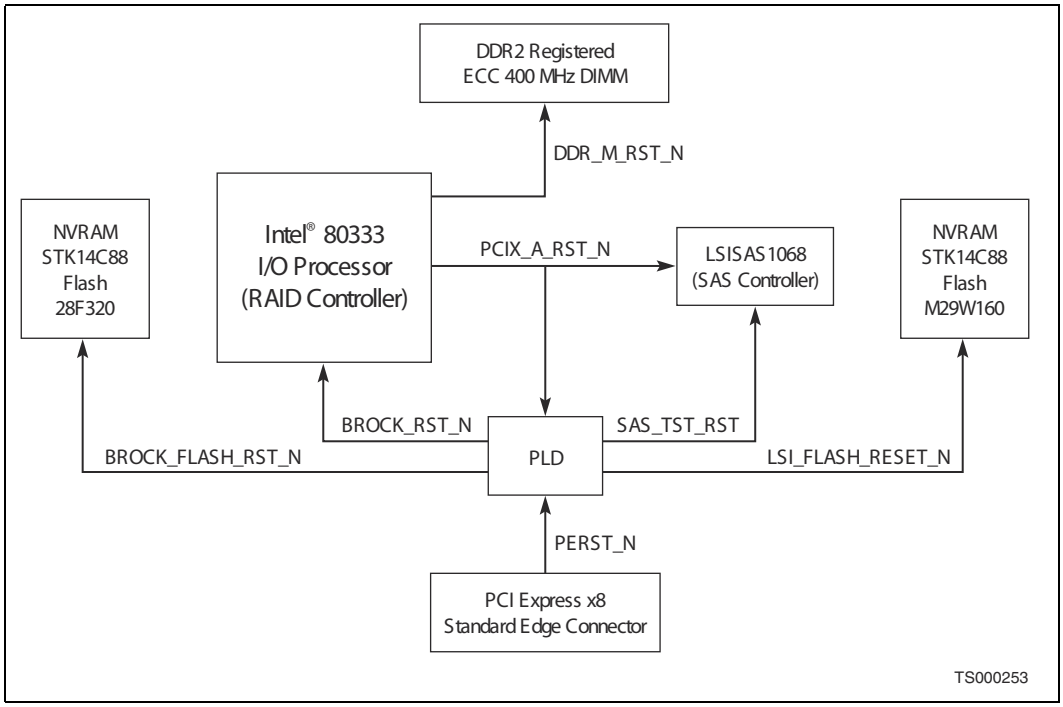
The PCI_PWRGOOD signal indicates that the +3.3V power rail supplied by the server board is good.

4.13 Reset Control

Board resets are controlled by the Programmable Logic Device (PLD) and are generated off of the voltage "Power Good" signals and the PERST_N PCIe signal.

The Brock_RST_N signal must be held off for 1 ms after the 80333 processor power good signal goes active.

Figure 38. Reset Control



4.14 Connector Information

4.14.1 Baseboard Bridge Connector (J2C1)

The Baseboard Bridge Connector carries signals between the SFP Board and the server board. Table 25 gives the pinout for the Baseboard Bridge connector.

Table 25. Baseboard Bridge Connector Pinout (Sheet 1 of 3)

Pin #	Signal Name	Pin	Signal Name
A1	FAN1_TACH	B1	FAN2_TACH
A2	FAN3_TACH	B2	FAN4_TACH
A3	NC_FAN_TACH5	B3	NC_FAN_TACH6
A4	FAN7_TACH	B4	FAN8_TACH
A5	NC_FAN_TACH9	B5	NC_FAN_TACH10
A6	FAN_CPU2_PWM	B6	GND
A7	GND	B7	FAN_IO_PWM
A8	FAN_CPU1_PWM	B8	LED_FAN4_FAULT
A9	NC_LED_FAN1_FAULT	B9	NC_LED_FAN_FAULT5
A10	NC_LED_FAN2_FAULT	B10	NC_LED_FAN_FAULT6
A11	LED_FAN3_FAULT	B11	GND
A12	FP_TEMP_PWM	B12	NC_V_RED_CONN_FP

Table 25. Baseboard Bridge Connector Pinout (Sheet 2 of 3)

Pin #	Signal Name	Pin	Signal Name
A13	FP_ID_LED_N	B13	NC_V_GREEN_CONN_FP
A14	R_NC_P3V3STBY	B14	NC_V_BLUE_CONN_FP
A15	FP_PWR_LED_N	B15	GND
A16	R_NC_P3V3	B16	NC_V_VSYNC2_BUF_FP
A17	BB_HDD_ACT_N	B17	NC_V_HSYNC2_BUF_FP
A18	GND	B18	GND
A19	SMB_IPMB_5VSB_CLK	B19	SMB_PBI_3VSB_CLK
A20	SMB_IPMB_5VSB_DAT	B20	SMB_PBI_3VSB_DAT
A21	GND	B21	GND
A22	FP_ID_BTN_N	B22	LED_STATUS_AMBER_N
A23	FP_PWR_BTN_N	B23	LED_NIC2_ACT_N
A24	FP_RST_BTN_N	B24	NC_LED_NIC2_LINK_N
A25	FP_NMI_BTN_N	B25	LED_STATUS_GREEN_N
A26	GND	B26	LED_NIC1_ACT_N
A27	USB0_FP_CONN_DN	B27	NC_LED_NIC1_LINK_N
A28	USB0_FP_CONN_DP	B28	NC_USB2_ESB_OC_N
A29	GND	B29	GND
A30	USB_FP_OC_FLT_N	B30	NC_USB2_ESB_DN
A31	USB_SYSCON_OC_FLT_N	B31	NC_USB2_ESB_DP
A32	GND	B32	GND
A33	USB1_SYSCON_DN	B33	SGPIO_CLOCK
A34	USB1_SYSCON_DP	B34	SGPIO_LOAD
A35	GND	B35	SGPIO_DATAOUT0
A36	FAN_PRSNT2_N	B36	SGPIO_DATAOUT1
A37	FAN_PRSNT3_N	B37	GND
A38	FAN_PRSNT1_N	B38	CLK_100M_DOBSON_P
A39	GND	B39	CLK_100M_DOBSON_N
A40	EXP_NB_0P	B40	GND
A41	EXP_NB_0N	B41	SW_RAID_MODE
A42	GND	B42	GND
A43	IBUTTON_PRESENT	B43	EXP_SB_0P
A44	GND	B44	EXP_SB_0N
A45	EXP_NB_1P	B45	GND
A46	EXP_NB_1N	B46	PCIE_PWRGOOD
A47	GND	B47	GND
A48	FAN_PRSNT4_N	B48	EXP_SB_1P
A49	GND	B49	EXP_SB_1N
A50	EXP_NB_2P	B50	GND
A51	EXP_NB_2N	B51	FAN_PRSNT5_N
A52	GND	B52	GND

Table 25. Baseboard Bridge Connector Pinout (Sheet 3 of 3)

Pin #	Signal Name	Pin	Signal Name
A53	FAN_PRSNT6_N	B53	EXP_SB_2P
A54	GND	B54	EXP_SB_2N
A55	EXP_NB_3P	B55	GND
A56	EXP_NB_3N	B56	PE_WAKE_N
A57	GND	B57	GND
A58	PD_BRIDGE_PRSNT_N	B58	EXP_SB_3P
A59	NC_SMB_SENSOR_3V3SB_DAT_BUF	B59	EXP_SB_3N
A60	NC_SMB_SENSOR_3V3SB_CLK_BUF	B60	GND

4.14.2 Intelligent Battery Backup Unit Connector (J8B2)

The Intelligent Battery Backup Unit (IBBU) connector carries signals between the IP Network Server NSC2U SFP board and the IBBU. Table 26 gives the pinout for the IBBU connector.

Table 26. Intelligent Battery Backup Unit Connector (J8B2) Pinout

Pin #	Signal Name	Pin #	Signal Name
1	12V	2	GND
3	NC	4	GND
5	VBAT_RAID	6	GND
7	3.3V	8	GND
9	VBAT_RAID	10	GND
11	RESET_N	12	GND
13	SCK	14	GND
15	SDA	16	PFAIL_N
17	DDR_SEL	18	BBE
19	BBSTROBE	20	STATUS

4.14.3 DDR2 DIMM Connector (J6D1)

Table 27 gives the pinout for the DDR2 DIMM connector.

Table 27. DDR2 DIMM Connector (J6D1) Pinout (Sheet 1 of 3)

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	DDR_VREF	62	DDR_MA<4>	123	GND	184	VBAT_RAID
2	GND	63	VBAT_RAID	124	DDR_DQ<4>	185	DDR_MA<3>
3	DDR_DQ<0>	64	DDR_MA<2>	125	DDR_DQ<5>	186	DDR_MA<1>
4	DDR_DQ<1>	65	VBAT_RAID	126	GND	187	VBAT_RAID
5	GND	66	GND	127	DDR_DM<0>	188	MCLK0_200MHZ_P
6	DDR_DQS_N<0>	67	GND	128	NC_DDR_128	189	MCLK0_200MHZ_N

Table 27. DDR2 DIMM Connector (J6D1) Pinout (Sheet 2 of 3)

