TS000581

Kontron CG2100 Carrier Grade Server

Document Revision 1.2

Revision History

Date	Revision Number	Modifications
03/25/2010	1.0	Final released version
04/19/2010	1.1	Updated Section 8.3.1
10/15/2010	1.2	Updated serial port from COM2 to COM1 throughout the document

Disclaimers

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This document provides detailed information about the Kontron CG2100 Carrier Grade Server, including information about the chassis hardware, cables, connectors, system boards, power subsystem, and regulatory requirements.

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Provides an overview of this document

Chapter 2:   **System Overview**
Provides an overview of the Kontron Carrier Grade Server CG2100 hardware

Chapter3:   **Cables and Connectors**
Describes the cables and connectors used to interconnect the system board set and the server system components

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Describes system compliance to regulatory specifications

Appendix A: **Glossary**
Provides definition of key terms used in this document

2. System Overview

This chapter provides an overview of the key features of the Kontron CG2100 Carrier Grade Server in the following sections:

Section 2.1:	**Introduction**	Provides an overview of the server features and a block diagram of the Kontron CG2100 Carrier Grade Server
Section 2.2:	**CG2100 Server External Chassis Features**	Describes the user-accessible features of the CG2100 server chassis in detail (buttons, switches, bezel, etc.)
Section 2.3:	**CG2100 Server Internal Chassis Features**	Provides an overview of the internal functional components of the CG2100 server
Section 2.4:	**CG2100 Server Platform Management**	Describes the server management features of the CG2100 server
Section 2.5:	**CG2100 Server Specifications**	Summarizes the environmental and physical specifications of the CG2100 server

2.1   Introduction

2.1.1   Kontron CG2100 Carrier Grade Server

The Kontron CG2100 Carrier Grade Server is a compact, high-density, rack-mount server with support for the Intel® Xeon® 5600 series processors and up to twelve DDR3 DIMMs. The CG2100 server supports high availability features such as hot-swappable and redundant power supply modules, hot-swappable and redundant fans, and up to six hot swappable 2.5" hard disk drives. The scalable architecture of the CG2100 server supports a variety of operating systems.

Figure 1 shows the CG2100 server completely assembled. Figure 2 shows the CG2100 server with the top covers and the front bezel removed.

Figure 1. Kontron Carrier Grade Server CG2100 (Top Covers On)
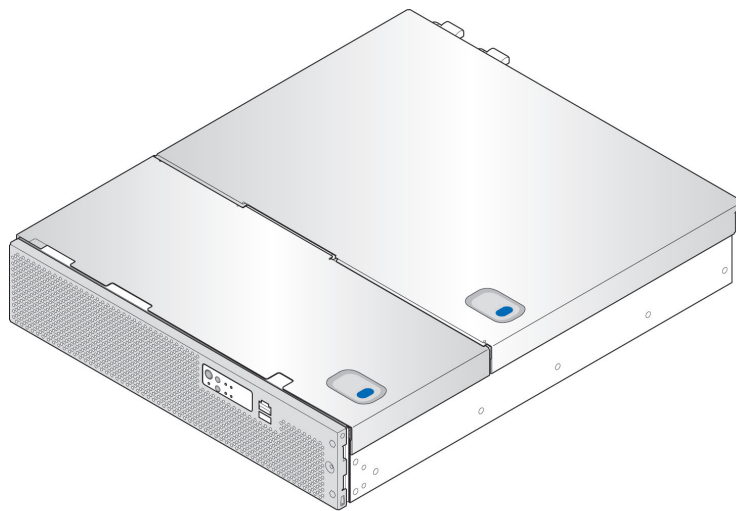
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Figure 2. Kontron CG2100 Carrier Grade Server (Covers and Front Bezel Removed)
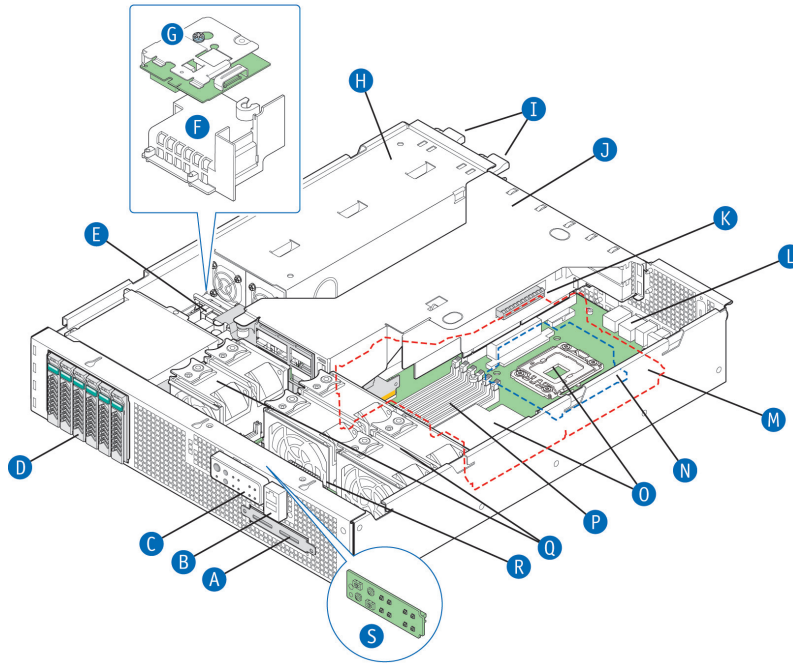
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Item	Description	Item	Description
A	SD flash modules	K	PCI riser options: 3x PCIe, 5x PCIe butterfly, or 2x PCI-X +3x PCIe butterfly
B	RJ45 COM1 port and USB port (2 connectors)	L	Rear I/O modules
C	Control panel and status/alarm indicators	M	Intel® Server Board T5520UR (baseboard)
D	SAS or SATA hard disk drives (up to six)	N	DDR3 memory DIMM sockets (CPU 1 DIMM slots shown
E	Power distribution board and SAS/SATA module location	O	Two CPUs (CPU 1 shown)
F	Power distribution board (PDB)	P	DDR3 memory DIMM sockets (CPU 2 DIMM slots shown)
G	SAS/SATA control module or SAS/SATA RAID module	Q	System fans
H	Power supply cage for two power supply modules	R	Front panel board with optional SD flash module and TAM module
I	Redundant hot-swappable power supply modules	S	LED/switch board and telco alarm LEDs
J	Riser card assembly (containing both full-height and low-profile adapter and riser cards)		

2.1.2   CG2100 Server Feature Summary

Table 1 lists the features of the CG2100 server.

Table 1. CG2100 Server Feature List

Feature	Description
Peripheral Interfaces	**External connections:** DB-15 video connector (rear) DB-15 alarms connector (rear) RJ45 COM1 serial Port connector (front or rear) Two RJ45 10/100/1000 Mb network connections (rear) Four USB 2.0 connectors (rear) One USB 2.0 connector (front) **Internal connections:** Two low-profile USB 2x5-pin headers for low-profile USB solid state drives, such as the SMART Embedded USB Solid State Drive. One header is located on the front panel board and the other header is on the baseboard. Six Serial ATA (SATA) II connectors Two I/O personality module connectors One RMM3/GCM4 connector for an optional Intel® Remote Management Module 3
Video	On-board ServerEngines* LLC Pilot II Controller Integrated 2D Video Controller 32 MB DDR2 Memory
LAN	Two 10/100/1000 Intel® 82575 PHYs

Expansion Capabilities	Riser card options:
	Three full-height PCI Express* slots (passive)
	Five-slot PCI-X riser:
	  Two full-height PCI-X slots with on-board PCI Express to PCI-X bridge chips
	  One full-height PCI Express slot and two low-profile PCI Express slots
	Five-slot PCI Express riser:
	  Three full-height PCI Express slots and two low-profile PCI Express slots

Hard Drive Options	Up to six 2.5-inch SAS or SATA hard drives SAS/SATA backplane board drive controller
Peripherals	PCI riser card assembly bracket
Front Panel Buttons	Power on/off System reset Chassis ID NMI
Front Panel LEDs	Power status Chassis identification System status Fan status HDD activity/fault NIC activity Alarms (Critical, Major, Minor, Power)
Power Supply	Up to two 600-W power supply modules (AC or DC)
Fans	Four hot-swappable, redundant CPU/memory area cooling fans Two hot-swappable, redundant PCI area cooling fans Two redundant power supply fans (with PS redundancy configuration only)
System Management	On-board ServerEngines* LLC Pilot II Controller Integrated Baseboard Management Controller (Integrated BMC), IPMI 2.0-compliant Integrated Super I/O on LPC interface

The CG2100 T5520UR server board is mounted horizontally toward the rear of the chassis behind the CPU/memory area fan array.

Up to six 2.5-inch hot-swappable SAS/SATA technology hard drives can be mounted in the drive bays, which are accessed from the front of the chassis with the front bezel removed. Figure 2 shows the location of the drive bays.

The Front Panel (FP) board and LED/switch board, which provide the user interface for the system, are located in front of the CPU fans.

The power supply modules are installed at the rear of the chassis. Up to two hot-swappable 600W power supply modules can be installed for a 1+1 redundant configuration. A filler module for the empty power supply slot is supplied and must be installed for systems without redundancy. The left slot (looking from the front of the system) is the non-redundant power supply module location.

The server contains four 80x38mm and two 60x38mm redundant, hot-swappable fans to cool the T5520UR server board and other components. These fans are installed directly behind the front panel board and in front of the T5520UR server board. The four 80 x 38mm fans are powered and controlled from the 2x12-pin connector located on the front panel (FP) board. The two 60 x 38mm fans are powered and controlled from the 2x8-pin connector located on the FP board. Fan failures are indicated by a fault LED on the fan carrier. Each fan has its own separate carrier.

The front bezel design allows adequate airflow to cool the system components and it can be customized to meet OEM industrial design requirements. The bezel has to be removed to access the drive carriers in the hard drive bays and the optional SD flash modules.

Figure 3 shows a block diagram of the CG2100 server I/O subsystems.

Figure 3. CG2100 Server Block Diagram
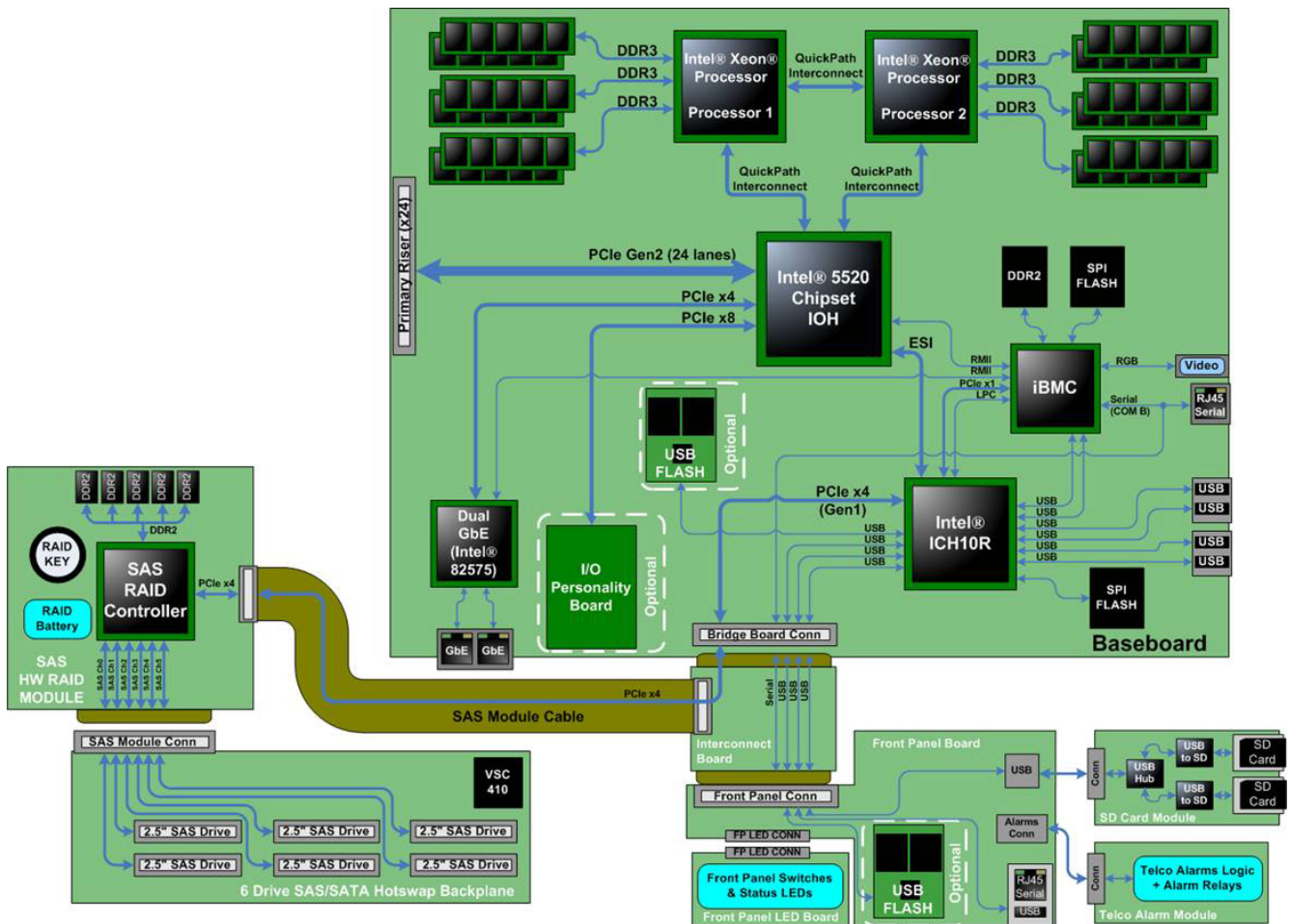
2.2   CG2100 Server External Chassis Features

2.2.1   Chassis -- Front Views

Figure 4 shows the front of the CG2100 server with the bezel installed. Figure 5 shows the front of the server with the bezel removed. Removing the bezel provides access to the hard drive bays and SD card modules.