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
7	DDR_DQS_P<0>	68	DDR_PAR_IN	129	GND	190	VBAT_RAID
8	GND	69	VBAT_RAID	130	DDR_DQ<6>	191	DDR_MA<0>
9	DDR_DQ<2>	70	DDR_MA<10>	131	DDR_DQ<7>	192	DDR_BA1
10	DDR_DQ<3>	71	DDR_BA0	132	GND	193	VBAT_RAID
11	GND	72	VBAT_RAID	133	DDR_DQ<12>	194	DDR_RAS_N
12	DDR_DQ<8>	73	DDR_WE_N	134	DDR_DQ<13>	195	VBAT_RAID
13	DDR_DQ<9>	74	VBAT_RAID	135	GND	196	DDR_CS0_N
14	GND	75	DDR_CAS_N	136	DDR_DM<1>	197	VBAT_RAID
15	DDR_DQS_N<1>	76	VBAT_RAID	137	NC_DDR_137	198	DDR_ODT0
16	DDR_DQS_P<1>	77	NC_DDR_77	138	GND	199	DDR_MA<13>
17	GND	78	NC_DDR_78	139	NC_DDR_139	200	VBAT_RAID
18	DDR_M_RST_N	79	VBAT_RAID	140	NC_DDR_140	201	NC_DDR_201
19	NC_DDR_19	80	NC_DDR_80	141	GND	202	GND
20	GND	81	GND	142	DDR_DQ<14>	203	DDR_DQ<36>
21	DDR_DQ<10>	82	DDR_DQ<32>	143	DDR_DQ<15>	204	DDR_DQ<37>
22	DDR_DQ<11>	83	DDR_DQ<33>	144	GND	205	GND
23	GND	84	GND	145	DDR_DQ<20>	206	DDR_DM<4>
24	DDR_DQ<16>	85	DDR_DQS_N<4>	146	DDR_DQ<21>	207	NC_DDR_207
25	DDR_DQ<17>	86	DDR_DQS_P<4>	147	GND	208	GND
26	GND	87	GND	148	DDR_DM<2>	209	DDR_DQ<38>
27	DDR_DQS_N<2>	88	DDR_DQ<34>	149	NC_DDR_149	210	DDR_DQ<39>
28	DDR_DQS_P<2>	89	DDR_DQ<35>	150	GND	211	GND
29	GND	90	GND	151	DDR_DQ<22>	212	DDR_DQ<44>
30	DDR_DQ<18>	91	DDR_DQ<40>	152	DDR_DQ<23>	213	DDR_DQ<45>
31	DDR_DQ<19>	92	DDR_DQ<41>	153	GND	214	GND
32	GND	93	GND	154	DDR_DQ<28>	215	DDR_DM<5>
33	DDR_DQ<24>	94	DDR_DQS_N<5>	155	DDR_DQ<29>	216	NC_DDR_216
34	DDR_DQ<25>	95	DDR_DQS_P<5>	156	GND	217	GND
35	GND	96	GND	157	DDR_DM<3>	218	DDR_DQ<46>
36	DDR_DQS_N<3>	97	DDR_DQ<42>	158	NC_DDR_158	219	DDR_DQ<47>
37	DDR_DQS_P<3>	98	DDR_DQ<43>	159	GND	220	GND
38	GND	99	GND	160	DDR_DQ<30>	221	DDR_DQ<52>
39	DDR_DQ<26>	100	DDR_DQ<48>	161	DDR_DQ<31>	222	DDR_DQ<53>
40	DDR_DQ<27>	101	DDR_DQ<49>	162	GND	223	GND
41	GND	102	GND	163	DDR_CB<4>	224	NC_DDR_224
42	DDR_CB<0>	103	DIMM1A_SA2	164	DDR_CB<5>	225	NC_DDR_225
43	DDR_CB<1>	104	NC_DDR_104	165	GND	226	GND
44	GND	105	GND	166	DDR_DM<8>	227	DDR_DM<6>
45	DDR_DQS_N<8>	106	DDR_DQS_N<6>	167	NC_DDR_167	228	NC_DDR_228
46	DDR_DQS_P<8>	107	DDR_DQS_P<6>	168	GND	229	GND

Table 27. DDR2 DIMM Connector (J6D1) Pinout (Sheet 3 of 3)

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
47	GND	108	GND	169	DDR_CB<6>	230	DDR_DQ<54>
48	DDR_CB<2>	109	DDR_DQ<50>	170	DDR_CB<7>	231	DDR_DQ<55>
49	DDR_CB<3>	110	DDR_DQ<51>	171	GND	232	GND
50	GND	111	GND	172	NC_DDR_172	233	DDR_DQ<60>
51	NC_DDR_51	112	DDR_DQ<56>	173	VBAT_RAID	234	DDR_DQ<61>
52	VBAT_RAID	113	DDR_DQ<57>	174	DDR_CKE1	235	GND
53	DDR_CKE0	114	GND	175	VBAT_RAID	236	DDR_DM<7>
54	VBAT_RAID	115	DDR_DQS_N<7>	176	NC_DDR_176	237	NC_DDR_237
55	NC_DDR_BA2	116	DDR_DQS_P<7>	177	NC_DDR_177	238	GND
56	NC_DDR_ERR_OUT	117	GND	178	VBAT_RAID	239	DDR_DQ<62>
57	VBAT_RAID	118	DDR_DQ<58>	179	DDR_MA<12>	240	DDR_DQ<63>
58	DDR_MA<11>	119	DDR_DQ<59>	180	DDR_MA<9>	241	GND
59	DDR_MA<7>	120	GND	181	VBAT_RAID	242	DDRII_SMBDA
60	VBAT_RAID	121	DIMM1A_SA0	182	DDR_MA<8>	243	DDRII_SMBCL
61	DDR_MA<5>	122	DIMM1A_SA1	183	DDR_MA<6>	244	P3V3

4.14.4 SAS Flex Connector (J2B1)

Table 28 gives the pinout for the SAS Flex connector, which connects to the SAS backplane through the flex circuit cable.

Table 28. SAS Flex Connector (J2B1) Pinout

Pin #	Signal Name	Pin #	Signal Name
1	FP_FLEX_PRES_N	41	GND
2	SMB_SAS_3V3_SCL	42	SAS4_RX_N
3	SMB_IPMB_5VSB_CLK	43	SAS3_TX_N
4	SMB_SAS_3V3_SDA	44	GND
5	SMB_IPMB_5VSB_DAT	45	SAS3_TX_P
6	NC_FLEX_CONN_SPARE_12	46	GND
7	NC_FP_FC_7	47	GND
8	SGPIO_CLOCK_R	48	SAS3_RX_N
9	GND	49	GND
10	SGPIO_LOAD_R	50	SAS3_RX_P
11	SAS7_TX_N	51	SAS2_TX_N
12	GND	52	GND
13	SAS7_TX_P	53	SAS2_TX_P
14	GND	54	GND
15	GND	55	GND
16	SAS7_RX_N	56	SAS2_RX_N
17	GND	57	GND

Table 28. SAS Flex Connector (J2B1) Pinout (Continued)

Pin #	Signal Name	Pin #	Signal Name
18	SAS7_RX_P	58	SAS2_RX_P
19	SAS6_TX_P	59	SAS1_TX_N
20	SGPIO_DATAOUT0_R	60	HDD_ACT_N
21	SAS6_TX_N	61	SAS1_TX_P
22	GND	62	GND
23	GND	63	GND
24	SAS6_RX_N	64	SAS1_RX_N
25	GND	65	GND
26	SAS6_RX_P	66	SAS1_RX_P
27	SAS5_TX_N	67	SAS0_TX_P
28	SGPIO_DATAOUT1_R	68	HDD_FLT_N
29	SAS5_TX_P	69	SAS0_TX_N
30	GND	70	GND
31	GND	71	GND
32	SAS5_RX_N	72	SAS0_RX_N
33	GND	73	NC_FP_FC_73
34	SAS5_RX_P	74	SAS0_RX_P
35	SAS4_TX_P	75	NC_DIFF2_P
36	NC_FP_PWR_ENABLE	76	GND
37	SAS4_TX_N	77	NC_DIFF2_N
38	GND	78	NC_FP_FC_78
39	GND	79	GND
40	SAS4_RX_P	80	GND

4.14.5 Serial Cable Header From Server Board (J8B1)

Table 29 gives the pinout for the Serial Cable Header connector.

Table 29. Serial Cable Header (J8B1) Pinout

Pin #	Signal Name
1	EMP_DCD_L
2	EMP_DSR_N
3	EMP_SIN
4	EMP_RTS_N
5	EMP_SOUT
6	EMP_CTS_N
7	EMP_DTR_N
8	NC_EMP_RI_N
9	EMP_INUSE_L

Table 29. Serial Cable Header (J8B1) Pinout (Continued)

Pin #	Signal Name
10	NC_5V_STBY
11	GND
12	NC

4.14.6 Power Connectors

Table 30, Table 31 and Table 31 give the pinouts for power connectors J1D2, J2D2 and J2D1 respectively.

Table 30. SAS Backplane Power Connector (J1D2)

Pin #	Signal Name	Signal Name	Pin #
1	P5V	P5V	7
2	P5V	P5V	8
3	P12V	P3V3	9
4	P12V	GND	10
5	GND	GND	11
6	GND	GND	12

Table 31. PDB Power Connector (J2D2) Pinout

Pin #	Signal Name
1	GND
2	P5V
3	P5V

Table 32. PDB Power Connector (J2D1) Pinout

Pin #	Signal Name	Signal Name	Pin #
1	GND	P12V	4
2	GND	P12V	5
3	P5V	P3V3	6

4.14.7 External USB/Serial (J8E1)

Table 33 gives the pinout for the External USB/Serial connector on the SFP board. The user-side pin-outs for connectors are in Section 3.3, “User-Accessible Interconnects” on page 35.

Table 33. External USB/Serial Port Connector (J8E1) Pinout

Pin #	Signal Name
1	GND
2	GND
3	GND
4	GND
5	USB_PWR
6	USB0_FP_CONN_N
7	USB0_FP_CONN_P
8	USB_GND
9	RJ45_EMP_RTS_L
10	RJ45_EMP_DTR_L
11	RJ45_EMP_SOUT
12	GND
13	RJ45_EMP_INUSE_L
14	RJ45_EMP_SIN
15	RJ45_EMP_DSR_DCD_L
16	RJ45_EMP_CTS_L

4.14.8 80333 Processor UART Connector (J3B1)

Table 34 gives the connector pinouts for the UART connector.

Table 34. 80333 Processor UART Connector (J3B1) Pinout

Pin #	Signal Name
1	BROCK_UART_TX
2	GND
3	BROCK_UART_RX
4	P3V3

4.14.9 Fan Connectors

Table 35, Table 36, Table 37 and Table 38 give the connector pinouts for the upper fan connector, lower fan connector, CPU1 fan connector and the CPU2 fan connector respectively.

Table 35. Upper Fan Connector (J1D1) Pinout

Pin #	Signal Name
1	P12V
2	FAN4_TACH
3	GND

Table 35. Upper Fan Connector (J1D1) Pinout (Continued)

Pin #	Signal Name
4	FAN_IO_PWM
5	P12V
6	FAN8_TACH
7	GND
8	FAN_IO_PWM

Table 36. Lower Fan Connector (J1C1) Pinout

Pin #	Signal Name
1	P12V
2	FAN3_TACH
3	GND
4	FAN_IO_PWM
5	P12V
6	FAN7_TACH
7	GND
8	FAN_IO_PWM

Table 37. CPU1 Fan Connector (J7A1) Pinout

Pin #	Signal Name
1	P12V
2	FAN1_TACH
3	GND
4	FAN_CPU2_PWM

Table 38. CPU2 Fan Connector (J7A2) Pinout

Pin #	Signal Name
1	P12V
2	FAN2_TACH
3	GND
4	FAN_CPU2_PWM

4.14.10 SMART eUSB SSD Interposer Board Connector

Table 39 gives the connector pinouts for the interposer board connector.

Table 39. Interposer Board Connector Pinout

Pin #	Signal
1	GND
2	Keyed (no connect)
3	SYSCON_USB_P
4	SYSCON_PWR
5	SYSCON_USB_N
6	GND

5 SAS Backplane

This chapter describes the SAS backplane, which provides support for the SAS hard disk drives and the optional optical disk drive in the Kontron IP Network Server NSC2U.