Figure 4. Front View of the CG2100 Server (Bezel Installed)

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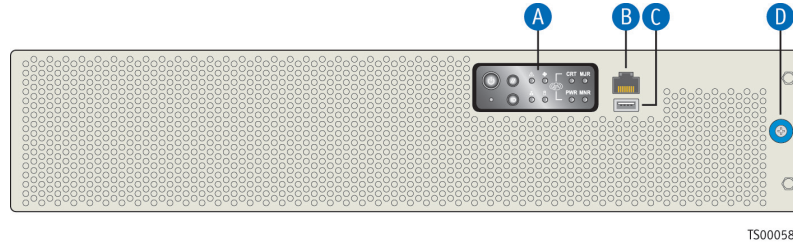
Item	Description	Item	Description
A	Front panel control buttons, status indicator and telco alarm LEDs	**C**	USB port
B	RJ45 COM1 port	**D**	Bezel captive screw

Figure 5. Front View of CG2100 Server (Bezel Removed)

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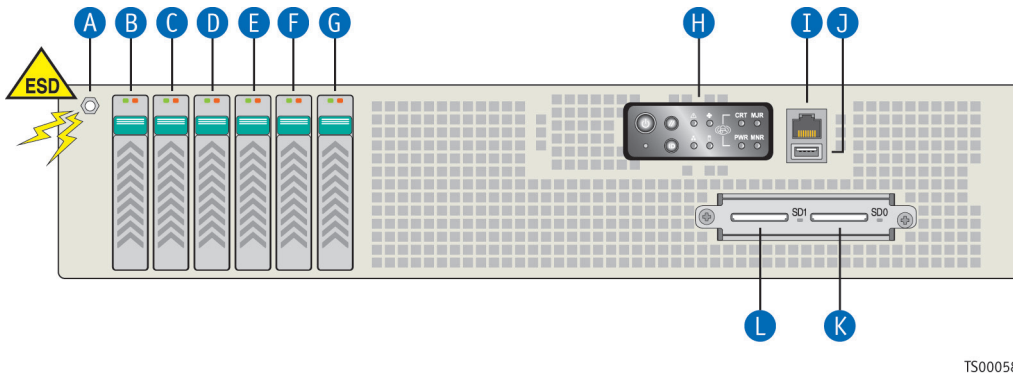
Item	Description	Item	Description
A	ESD ground strap attachment	**G**	Hard drive bay 0
B	Hard drive bay 5	**H**	Front panel control buttons, status indicator and telco alarm LEDs
C	Hard drive bay 4	**I**	RJ45 serial port (COM1/serial A)
D	Hard drive bay 3	**J**	USB port
E	Hard drive bay 2	**K**	SD flash module 0 (optional)
F	Hard drive bay 1	**L**	SD flash module 1 (optional)

2.2.2   Front Panel

The front panel features are shown in Figure 6. All front panel switches and status LEDs are located on the LED/switch board. See Section 5.2 "LED/Switch Board Features" for a detailed description of the control switches and status LEDs contained on the front panel.

Figure 6: Front Panel Details

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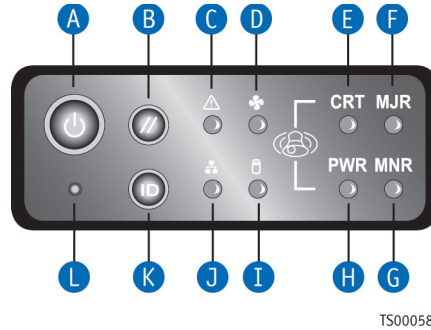
Item	Description	Item	Description
A	Power button	**G**	Minor alarm (amber)
B	System reset button	**H**	Power alarm (amber)
C	Chassis information LED	**I**	HDD activity LED
D	Fan status LED	**J**	NIC1/NIC2 activity LED
E	Critical alarm (amber or red†)	K	Chassis ID button
F	Major alarm (amber or red†)	L	NMI button

† Critical and Major alarm indicators are bi-color LEDs that can be configured to be yellow or red by means of an SDR TAM setting. Yellow is the default color.

2.2.3   Hard Drives

The CG2100 Carrier Grade Server chassis supports up to six hard disk drives in the drive bays, which are accessible from the front of the chassis. SAS or SATA 2.5-inch hard disk drives are mounted in removable drive carriers (Figure 7, "A") that latch into the drive bay sub-assembly. The hard disk drives installed in the carriers are hot-swappable.

The front bezel must be removed to access the hard disk drive bays.

Figure 7: Hard Disk Drives
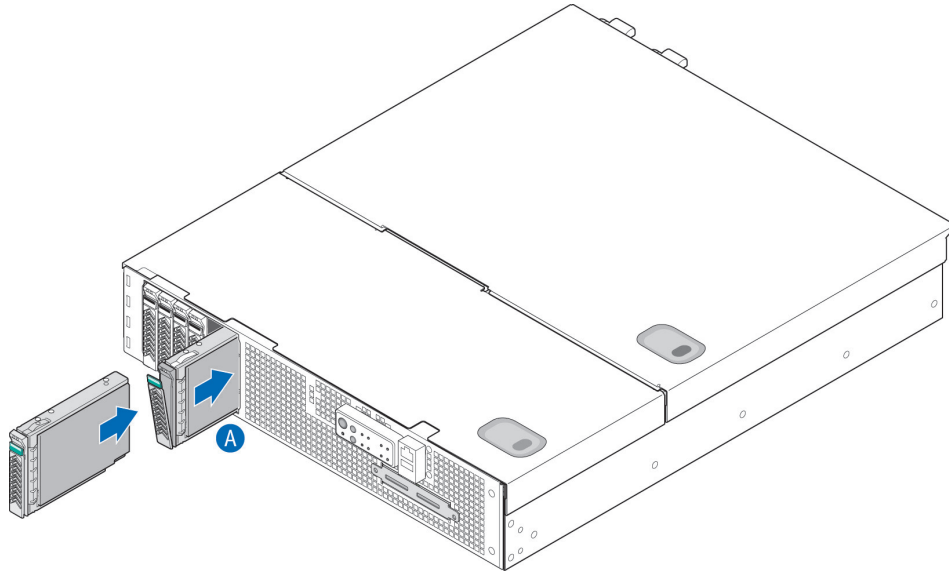
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2.2.3.1   SAS/SATA Hard Drive Carriers

Each hard drive used in the server must be mounted to a drive carrier (A) using four screws (B) inserted into the sides of the drive as shown in Figure 8.

Figure 8: SAS/SATA Hard Drive Tray Assembly
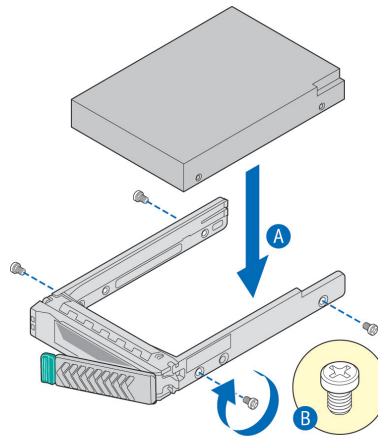
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2.2.4   Chassis -- Rear View

Figure 9 shows the rear of the CG2100 Server chassis.

Figure 9: Chassis Rear View
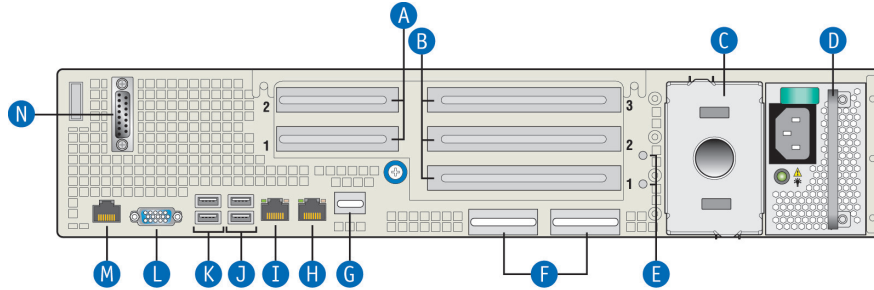
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Item	Description	Item	Description
A	Two low-profile PCIe add-in cards (or filler panels)	H	GbE NIC #2 connector
B	Three full-length PCI-X / PCIe add-in cards (or filler panels)	I	GbE NIC #1 connector
C	Power supply 2 (optional, filler panel shown[1)])	J	USB 2 and 3 (#3 on top)
D	Power supply 1 (AC power supply shown)	K	USB 0 and 1 (#1 on top)
E	[1]Two ground studs (used for DC-input system)	L	Video connector
F	Two personality card slots (for I/O expansion modules) [2]	M	RJ45 COM1 serial port
G	RMM3/GCM4 NIC connector [3]	N	Alarms cable connector

NOTES:
1: Figure 9 shows the AC configuration. Items C and D can also be configured for DC operation. The filler panel is mandatory in non-redundant configurations.
2: Only one personality card can be installed at any time. These slots can be used for an optional Gbit Ethernet port or an external SAS port. Dual- and four-port 10/100/1000 Ethernet modules use both openings. A four-port external SAS module uses only one opening. If neither option is installed, filler panels occupy these slots.
3. If RMM3/GCM4 NIC is not used, the filler panel occupies this space

2.3   CG2100 Server Internal Features

2.3.1   Intel® T5520UR Server Board (the Baseboard)

NOTE: See the *Intel® S5520UR Server Board Technical Product Specification* on the Kontron website for detailed information about the baseboard used in this server.

Figure 10 T5520UR Server Board
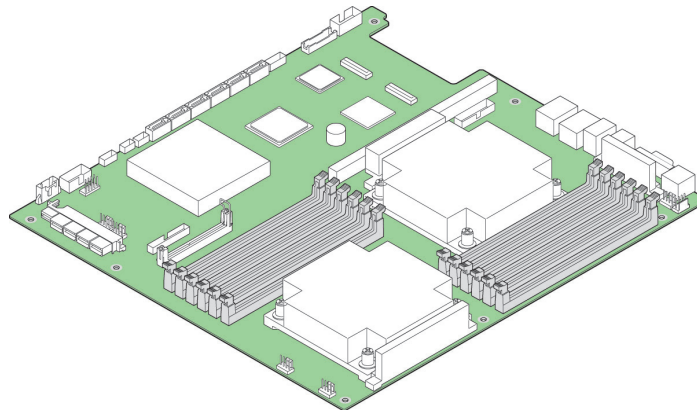
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2.3.2 PCI Riser Card Assembly

The PCI riser card assembly houses one of three different PCI riser card options, as defined in Chapter 11, "PCI Riser Card Assembly".
One of the three riser cards, along with the appropriate PCI adapter cards, is assembled into the sheet metal housing when the assembly is removed from the chassis.

Figure 11 shows the installation or removal of the riser card assembly. Blue touch points (A) are provided on the top of the assembly for mating the riser card to the baseboard once the assembly has been aligned on the chassis guide pins. Guide forks and a guide hole in the sheet metal tab on the front of the assembly help align the riser assembly with the alignment pins (B). A captive screw secures the riser assembly in the chassis. The hole/tab on the front of the riser card assembly aligns with the guide pin on the baseboard (C).

Figure 11. Riser Card Assembly
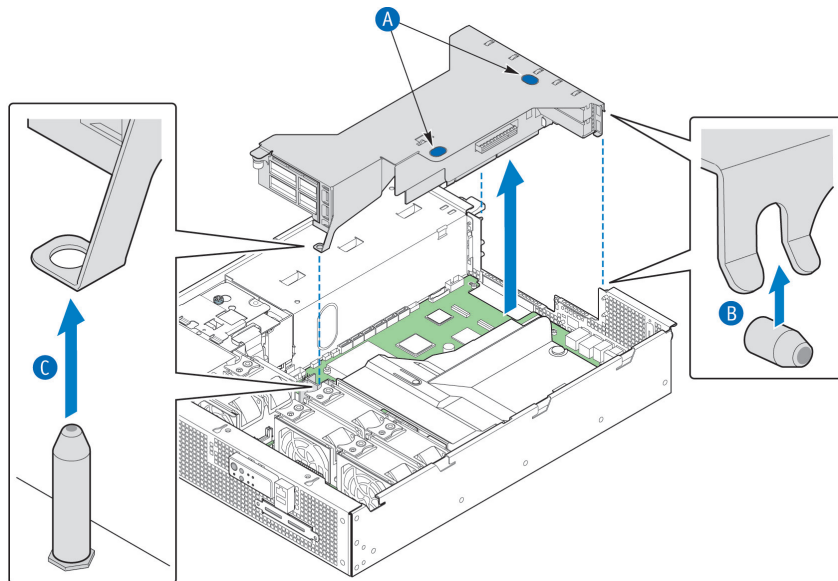
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Figure 12 shows the configuration options for the riser card assembly.

Figure 12. Riser Card Configurations
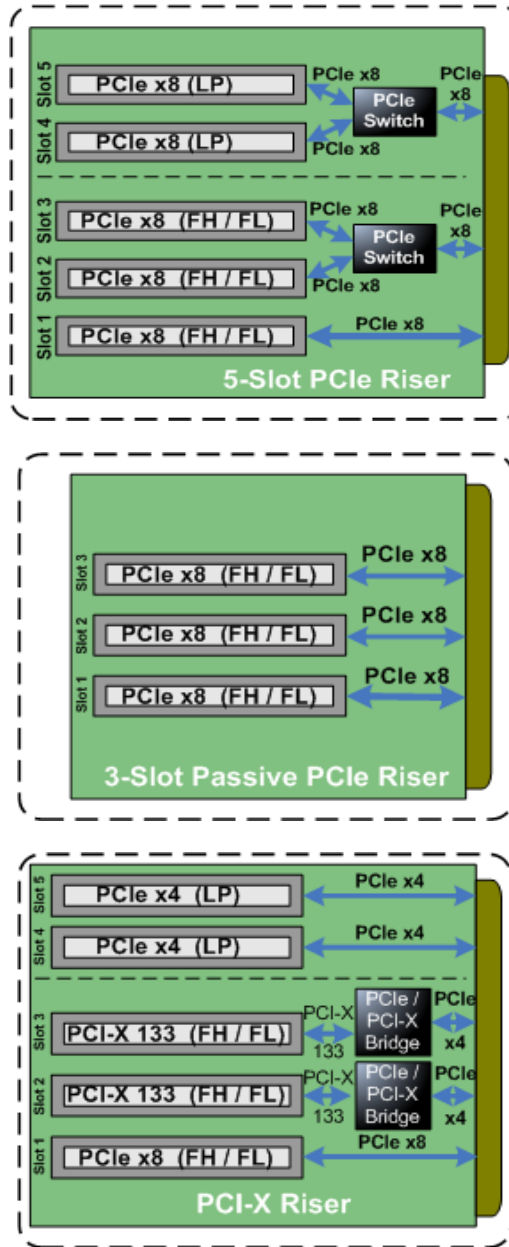
2.3.3   Cooling Subsystem