This chapter contains the following sections:

5.1 Overview

The Kontron IP Network Server NSC2U system contains a single SAS backplane that provides support for six 2.5-inch SAS HDD and one slim-line CD-ROM/DVD. The backplane interfaces with the SAS Front Panel (SFP) board, which contains a SFP-2U controller that provides support for up to six standard SAS drives. The backplane board interfaces to the SFP board via a controlled impedance flex cable that contains the six SAS HDD signals, control signals, and system management SMBus signals.

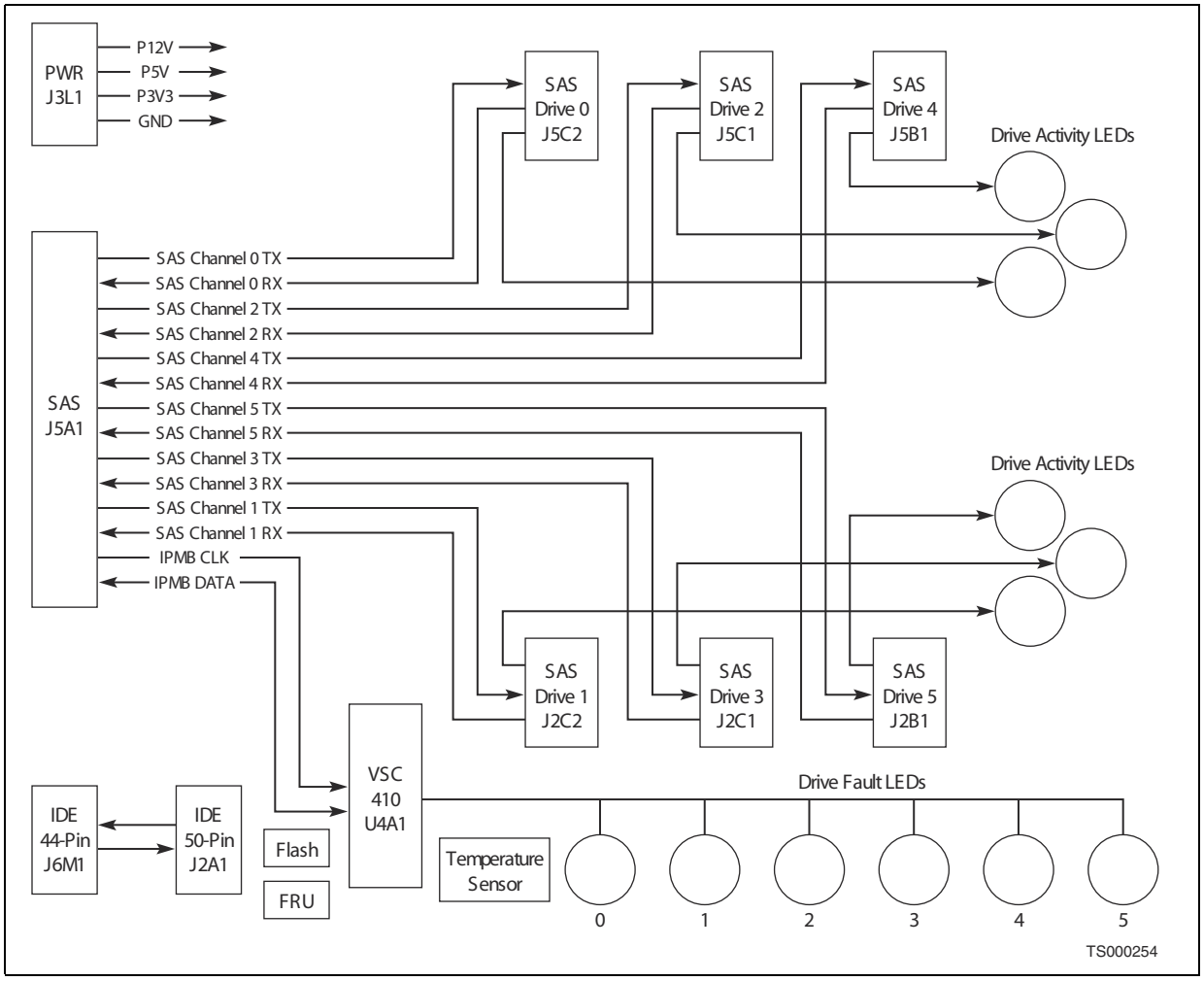
The SAS interface to the HDDs is via the 29-pin SAS connector. Activity and fault LEDs are provided for each of the six HDD positions. A composite fault and activity LED signal for all six drives is sent to the SFP board to drive the front panel drive activity/fault LED.

The backplane board also provides the interface between the IDE controller on the Intel® Server Board T5000PAL and the slim-line CD-ROM/DVD drive. The IDE interface to the server board is via a 44-pin ribbon cable.

The DC power to the backplane (12V, 5V, and 3.3V) is provided from the SFP board via a 12-pin (2x6) connector.

Figure 39 is a block diagram of the SAS backplane.

Figure 39. SAS Backplane Block Diagram



5.2 SFP Board Interface

An 80-pin connector and a flex circuit cable provide the interconnection from the SAS backplane to the SFP board. The flex circuit permits the interconnect using a single cable that meets the SI requirements for the SAS signals and meets the mechanical constraints for routing the cable. Table 40 gives the pinout for the 80-pin flex cable connector.

The interconnect supports up to a maximum of eight SAS channels and the drive management controller interface. For this application, only six SAS channels are used.

Table 40. 2x40 Flex Cable Connector (J5A1) Pinout

Pin #	Signal Name	Pin #	Signal Name
1	FP_FLEX _PRES1	2	SMB_SAS_3V3_SCL
3	IPMB_I2C_SCL	4	SMB_SAS_3V3_SDA
5	IPMB_I2C_SDA	6	NC_FLEX_CONN_6
7	NC_FLEX_CONN_7	8	SGPIO_CLOCK_R
9	GROUND	10	SGPOI_LOAD_R
11	NC_SAS7_C_TX_N	12	GROUND
13	NC_SAS7_C_TX_P	14	GROUND
15	GROUND	16	NC_SAS7_C_RX_N
17	GROUND	18	NC_SAS7_C_RX_P
19	NC_SAS6_C_TX_P	20	SGPIO_DATAOUT0_R
21	NC_SAS6_C_TX_N	22	GROUND
23	GROUND	24	NC_SAS6_C_RX_N
25	GROUND	26	NC_SAS6_C_RX_P
27	SAS5_C_TX_N	28	SGPIO_DATAOUT1_R
29	SAS5_C_TX_P	30	GROUND
31	GROUND	32	SAS5_C_RX_N
33	GROUND	34	SAS5_C_RX_P
35	SAS4_C_TX_P	36	NC_FP_PWR_ENABLE
37	SAS4_C_TX_N	38	GROUND
39	GROUND	40	SAS4_C_RX_P
41	GROUND	42	SAS4_C_RX_N
43	SAS3_C_TX_N	44	GROUND
45	SAS3_C_TX_P	46	GROUND
47	GROUND	48	SAS3_C_RX_N
49	GROUND	50	SAS3_C_RX_P
51	SAS2_C_TX_N	52	GROUND
53	SAS2_C_TX_P	54	GROUND
55	GROUND	56	SAS2_C_RX_N
57	GROUND	58	SAS2_C_RX_P
59	SAS1_C_TX_N	60	LED_HDD_ACT_R_L
61	SAS1_C_TX_P	62	GROUND
63	GROUND	64	SAS1_C_RX_N
65	GROUND	66	SAS1_C_RX_P
67	SAS0_C_TX_P	68	LED_HDD_FLT_R_L
69	SAS0_C_TX_N	70	GROUND
71	GROUND	72	SAS0_C_RX_N
73	NC_FLEX_CONN_73	74	SAS0_C_RX_P
75	NC_DIFF2_P	76	GROUND

Table 40. 2x40 Flex Cable Connector (J5A1) Pinout (Continued)

Pin #	Signal Name	Pin #	Signal Name
77	NC_DIFF2_N	78	NC_FLEX_CONN_78
79	GROUND	80	FP_FLEX_PRES1
TP1	GROUND	TP2	GROUND

5.3 SAS HDD Interface

The SAS HDD interface is via the 29-pin SAS connector. Connections are provided for six SAS hard disk drives. Table 41 gives the pinout for the hard drive connectors.

Table 41. Hard Drive Connectors (J5C2, J5C1, J5B1, J2C2, J2C1, J2B1) Pinout

Pin #	Signal Name	Pin #	Signal Name
P1	Not Used	SI	Ground
P2	Not Used	S2	SAS#_TX_DP (# = 0…5)
P3	Not Used	S3	SAS#_TX_DN (# = 0…5)
P4	Ground	S4	Ground
P5	Ground	S5	SAS#_RX_DN (# = 0…5)
P6	DRV#_PRSNT_N (# = 0…5)	S6	SAS#_RX_DP (# = 0…5)
P7	P5V Pre-charge	S7	Ground
P8	P5V	S8	Not Used
P9	P5V	S9	Not Used
P10	Ground	S10	Not Used
P11	LED_SAS#_ACT_L (# = 0…5)	S11	Not Used
P12	Ground	S12	Not Used
P13	P12V Pre-charge	S13	Not Used
P14	P12V	S14	Not Used
P15	P12V		
PTH0	Ground		
PTY1	Ground		

5.4 IDE CD ROM/DVD to Server Board Interface

The IDE interface to server board is via a standard 44-pin IDE connector. Signals 41 to 44 are unused in this application. Table 42 gives the pinout for the slim-line IDE optical driver connector.

Table 42. 2x22 Slim-Line IDE Optical Drive Connector (J6M1) Pinout

Pin #	Signal Name	Pin #	Signal Name
1	RST_IDE_L	2	GROUND
3	RIDE_DD <15..0> 7	4	RIDE_DD <15..0> 8
5	RIDE_DD <15..0> 6	6	RIDE_DD <15..0> 9

Table 42. 2x22 Slim-Line IDE Optical Drive Connector (J6M1) Pinout (Continued)

Pin #	Signal Name	Pin #	Signal Name
7	RIDE_DD <15..0> 5	8	RIDE_DD <15..0> 10
9	RIDE_DD <15..0> 4	10	RIDE_DD <15..0> 11
11	RIDE_DD <15..0> 3	12	RIDE_DD <15..0> 12
13	RIDE_DD <15..0> 2	14	RIDE_DD <15..0> 13
15	RIDE_DD <15..0> 1	16	RIDE_DD <15..0> 14
17	RIDE_DD <15..0> 0	18	RIDE_DD <15..0> 15
19	GROUND	20	NC
21	RIDE_DDREQ	22	GROUND
23	RIDE_DIOW_N	24	GROUND
25	RIDE_DIOR_N	26	GROUND
27	RIDE_DIORDY	28	IDE_CSEL
29	RIDE_DDACK_N	30	GROUND
31	IRQ_IDE	32	RIDE_P32
33	RIDE_DA1	34	IDE_PRI_CBLSNS
35	RIDE_DA0	36	RIDE_DA2
37	RIDE_DCS1_N	38	RIDE_DCS3_N
39	LED_IDE_L	40	GROUND
41	NC_44P_IDE_P41	42	NC_44P_IDE_P42
43	NC_44P_IDE_P43	44	NC_44P_IDE_P44

5.5 IDE CD ROM/DVD Drive Interface

The IDE interface to the CD-ROM/DVD drive is via a standard 50-pin connector used on slim-line CD-ROM/DVD drives in laptop computers. Table 43 gives the pinout of the standard 50-pin IDE interface connector for the CD-ROM/DVD drive.