All system components except the power distribution board and power supplies are cooled by a set of fans mounted near the middle of the chassis behind the front panel board, as shown in Figure 13

Figure 13. Cooling Subsystem
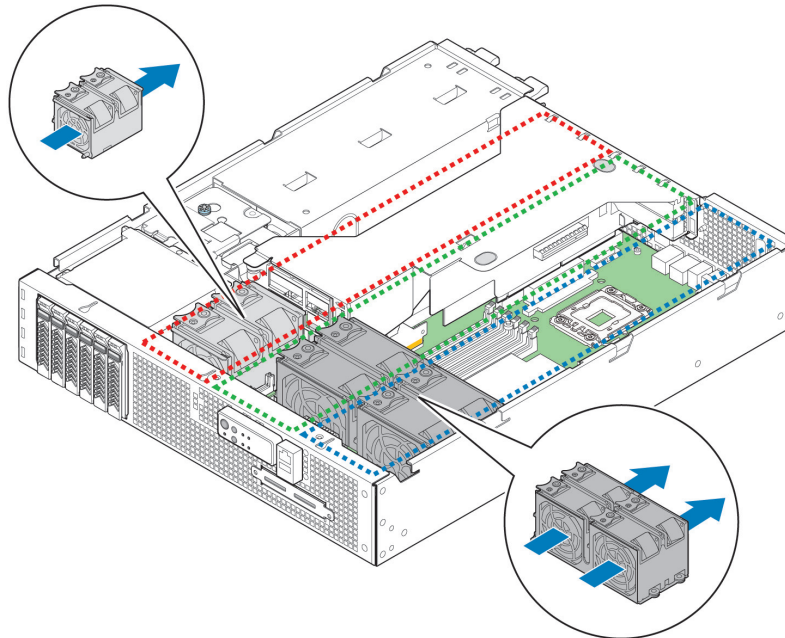
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The CG2100 server has redundant six-fan cooling with four 80x38mm fans and two 60x38mm fans. There are three main cooling zones, as shown in Figure 13:

- Zone 1 (blue) contains fans 1 and 2, which cool CPU1 and all the components in this zone.
- Zone 2 (green) contains fans 3 and 4, which cool CPU2, low-profile PCI cards, and all the other components in this zone.
- Zone 3 (red) contains fans 5 and 6, which cool full-height/length PCI cards and all the other components in this area.

A fourth zone is cooled by the power supply fans. This zone contains the SAS RAID and SAS/SATA boards. Cooling redundancy in this zone is only achieved when there are two power supplies installed.

Air flows through the front bezel, over the system components, and exhausts through the rear of the chassis, as illustrated by the arrows in Figure 13. A plastic air duct directs air over the CPUs and memory area of the baseboard, i.e., cooling zones 1 and 2. The riser card, its sheet metal bracket, a plastic air duct between the fans and PCI subassembly, and the power supply cage form the air duct for the PCI area cooling zone 3. The power supply cage and the internal 60mm fans form the air duct for the SAS RAID or SAS/SATA controller board, power distribution board, and power supplies, i.e., cooling zone 4. Each fan provides tachometer signal output to the T5520UR server board to indicate the fan speed and to enable fan failure detection.

2.3.3.1 Ambient Temperature Control

The T5520UR server board contains three separate pulse-width-modulation (PWM) circuit domains that control the speed of the six system fans. PWM fan speed control enables quiet system operation when the ambient temperature is low and there are no fan failures. Domain 0 controls fans 1 and 2, domain 1 controls fans 3 and 4, and domain 2 controls fans 5 and 6.

2.3.3.2 Cooling Summary

The six-fan cooling subsystem is sized to provide cooling for:

- Up to two processors
- 96 Gbytes of DDR3 DIMM memory
- Six hard drives
- Five PCI cards

The cooling subsystem meets 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 Chapter15, "Regulatory Specifications".

2.4   CG2100 Server Platform Management Subsystem

Refer to the *Intel® S5520UR Server Board Technical Product Specification* for a detailed description of the Platform Management design and features.

The platform management subsystem is based on the Integrated Baseboard Management Controller (BMC) features of the ServerEngines* Pilot II. The on-board platform management subsystem consists of communication buses, sensors, system BIOS, and server management firmware.

The platform management system supports standard IPMI features as well as other features not part of IPMI.

2.4.1   IPMI 2.0 Features

The IPMI features are:

- Integrated Baseboard Management Controller (Integrated BMC)
- IPMI Watchdog timer
- Messaging support, including command bridging and user/session support
- Chassis device functionality, including power/reset control and BIOS boot flags support
- Event receiver device: the Integrated BMC receives and processes events from other platform subsystems
- Field replaceable unit (FRU) inventory device functionality: the Integrated BMC supports access to system FRU devices using IPMI FRU commands
- System event log (SEL) device functionality: the Integrated BMC supports and provides access to a SEL
- Sensor device record (SDR) repository device functionality: The Integrated BMC supports storage and access of system SDRs
- Sensor device and sensor scanning/monitoring: the Integrated BMC provides IPMI management of sensors by polling sensors to monitor and report system health
- IPMI interfaces
- Host interfaces include system management software (SMS) with receive message queue support, and server management mode (SMM)
- Terminal mode serial interface
- IPMB interface
- LAN interface supporting the IPMI-over-LAN protocol (RMCP, RMCP+)
- Serial-over-LAN (SOL)
- Advanced Configuration and Power Interface (ACPI) state synchronization: the Integrated BMC tracks ACPI state changes provided by the BIOS
- Integrated Baseboard Management Controller (Integrated BMC) self test: the Integrated BMC performs initialization and run-time self tests, and makes results available to external entities. (For more information, see the IPMI 2.0 Specification.)

2.4.2   Non IPMI Features

The Integrated BMC also supports the following non-IPMI features.

NOTE: This list does not preclude support for future enhancements or additions.

- In-circuit Integrated BMC firmware update.
- Fault resilient booting (FRB): FRB2 is supported by the watchdog timer functionality
- Chassis intrusion detection and chassis intrusion cable presence detection (rear cover only).
- Basic fan control using TControl version 2 SDRs
- Fan redundancy monitoring and support
- Power supply redundancy monitoring and support
- Hot-swap fan support
- Acoustic management: support for multiple fan profiles
- Signal testing support: test commands for setting and getting platform signal states
- Diagnostic beep codes: the Integrated BMC generates diagnostic beep codes for fault conditions
- System GUID storage and retrieval
- Front panel management: the Integrated BMC controls the system status LED and chassis ID LED. It supports secure lockout of certain front panel functionality and monitors button presses. The chassis ID LED is turned on using a front panel button or a command.
- Power state retention
- Power fault analysis
- Intel® Light-Guided Diagnostics
- Power unit management: support for power unit sensor. The Integrated BMC handles power-good dropout conditions.
- DIMM temperature monitoring: new sensors and improved acoustic management using a closed-loop fan control algorithm that takes into account DIMM temperature readings
- Address Resolution Protocol (ARP): the Integrated BMC sends and responds to ARPs (supported on embedded NICs)
- Dynamic Host Configuration Protocol (DHCP): the Integrated BMC performs DHCP (supported on embedded NICs)
- Chassis intrusion fan interactions
- Platform environment control interface (PECI) thermal management support

2.5   CG2100 Server Specifications

This section lists the environmental and physical specifications for the CG2100 server.