Table 43. 50-pin Connector to Slim-Line Optical Device (J2A1) Pinout

Pin #	Signal Name	Pin #	Signal Name
1	NC_50P_IDE_B1	2	NC_50P_IDE_A1
3	GND	4	NC_50P_IDE_A2
5	RIDE _DD<8>	6	RST_IDE_N
7	RIDE _DD<9>	8	RIDE_DD<7>
9	RIDE _DD<10>	10	RIDE_DD<6>
11	RIDE_DD<11>	12	RIDE_DD<5>
13	RIDE_DD<12>	14	RIDE_DD<4>
15	RIDE_DD<13>	16	RIDE_DD<3>
17	RIDE_DD<14>	18	RIDE_DD<2>
19	RIDE_DD<15>	20	RIDE_DD<1>
21	RIDE_DDREQ	22	RIDE_DD<0>
23	RIDE_DIOR_N	24	GND

Table 43. 50-pin Connector to Slim-Line Optical Device (J2A1) Pinout (Continued)

Pin #	Signal Name	Pin #	Signal Name
25	GND	26	RIDE_DIOW_N
27	RIDE_DDACK_N	28	RIDE_DIORDY
29	RIDE_P32	30	IRQ_IDE
31	IDE_PRI_CBLSNS	32	RIDE_DA1
33	RIDE_DA2	34	RIDE_DA0
35	RIDE_DCS3_N	36	RIDE_DCS1_N
37	P5V	38	LED_IDE_N
39	P5V	40	P5V
41	P5V	42	P5V
43	GND	44	GND
45	GND	46	GND
47	GND	48	IDE_CSEL_S
49	NC_50P_IDE B25	50	NC_50P_IDE_A25
MP1	GROUND	MP2	GROUND

5.6 Power Connector Interface to Front Panel

The backplane receives DC power through the SFP Board via a 2×6 Molex Micro Fit* connector. Table 44 give the pinout of the DC power connector.

Table 44. 12-pin Power Connector to Front Panel Board (J3L1) Pinout

Pin #	Signal Name	Pin #	Signal Name
1	P5V	7	P5V
2	P5V	8	P5V
3	P12V	9	P3V3
4	P12V	10	GROUND
5	GROUND	11	GROUND
6	GROUND	12	GROUND

6 PCI Riser Cards

This chapter describes the design and external interface of the PCI riser cards used in the Kontron IP Network Server NSC2U.

The system contains a riser assembly that includes two different riser cards that connect directly to the Intel® Server Board T5000PAL. One riser card facilitates the installation of full-height PCI-X* and PCI Express* (PCIe*) add-in cards. The other riser card facilitates the installation of low-profile PCIe add-in cards.

Each riser card is attached to the PCI riser assembly using two keyhole features and two 6/32 inch screws. Two blue flexible handles on the riser assembly facilitate the separation of the riser cards from their corresponding server board connectors when removing the riser assembly from the chassis. See Section 2.3.2, "PCI/PCI Express Subsystem" on page 18 for more information.

Figure 40 shows the full-height PCI-X/PCIe riser card and Figure 41 shows the low-profile PCIe riser card.

Figure 40. Full-Height PCI-X/PCIe Riser Card

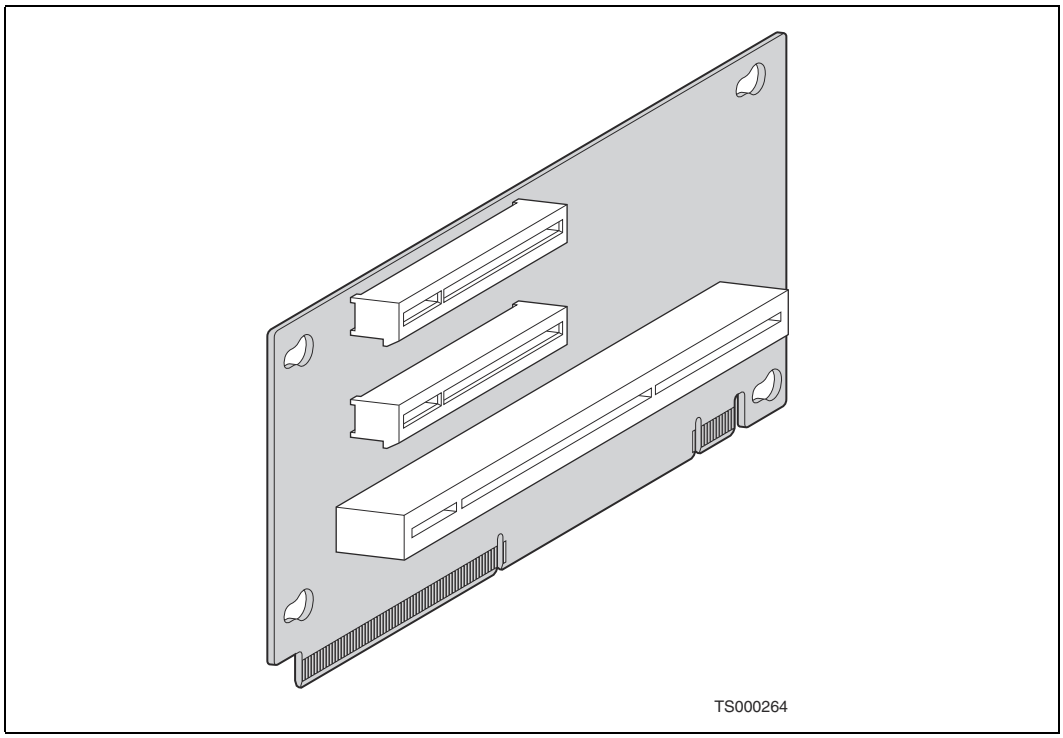
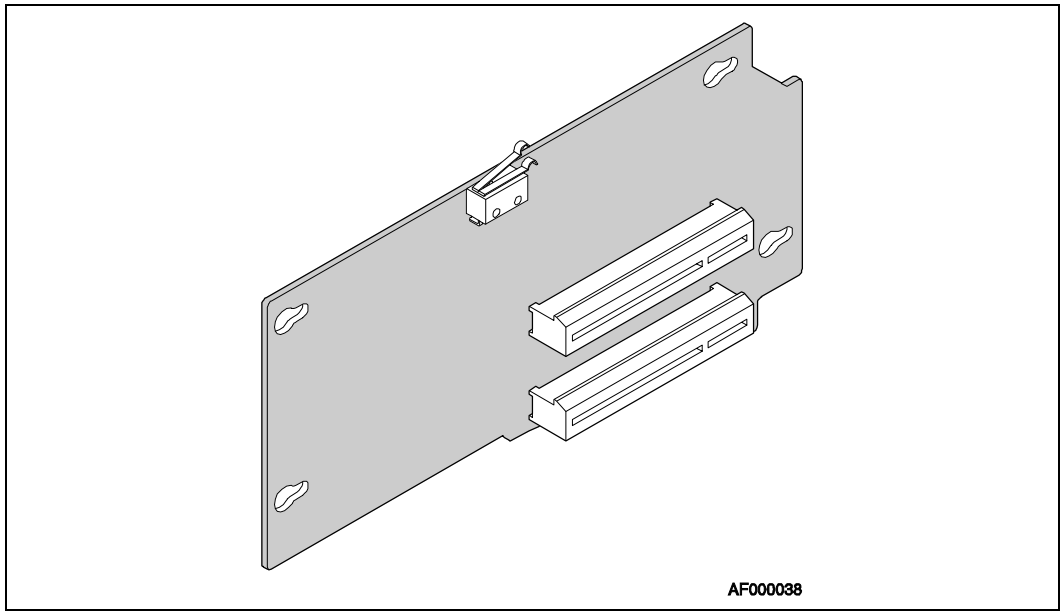


Figure 41. Low-Profile PCIe Riser Card



6.1 PCI-X and PCIe Add-in Card Options

The Intel® Server Board T5000PAL has two riser slots capable of supporting riser cards for 2U system configurations. The two slots are physically different and provide different capabilities.

The full-height riser slot (J4F1) implements Intel® Adaptive Slot technology and uses a 280-pin connector that meets both PCI-X and PCIe technology specifications. The full-height riser card supports the following interfaces: PCI-X, PCIe x4 and PCIe x8. Table 45 shows the supported throughput and the number of add-in cards installed for each possible configuration.

Table 45. Full-Height Riser Card Configurations and Throughput

Configuration	Bottom Slot	Middle Slot	Top Slot
1 add-in card	PCI-X †	–	–
	–	x8 or x4 PCIe	–
	–	–	x4 PCIe
2 add-in cards	PCI-X †	x8 or x4 PCIe	–
	PCI-X †	–	x4 PCIe
	–	x4 PCIe	x4 PCIe
3 add-in cards	PCI-X †	x4 PCIe	x4 PCIe
Note: † Up to 133 MHz bus speed			

The low-profile riser slot (J5B1) uses a 98-pin connector. It is capable of supporting up to two low-profile PCIe add-in cards. The low-profile riser only supports x4 PCIe interfaces. Table 46 shows the supported throughput and the number of add-in cards installed for each possible configuration.

Table 46. Low-Profile Riser Card Configurations and Throughput

Configuration	Lower Slot	Upper Slot
1 add-in card	x4 PCIe †	
		x4 PCIe †
2 add-in cards	x4 PCIe †	x4 PCIe †
† The riser card's PCIe slots can physically accommodate boards with x1, x4 or x8 connectors, but the link interface to each slot is only x4 maximum.		

Note: There are no population rules for installing a single low-profile add-in card in the 2U low-profile riser card; a single add-in card can be installed in either PCIe slot.

6.2 PCI Express Riser Card Mechanical Specifications

Figure 42 shows the mechanical specification of the low-profile passive PCI Express riser card and Figure 43 shows the mechanical specification of the full-height PCI Express riser card.

Figure 42. Low-Profile Passive PCIe Riser Card Mechanical Specification

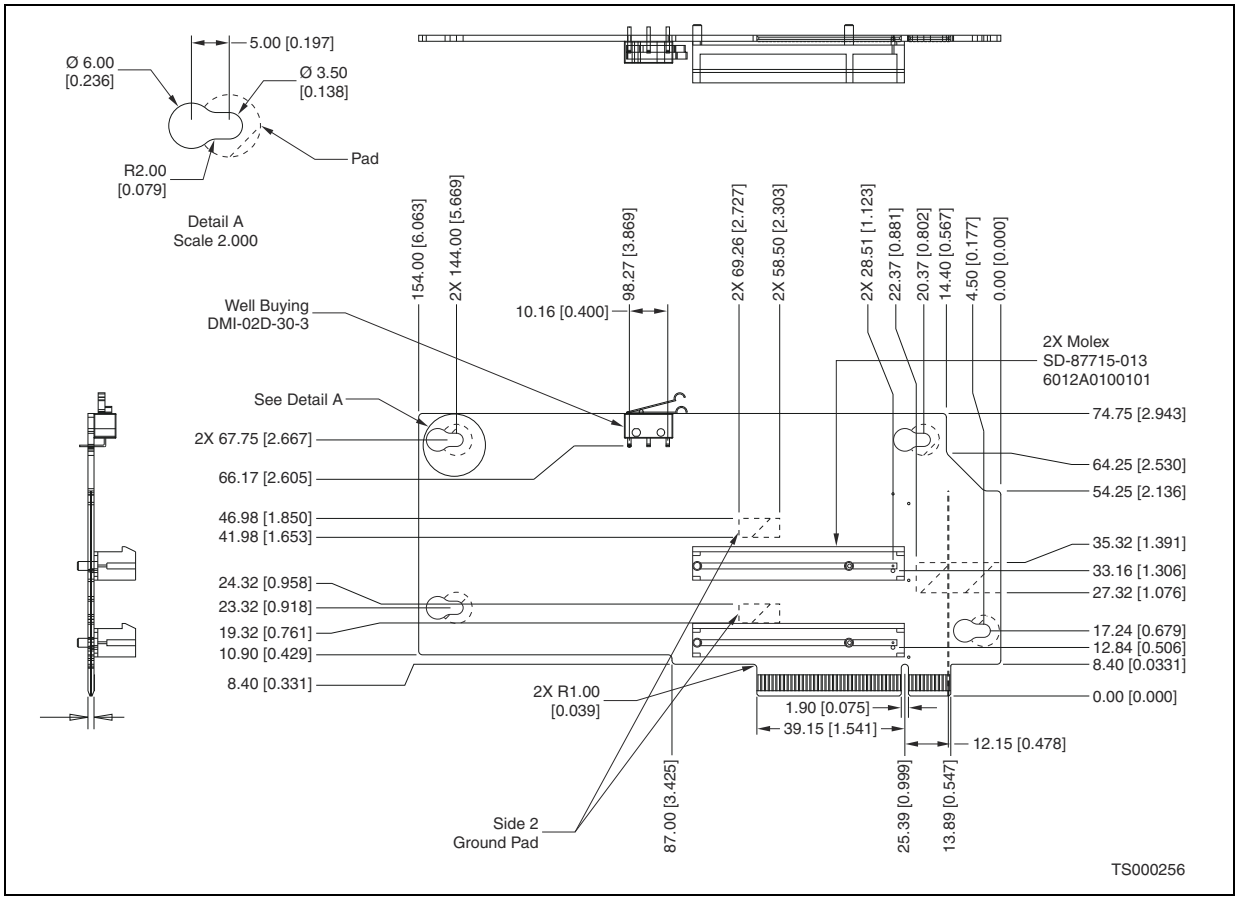
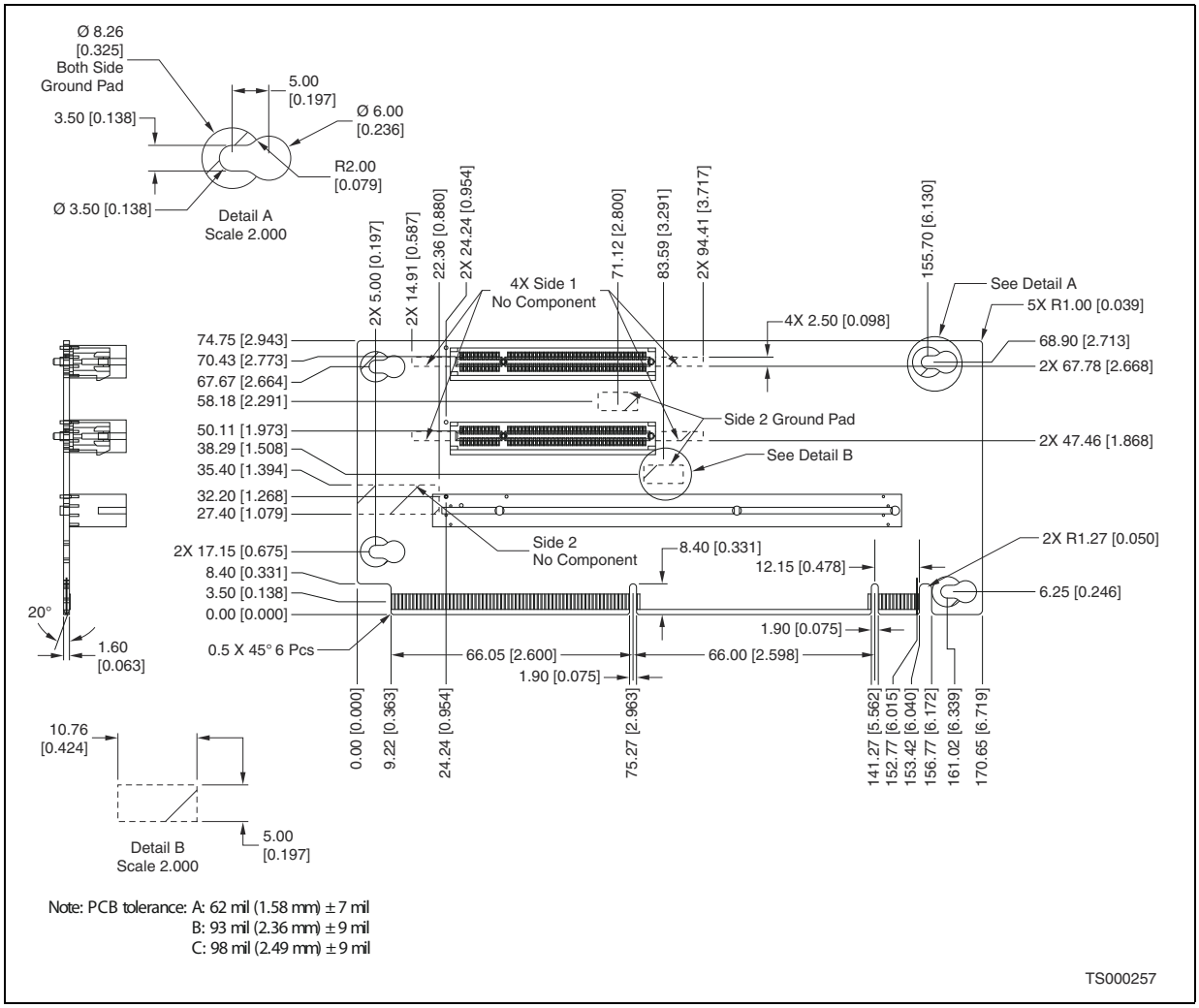


Figure 43. Full-Height PCI-X/PCIe Riser Card Mechanical Specification



7 Power Subsystem

This chapter defines the features and functionality of the switching power subsystem of the Kontron IP Network Server NSC2U. The power subsystem can use either AC-input or DC-input power supply modules. The subsystem comprises one or two PSUs and a Power Distribution Board (PDB). If two PSUs are used, the system can operate in redundant mode.

The information contained in this chapter is organized into the following sections:

7.1 Features

Power subsystem features include:

- support for AC-input and DC-input power supply modules
- 600W power module output capability in full AC or DC input voltage range
- 580W subsystem total output capability in full input voltage range
- power good indication LEDs
- predictive failure warning
- internal cooling fans with multi-speed capability
- remote sense of 3.3V, 5V, and 12V DC outputs (on the PDB)
- brown-out protection and recovery
- built-in load sharing capability
- built-in overloading protection capability
- onboard field replaceable unit (FRU) information
- I^2C interface for server management functions
- integral handle for insertion/extraction

7.2 Power Supply Cage

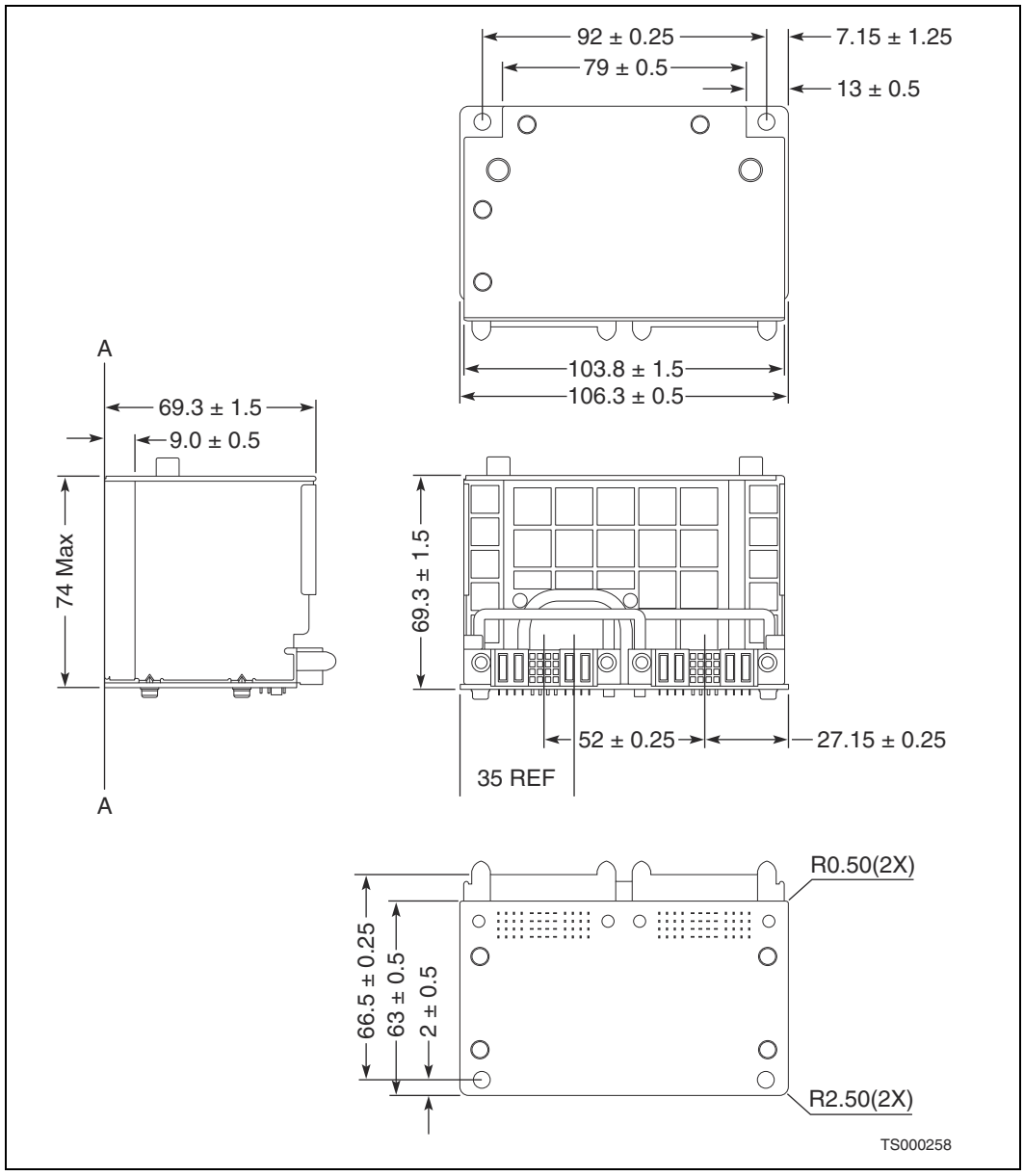
The power supply cage of the IP Network Server NSC2U can support a single 600W SSI Thin Power Supply (TPS) module for a 1+0 non-redundant configuration or two TPS modules for a 1+1 redundant configuration that supports hot swap.