2.5.1   Environmental Specifications

The CG2100 server is designed and tested to meet the environmental specifications in Table 2.

Table 2: Environmental Specifications Summary

Environment	Specification
Temperature, operating	+5°C to 40°C (41° F to 104° F)
Temperature, non-operating	-40° C to 70° C (-40 F to 158° F)
Temperature, short-term	-5C to 55C* *Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year. (This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that one-year period.)
Humidity, non-operating	95%, non-condensing at temperatures of 23° C (73° F) to 40° C (104° F)

Environment	Specification
Altitude	0 to 1800m (0 to 5905 ft) @ 40C max. 0-4000m (0-13,123 ft) @ 30C
Vibration, non-operating	Random profile: as per *Intel® 25-GS0009 Boards and Systems Environmental Standards Governing Spec* 5Hz @ 0.001g^2/Hz to 20Hz @ 0.01g^2/Hz (slope up) 20Hz to 500Hz @ 0.01g^2/Hz (flat) Input acceleration is 2.20g RMS 10 min. per axis, in all 3 axes, on all samples Random control limit tolerance in +/- 3dB
Shock operating	Half-sine 2G, 11 ms pulse, 100 pulses in each direction, on each of the three axes, as per the *K00158 CRMS Environmental Standards Specification*
Shock non-operating	Trapezoidal, 25G, 205 inches/sec delta V, two drops in per face, (total 12 drops), as per the *K00158 CRMS Environmental Standards Specification*
Electrostatic discharge (ESD)	Tested ESD levels up to 12kV (kilovolts) air discharge and up to 8kV contact discharge without physical damage, as per the *K00158 CRMS Environmental Standards Specification*
Acoustic	Sound power: 7B max at ambient temperatures < 23 +/-2°C measured as per the *K00158 CRMS Environmental Standards Specification*
RoHS	Complies with RoHS Directive 2002/95/EC and RoHS 6/6

2.5.2   Physical Specifications

Table 3 describes the physical specifications of the CG2100 system.

Table 3. Physical Dimensions & Weight (Max)

Height	3.45 inches (87.6 mm)
Width	17.14 inches (435.3 mm)
Depth	20 inches (508mm)
Front clearance	2 inches (76 mm)
Side clearance	1 inch (25 mm)
Rear clearance	3.6 inches (92 mm)
Weight (unpackaged)	38 lb (17 kg)

3. Cables and Connectors

This chapter describes interconnections among the various components of the Kontron CG2100 Carrier Grade Server with overview diagrams as well as tables describing the signals and pin-outs for the system connectors. Refer to the *Intel*® *Server Board S5520UR Technical Product Specification* or the 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 three sections:

Section 3.1:	**Interconnect Block Diagram** Provides an overview of system interconnects
Section 3.2:	**Cable and System Interconnect Descriptions** Provides a list of all the connectors and cables in the system
Section 3.3:	**User-Accessible Interconnects** Describes the form-factor and pin-out for user-accessible interconnects

3.1   Interconnect Block Diagrams

Figure 14 shows all of the system level cabled interconnections. Each cable is identified and defined in Table 4.

Figure 14: CG2100 Server Interconnect Block Diagram
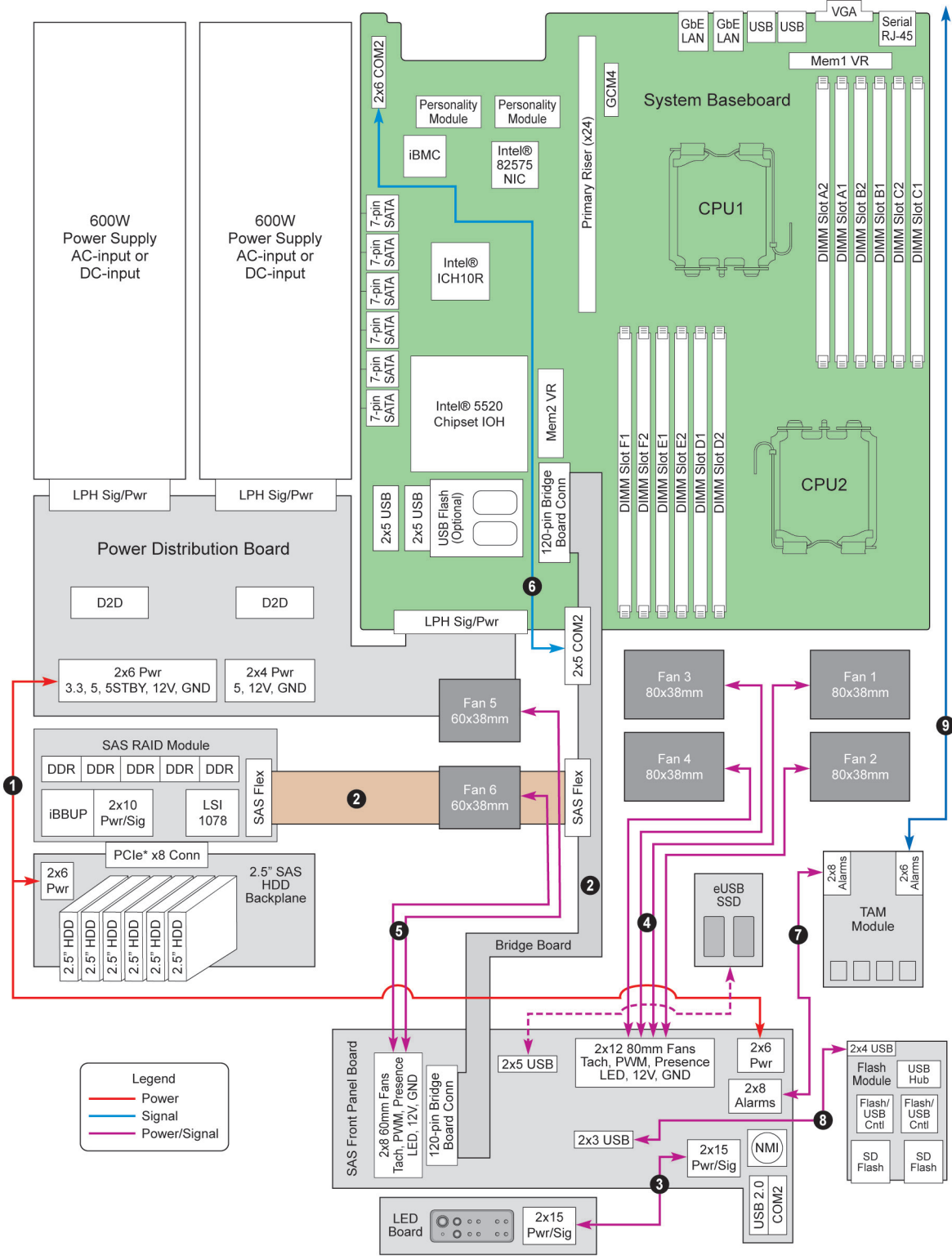
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Table 4 System Cables