The power cage provides mating connectors for two power supply modules and a power distribution board (PDB) that contains DC-to-DC converters for the 5V and 3.3V supply rails and connectors to distribute the rails to the T5000PAL server board and SAS front panel (SFP) board.

7.2.1 Power Supply Cage Mechanical Specification

The IP Network Server NSC2U can support up to two 600W PSUs in a 1+1 configuration or a 1+0 configuration. A mechanical drawing of the power supply cage is shown in Figure 44.

Figure 44. Power Supply Cage Mechanical Specification



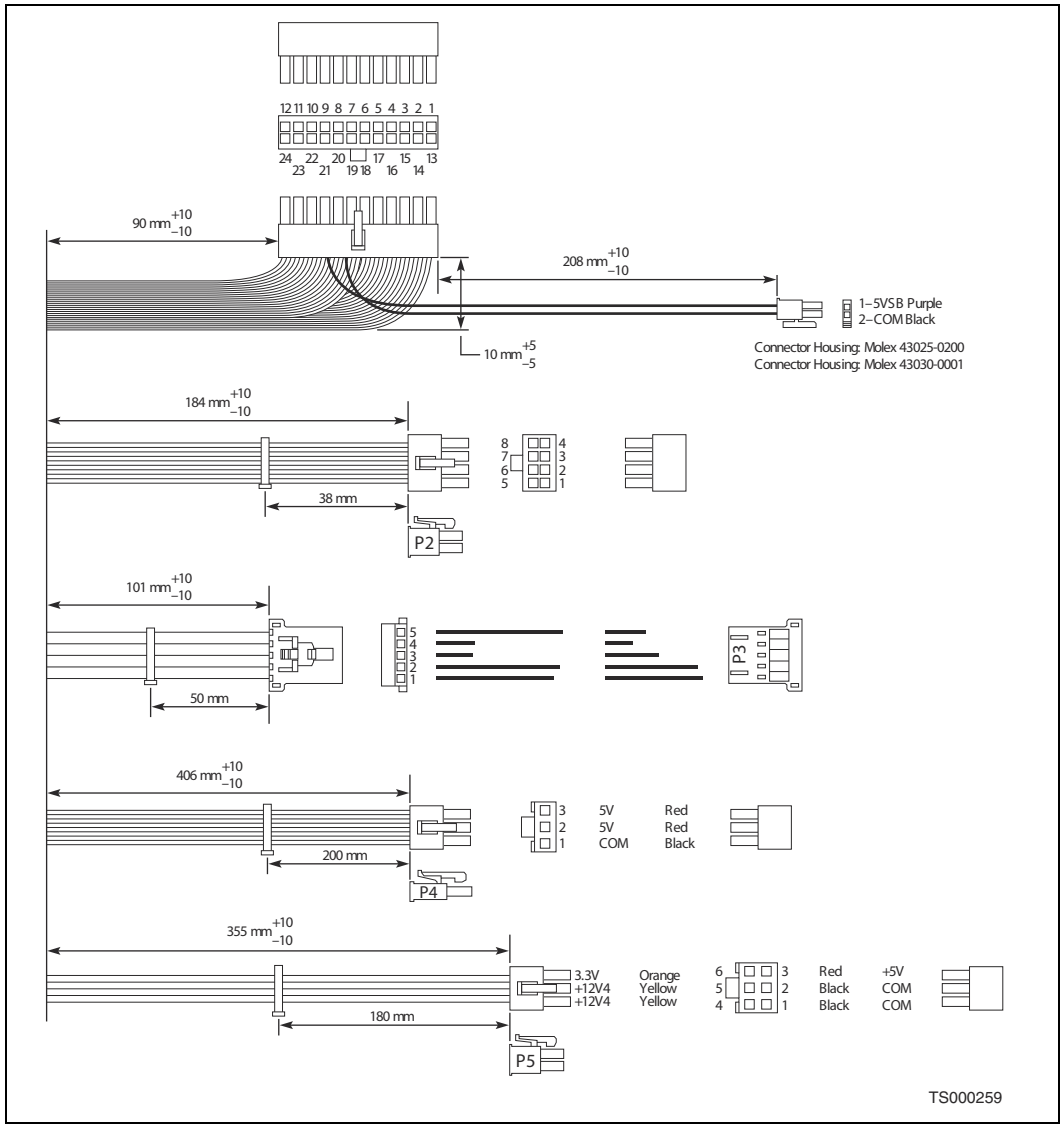
7.2.2 Power Supply Cage System Interface

The Power Distribution Board (PDB) in the power supply cage connects to the server board and the front panel board via captive wire harnesses. All wiring uses listed or recognized component appliance wiring material (AVLV2), VW-1 flame rating, rated 105°C minimum, 300 Vdc minimum. Table 47 gives the length of each wiring harness and Figure 45 gives wiring harness details.

Table 47. Power Supply Cage Wiring Harness Cable Lengths

From	To Connector	No of Pins	Length (mm)	Description
Backplane cover exit hole	P1	2x12	90, turn 90°	Server Board Power Connector
	P2	2x4	184	Processor Power Connector
	P3	1x5	101	Power Signal Connector
	P4	1x3	406	SFP Power Connector
	P5	2x3	355	SFP Power Connector

Figure 45. Power Supply Cage Output Wire Harness Detail



7.2.3 P1 Server Board Power Connector

A 24-pin Molex* 39-01-2245 (or equivalent) connector and harness from the power supply cage provides the server board (J3K3) with the required voltages and interface signals. Table 48 shows the pinout.

Table 48. 24-pin Server Board Power Connector Pinout

Pin	Signal	Wire Color (18 AWG)	Pin	Signal	Wire Color (18 AWG)
1	+3.3 VDC	Orange	13	+3.3 VDC	Orange
2	+3.3 VDC	Orange	14	-12 VDC	Blue
3†	COM (GND)	Black	15	COM	Black
	COM	Black (24 AWG)			
4††	5 VDC	Red	16	PS_ON#	Green
	5V RS	Red (24 AWG)			
5	COM	Black	17	COM	
6	+5 VDC	Red	18	COM	Black
7†	COM	Black	19	COM	Black
	COM	Black (24 AWG)			
8	PWR OK	Gray	20	Reserved	NC
9†††	5VSB	Purple	21	+5 VDC	Red
	5VSB	Purple (24 AWG)			
10	+12 V3	Yellow/Blue Stripe	22	+5 VDC	Red
11	+12 V3	Yellow/Blue Stripe	23	+5 VDC	Red
12	+3.3 VDC	Orange	24	COM	Black

† COM wire double crimped
†† 5V Remote Sense wire double crimped
††† 5VSB wire double crimped

7.2.4 P2 Processor Power Connector

An 8-pin Molex 39-01-2085 (or equivalent) connector and harness from the power supply cage provides the server board (J3K4) with the required +12V power for the processors. Table 49 shows the pinout.

Table 49. P2 Processor Power Connector Pinout

Pin	Signal	Wire Color (18 AWG)	Pin	Signal	Wire Color (18 AWG)
1	COM	Black	5	+12 V1	Yellow/Black Stripe
2	COM	Black	6	+12 V1	Yellow/Black Stripe
3	COM	Black	7	+12 V2	Yellow/White Stripe
4	COM	Black	8	+12 V2	Yellow/White Stripe

7.2.5 P3 Power Signal Cable

A 5-wire cable with a Molex 50-57-9705 (or equivalent) female housing connector is used to direct power management signals to the server board (J3K1). Table 50 shows the pinout.

Table 50. P3 Power Signal Cable Pinout

Pin	Signal	24 AWG Wire Color	Description
1	SMBus Clock (SCL)	White/Green Stripe	Serial Clock
2	SMBus Data (SDL)	White/Yellow Stripe	Serial Data; information from the power supply
3	SMBAlert#	White	Indicates power supply is operating beyond its limits and has failed or may fail soon
4	COM	Black	Return remote sense
5	3.3RS	Orange/White Stripe	3.3V sense
Note:	If the server signal connector is unplugged, the PS/PDB-combo does not shut down or go into an OVP condition.		

7.2.6 P4 SFP Board Power Connector

A 3-wire cable with a Molex Mini-Fit Jr.* PN# 39-01-4031 (or equivalent) connector is used to provide power to the SAS Front Panel (SFP) board. Table 51 shows the pinout.

Table 51. P4 SFP Board Power Connector Pinout

Pin	Signal	22 AWG Wire Color
1	COM	Black
2	5V	Red
3	5V	Red

7.2.7 P5 SFP Board Power Connector

A 6-wire cable with a Molex Mini-Fit Jr. PN# 39-01-2065 connector is used to provide additional power to the SFP board.