Cable Number and Name	End 1 Connection	End 2 Connection	End 3 Connection
1: Power distribution	Power distribution board	SAS/SATA backplane	Front panel board
2: Flex Circuit / Bridgeboard Assembly	SAS/SATA RAID module	Baseboard	Front panel board
3: LED/Switch Board Power and Signal	Front panel board	LED/switch board	
4: 80mm Fan Power and Signal	Front panel board	Ganged cable to 4 fans	
5: 60mm Fan Power and Signal	Front panel board	Ganged cable to 2 fans	
6: Serial Port (COM1)	Bridge board	Baseboard	
7: TAM Front Panel	TAM Module	Front Panel Board	
8: USB SD Flash	SD Flash Card	Front Panel Board	
9: Alarms Cable	TAM Module	Chassis Rear Panel	

3.2   Cable and System Interconnect Descriptions

3.2.1   Power Distribution Cable

The power distribution cable interconnects the power distribution board and the SAS/SATA backplane for power only. The physical details of this cable are shown in Figure 15.

Figure 15. Power Distribution Cable Mechanical Drawing
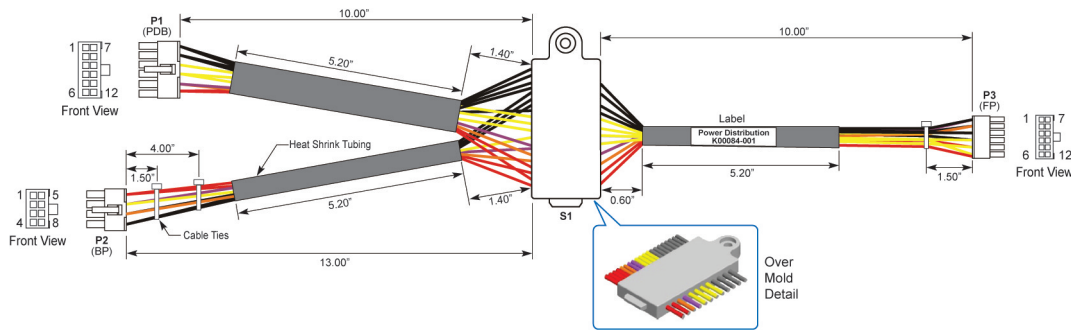
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3.2.2   Flex Circuit / Bridgeboard Assembly

The flex circuit/bridgeboard assembly is an impedance-controlled conduction path that connects the SAS/SATA control module or SAS/SATA RAID module to the baseboard to provide the SAS/SATA signal path between the HDDs and the baseboard. The bridge board connects the front panel board to the baseboard to pass fan tachometer and drive signals to/from the baseboard to the front panel. Figure 16 shows the physical details of the flex circuit/bridgeboard assembly.

Figure 16. Flex Circuit/Bridgeboard Assembly
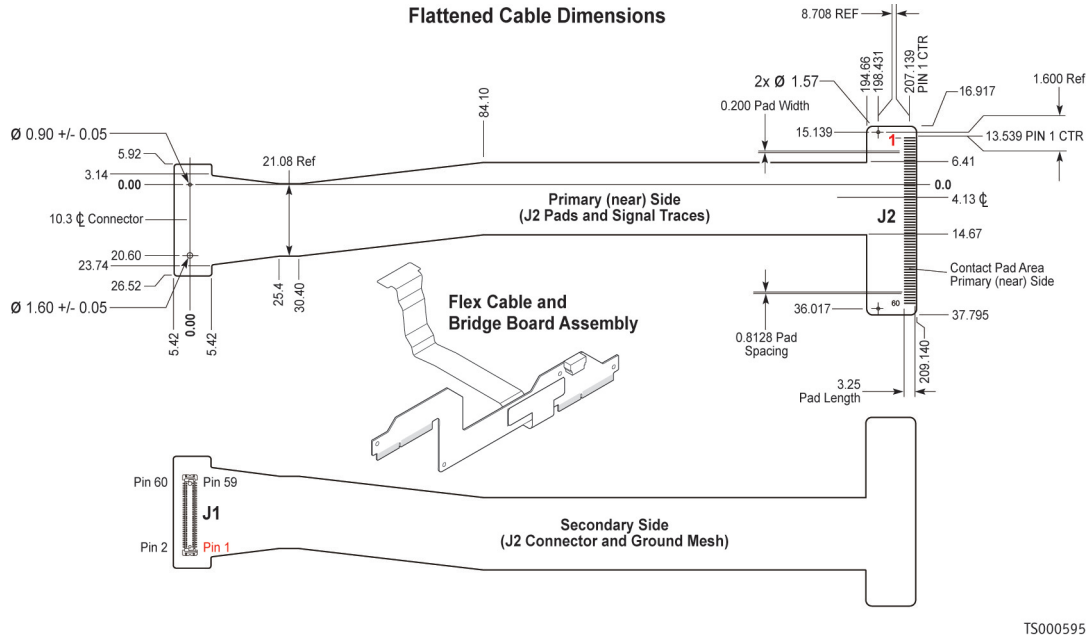
3.2.3 LED/Switch Board Power and Signal Cable

The LED/switch board power and signal cable connects the LED/switch board to the front panel board. Figure 17shows the physical details of the LED/switch board cable.

Figure 17. LED/Switch Board Power and Signal Cable Mechanical Drawing
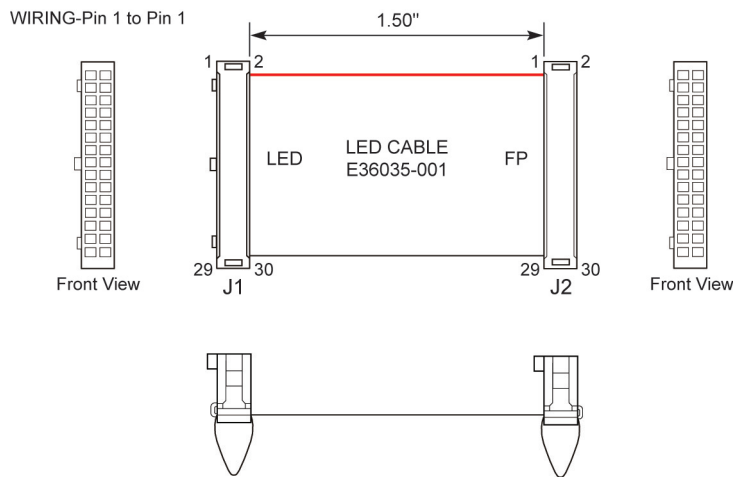
3.2.4 80mm Fan Power and Signal Cable

The 80mm fan power cable connects the CPU cooling fans to the front panel board. The physical details of the 80mm fan cable are shown Figure 18.