Table 52. P5 SFP Board Power Connector Pinout

Pin	Signal	18 AWG Wire Color
1	COM	Black
2	COM	Black
3	5V	Red
4	12V4	Yellow
5	12V4	Yellow
6	3.3V	Orange

7.2.8 Output Current Requirements

Table 53 gives the +12V output power requirements from the Power Distribution Board (PDB) with one or two 600W PSUs plugged into the input of the PDB.

Table 53. +12V Outputs Load Ratings

	+12V1	**+12V2**	**+12V3**	**+12V4**
Maximum Load	16A	16A	16A	16A
Minimum Static/Dynamic Load	0A	0A	0A	0A
Peak Load (12 seconds)	18A	18A	18A	18A
Maximum Output Power	12V x 16A = 192W	12V x 16A = 192W	12V x 16A = 192W	12V x 16A = 192W
Notes: 1. The combined total power limit for all outputs is 580W maximum. 2. +12V1/2/3/4 combined output limit = 46.2A / 63A peak maximum.				

Table 54 gives the power and current ratings of the two DC/DC converters located on the PDB, each powered from the +12V rail. The converters meet both static and dynamic voltage regulation requirements for the minimum and maximum loading conditions.

Table 54. DC/DC Converters Load Ratings

	+12 VDC Input DC/DC Converters	
	+3.3V Converter	**+5V Converter**
Maximum Load	20A	26A
Minimum Static/Dynamic Load	0.5A	0.5A
Maximum Output Power	20A x 3.3V = 66W	26A x 5V = 130W
Note: 3.3V /5V combined power limit: 150W maximum.		

7.2.9 Hot Swapping Power Modules

Hot swapping a power supply module is the process of extracting and inserting a PSU from an operating system. The IP Network Server NSC2U power subsystem is capable of supporting hot swapping of power supply modules in a 1+1 configuration.

7.2.10 Intelligent Cage Functions

The PSU and Power Distribution Board (PDB) combination provides a monitoring interface to the system over a server management bus. The device is compatible with both SMBus 2.0 "high power" and I^2C Vdd-based power and drive. This bus may operate inside the PSU and PDB at 5V (powered from stand-by voltage), however, looking from the system server management into the PSU and PDB combination, it is compatible with the 3.3V bus. A bi-directional I^2C voltage translator is employed on the PDB. The SMBus pull-ups are located on the server board.

The PDB's I^2C bus has a dual function:

- provide PSU and PDB monitoring features
- conveys the stored FRU data in the PSU and PDB EEPROM

7.2.11 FRU Data

The power supply cage contains a 2 Kbyte EEPROM device that contains FRU data for the cage according to the IPMI specification. Each separate output is given a different number for identification purposes.

7.3 Power Supply Module Characteristics

The IP Network Server NSC2U can be configured with either AC-input or DC-input power supply modules, which have the same physical dimensions and share many of the same characteristics and specifications. Those common characteristics are described in this section before presenting specific details about the two different types of power supply module.

7.3.1 Power Supply Module to Cage Interconnect

The power supply provides a pluggable terminal block, which mates to a connector located at the PDB. This is a blind mating type connector that connects the power supply's output voltages and signals.

The power supply must be provided with a reliable protective earth ground, and all secondary circuits must be connected to that protective earth ground. Resistance of the ground returns to chassis must not exceed 1.0 mΩ. This path may be used to carry DC current.

Figure 46 shows the outline of the mating connector. Table 55 provides pinout information.

Figure 46. Power Supply Module Output Connector

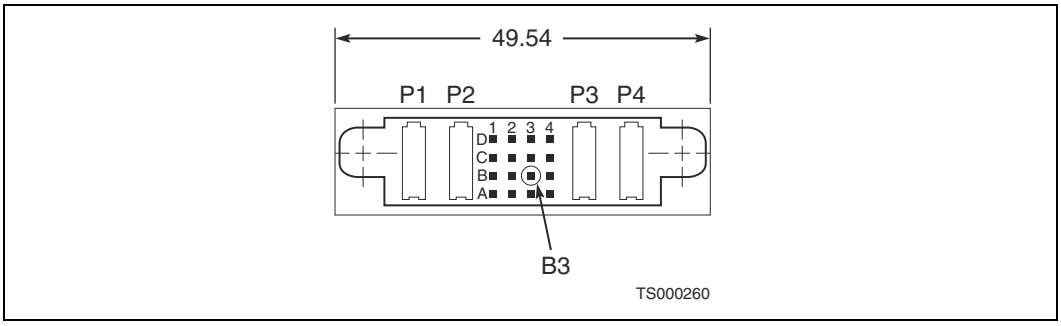


Table 55. Power Supply Module Output Connector Pinout

Signal Pins				
Position	**1**	**2**	**3**	**4**
D	+12VRDS	-12V	+5VSB	15VCC
C	PWOK	RS RTN	+5VSB	A0
B	+12VLS	RESERVE	PS KILL†	A1
A	PS ON#	SDA	SLC	PS ALERT#
† Signal pin B3 is shortened.				

Table 55. Power Supply Module Output Connector Pinout (Continued)

Power Blades				
P1	**P2**	**P3**	**P4**	
+12V	+12V	RTN	RTN	
† Signal pin B3 is shortened.				

7.3.2 Output Current Ratings

Each PSU provides three outputs: +12V, +5V standby, and -12V voltages. (The main +5V and 3.3V rails are generated by DC-to-DC converters on the PDB.) The combined maximum output power of all outputs is 600W (680W peak). Each output has a maximum and minimum current rating as shown in Table 56.

Table 56. PSU Load Ratings

	+12V	**+5V Standby**	**-12V**
Maximum Load	49.0A	2.0A	0.5A
Minimum Dynamic Load	2.5A	0.1A	0.0A
Minimum Static Load	0.5A	0.1A	0.0A
Peak Load (12 seconds minimum)	56.0A	2.5A	N/A
Maximum Output Power (continuous), see note 1	49A x 12 = 588W max.	2A x 5V = 10W max.	0.5A x 12V = 6W max.
Peak Output Power (for 12 seconds minimum), see note 2	56A x 12V = 672W peak	2.5A x 5V = 12.5W peak	N/A

Notes:

1. At maximum load, the output voltages are allowed to sag to -4%. For the 12V output, this results in 11.52V, so the actual maximum power will then be 11.52V x 49A = 564.5W. For the 5V standby output, the maximum load voltage can sag to 4.80V so the actual maximum power is 4.80V x 2A = 9.6W. The total maximum continuous power is therefore 564.5 + 9.6 = 571.4W.
2. At peak load, the output voltages are allowed to sag to -4%. For the 12V output, this results in 11.52V, so the actual maximum power will then be 11.52V x 56A = 645W. For the 5V standby output, the maximum load voltage can sag to 4.80V so the actual maximum power is 4.80V x 2.5A = 12W. The total maximum continuous power is therefore 645 + 12 = 657W.

7.3.3 Air Flow

Each power supply module incorporates a single 40 mm fan for self-cooling, which also contributes to overall system cooling. The PSU fan provides no less than 10 CFM airflow through the power supply when installed in the system and operating at maximum fan speed. The cooling air enters the power module from the PDB side (pre-heated air from the system). The fan's variable speed is based on output load and ambient temperature. Under standby mode, the fans run at minimum RPM.

7.3.4 Thermal Protection

Each PSU incorporates thermal protection that causes a shutdown if airflow through the PSU is insufficient. Thermal protection activates shutdown before the temperature of any PSU component passes the maximum rated temperature. This shutdown takes place prior to over-temperature induced damage to the PSU.

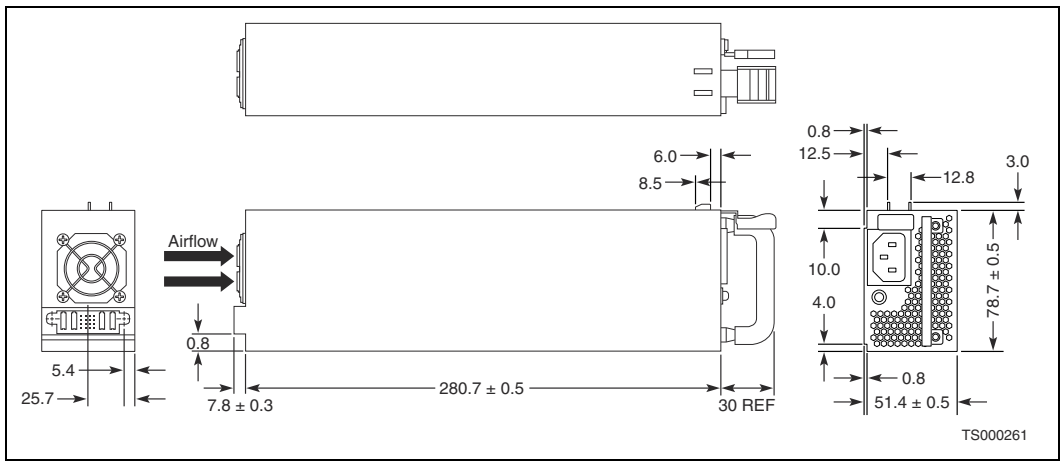
7.4 AC-input Power Supply Module

The AC-input power system supports one 600W SSI TPS (Thin Power Supply) module for a non-redundant configuration, or two in a 1+1 redundant configuration.

7.4.1 AC-Input PSU Mechanical Specification

Figure 47 shows the mechanical specification of the AC-input power supply module.

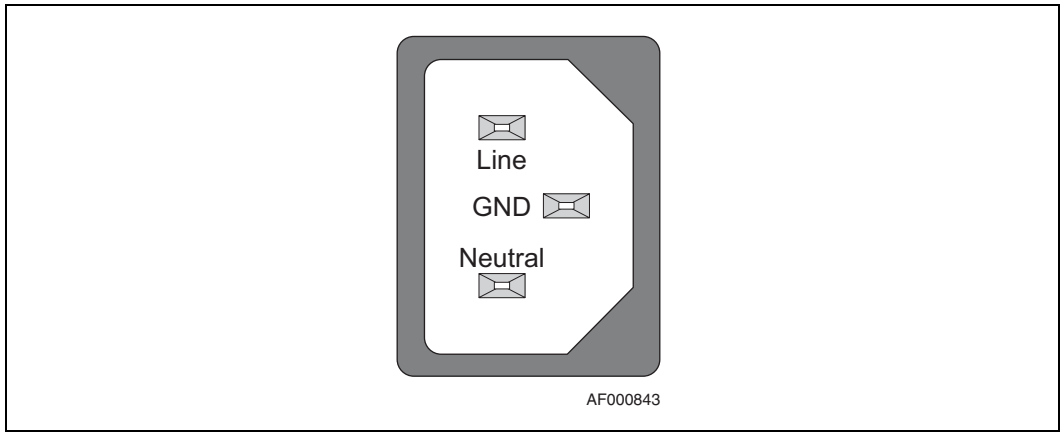
Figure 47. AC-Input Power Supply Module Mechanical Specification



7.4.2 AC-Input PSU Power Input Connector

Figure 48 shows the power input connector on the AC-input PSU.

Figure 48. AC-Input Power Supply Module Input Connector



7.4.3 AC-Input PSU LED Indicators

The AC-input PSU provides a single, external, bi-color LED to indicate the status of the power supply.

When AC is applied to the PSU and standby voltages are available, the LED blinks green.

The LED is solid green when all the power outputs are available.

The LED is solid amber when the PSU has failed or has shut down due to over-current or over-temperature.

Table 57 summarizes the AC-Input PSU LED indications.

Table 57. AC-Input PSU LED Indicators

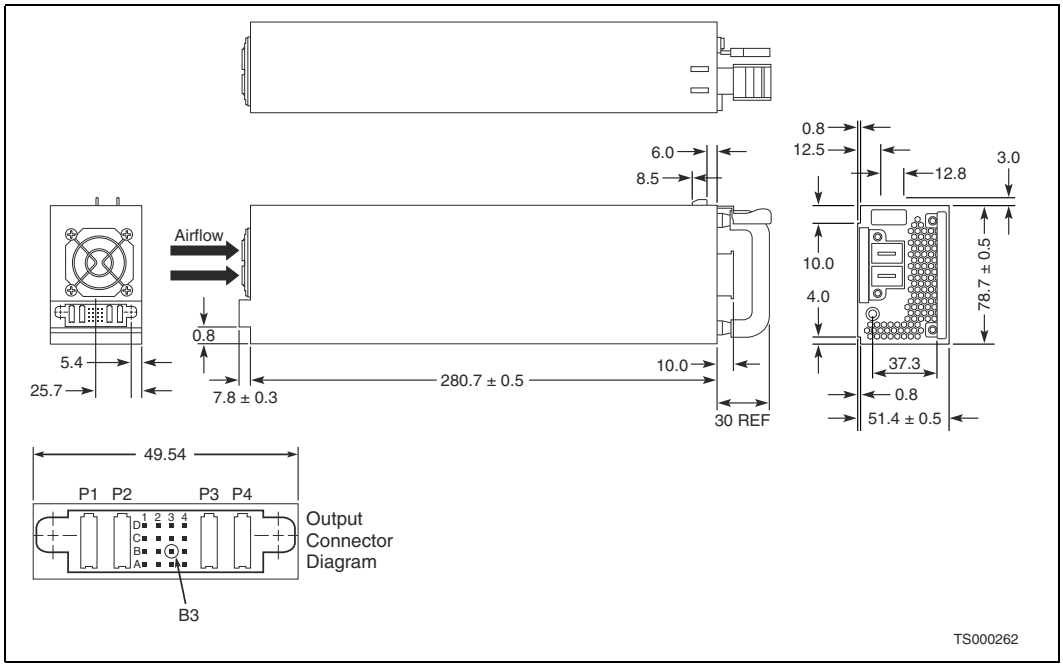
Bi-color LED Indication	Power Supply Condition
OFF	No AC input power to any power supply
Amber	No AC power input to this PSU only (for 1+1 configuration) or Power supply **critical event** causing a shutdown, such as: failure, fuse blown (1+1 only), OCP (12V), OVP (12V), fan failed
1 Hz Blinking Amber	Power supply **warning event**, but the power supply **continues to operate**, such as: high temp, high power/high current, slow fan
1 Hz Blinking Green	AC input present, only 5 Vsb on (volts standby on, PS switched off)
Green	Output on and OK

7.5 DC-input Power Supply Module

7.5.1 DC-Input PSU Mechanical Specification

Figure 49 shows the mechanical specification of the DC-input power supply module.

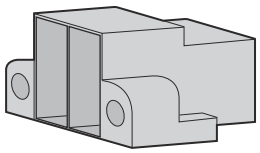
Figure 49. DC-Input Power Supply Module Mechanical Specification



7.5.2 DC-Input PSU Power Input Connector

Figure 50 shows the power input connector on the DC-input PSU.

Figure 50. DC-Input Power Supply Module Input Connector



7.5.3 DC-Input PSU LED Indicators

The DC-input PSU provides a single, external, bi-color LED to indicate the status of the power supply.

When DC is applied to the PSU and standby voltages are available, the LED blinks green.

The LED is solid green when all the power outputs are available.

The LED is solid amber when the PSU has failed or shut down due to over-current, or over-temperature.

Table 58 summarizes the DC-Input PSU LED indications.

Table 58. DC-Input PSU LED Indicators

Bi-color LED Indication	Power Supply Condition
OFF	No DC input power to any power supply
Amber	No DC power input to this PSU only (for 1+1 configuration) or Power supply **critical event** causing a shutdown, such as: failure, fuse blown (1+1 only), OCP (12V), OVP (12V), fan failed
1 Hz Blinking Amber	Power supply **warning event**, where the power supply **continues to operate**, such as: high temp, high power/high current, slow fan
1 Hz Blinking Green	DC input present, only 5 Vsb on (volts standby on, PS switched off)
Green	Output on and OK

8 Regulatory Specifications

The Kontron IP Network Server NSC2U system meets the specifications and regulations for safety and EMC defined in this chapter.

8.1 Safety Compliance

USA/Canada	UL 60950-1, 1st Edition/CSA 22.2
Europe	Low Voltage Directive, 73/23/EEC TUV/GS to EN60950-1, 1st Edition
International	CB Certificate and Report to IEC60950-1, 1St Edition and all international deviations

8.2 Electromagnetic Compatibility

USA	FCC 47 CFR Parts 2 and 15, Verified Class A Limit
Canada	IC ICES-003 Class A Limit
Europe	EMC Directive, 89/336/EEC EN55022, Class A Limit, Radiated & Conducted Emissions EN55024 Immunity Characteristics for ITE EN61000-4-2 ESD Immunity (level 2 contact discharge, level 3 air discharge) EN61000-4-3 Radiated Immunity (level 2) EN61000-4-4 Electrical Fast Transient (level 2) EN61000-4-5 Surge EN61000-4-6 Conducted RF EN61000-4-8 Power Frequency Magnetic Fields EN61000-4-11 Voltage Fluctuations and Short Interrupts EN61000-3-2 Harmonic Currents EN61000-3-3 Voltage Flicker
Australia/New Zealand	EN55022, Class A Limit
Japan	VCCI Class A ITE (CISPR 22, Class A Limit)
Taiwan	BSMI Approval, CNS 13438, Class A and CNS13436 Safety
Korea	RRL Approval, Class A
China	CCC Approval, Class A (EMC and Safety)
Russia	Gost Approval (EMC and safety)
International	CISPR 22, Class A Limit, CISPR 24 Immunity

8.3 CE Mark

The CE marking on this product indicates that it is in compliance with the European Union's EMC Directive 89/336/EEC, and Low Voltage Directive 73/23/EEC.

Appendix A: Glossary

This appendix contains important acronyms and terms used in the preceding chapters.

Term	Definition
A, Amp	Ampere
AC	Alternating current
ATA	Advanced Technology Attachment
AWG	American wire gauge
BIOS	Basic input/output system
BMC	Baseboard management controller
Bridge	Circuitry that connects one computer bus to another
Byte	8-bit quantity
C	Centigrade
CE	Community European
CFM	Cubic feet per minute
CISPR	International Special Committee on Radio Interference
CSA	Canadian Standards Organization
CTS	Clear to send
D2D	DC-to-DC
DC	Direct current
DDR	Dual Data Rate
DIMM	Dual inline memory module
DOSA	Distributed-power Open Standards Alliance
DPC	Direct Platform Control
DRAM	Dynamic random access memory
DSR	Data set ready
DTR	Data terminal ready
ECC	Error checking and correcting
EEPROM	Electrically erasable programmable read-only memory
EMC	Electromagnetic compatibility
EMP	Emergency management port
EN	European Standard (Norme Européenne or Europäische Norm)
ESD	Electrostatic discharge
F	Fahrenheit
FBD	Fully Buffered DRAM
FCC	Federal Communications Commission

Term	Definition
Flash ROM	EEPROM
FRB	Fault resilient booting
FRU	Field replaceable unit
G	Acceleration in gravity units, 1G = 9.80665 m/s^2
GbE	Gigabit Ethernet
GB, Gbyte	Gigabyte – 1024 Mbytes
GCM	
GND	Ground (Earth)
GPIO	General purpose input/output
Grms	Root mean square of acceleration in gravity units
HDD	Hard disk drive
HSC	Hot-swap controller
Hz	Hertz – 1 cycle/second
I/O	Input/output
I^2C	Inter-integrated circuit bus
IBBU	Intelligent Battery Backup Unit
ICMB	Intelligent Chassis Management Bus
IDE	Integrated drive electronics
IPMI	Intelligent Platform Management Initiative
ITE	Information technology equipment
Kbyte	Kilobyte – 1024 bytes
kV	Kilovolt – 1,000 volts
LAN	Local area network
LED	Light-emitting diode
mA	Milliampere
Mbyte	Megabyte – 1024 Kbytes
Mbps	Millions of bits per second
mm	Millimeter
MPS	Multiprocessor specification
mΩ	Milliohm
NIC	Network interface card
NMI	Nonmaskable interrupt
OEM	Original equipment manufacturer
OS	Operating system
OTP	Over-temperature protection
OVP	Over-voltage protection
PCI	Peripheral component interconnect
PCIe	PCI Express peripheral component interconnect
PLD	Programmable Logic Device
PnP	Plug and play
POST	Power-on Self Test

Term	Definition
PSU	Power supply unit
PWM	Pulse width modulation
RAID	Redundant Array of Independent Drives
RPM	Revolutions per minute
RTS	Request to send
SAS	Serial Attached SCSI
SCL	Serial clock
SCSI	Small Computer Systems Interface
SDR	Sensor data records
SDRAM	Synchronous dynamic RAM
SEL	System event log
SFP	SAS Front Panel
SGRAM	Synchronous graphics RAM
SM	Server management
SMBIOS	System management BIOS
SMBus	Subset of I2C bus/protocol (developed by Intel)
SSI	Server system infrastructure
TUV	Technischer Uberwachungs-Verein (A safety testing laboratory with headquarters in Germany)
UART	Universal Asynchronous Receiver/Transmitter
UL	Underwriters Laboratories, Inc.
USB	Universal Serial Bus
V	Volt
VA	Volt-amps (volts multiplied by amps)
Vac	Volts alternating current
VCCI	Voluntary Control Council for Interference
Vdc	Volts direct current
VGA	Video graphics array
VRM	Voltage regulator module
VSB	Voltage standby
W	Watt
Ω	Ohm