Figure 18. 80mm Fans Power and Signal Cable Mechanical Drawing
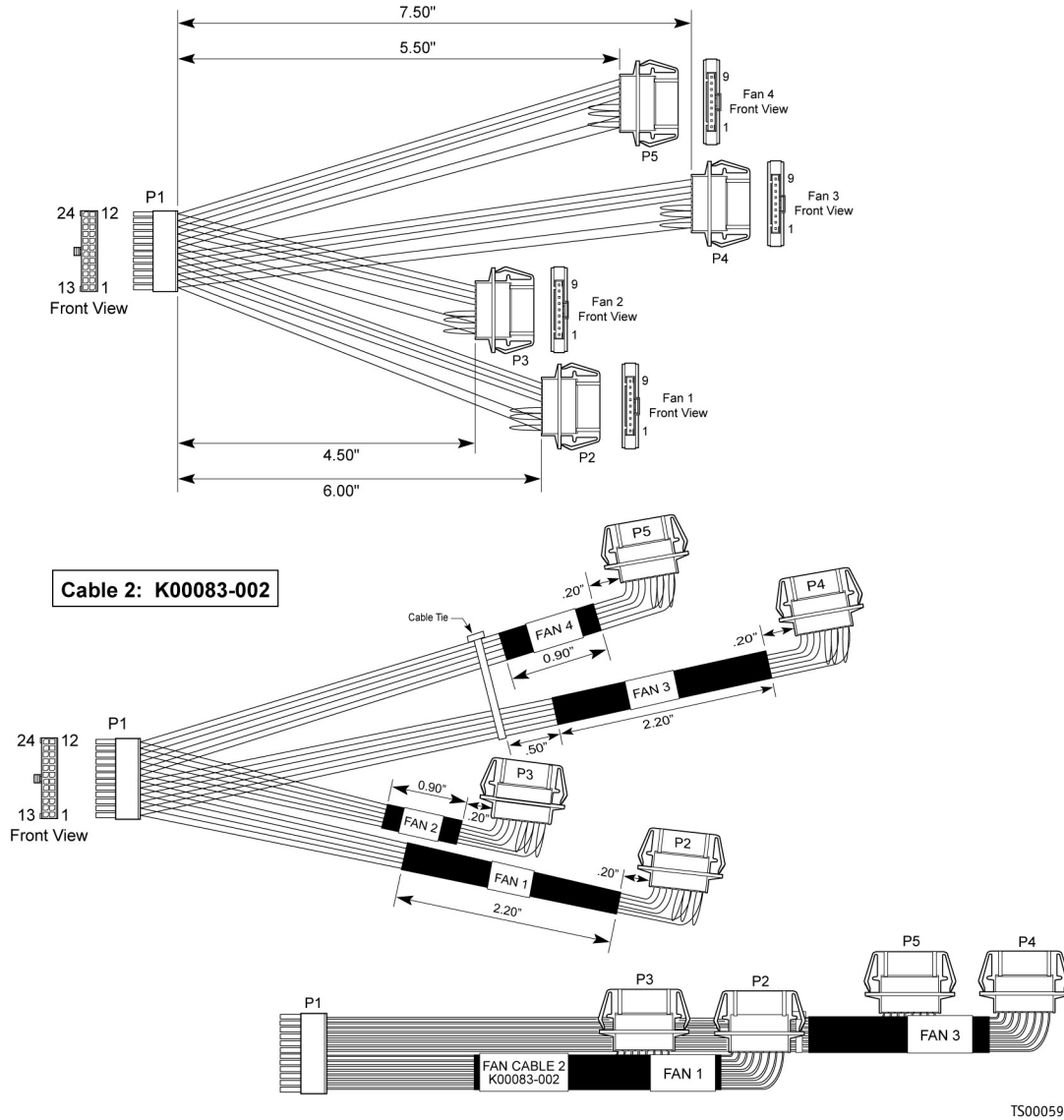
3.2.5   60mm Fan Power Cable

The 60mm fan power cable connects the PCI cooling fans to the front panel board. The physical details of the 60mm fan cable are shown in Figure 19

Figure 19. 60mm Fan Power and Signal Cable Mechanical Drawing
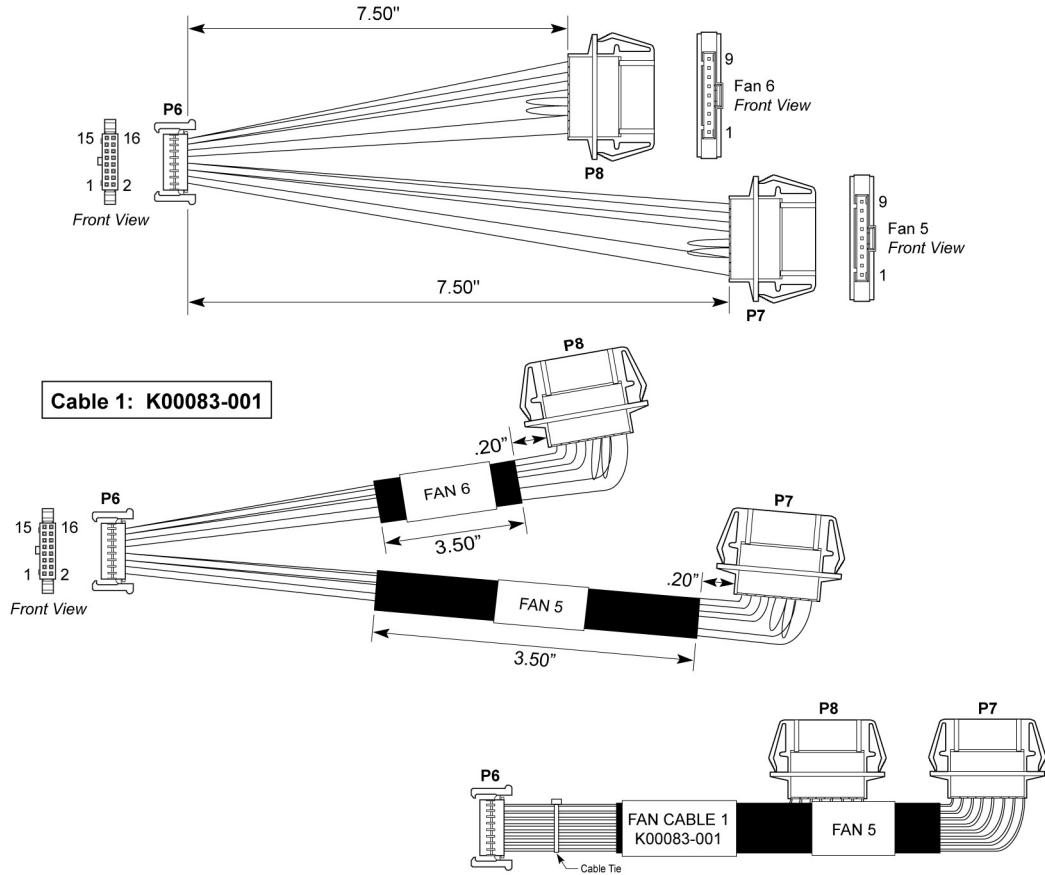
TS000597A

3.2.6 Serial Port Cable

The serial port cable provides the interconnection between the user-accessible RJ45 serial port connector on the front panel board and the baseboard. The physical details of the serial port cable are shown in Figure 20.

Figure 20. Serial Port Cable Mechanical Drawing
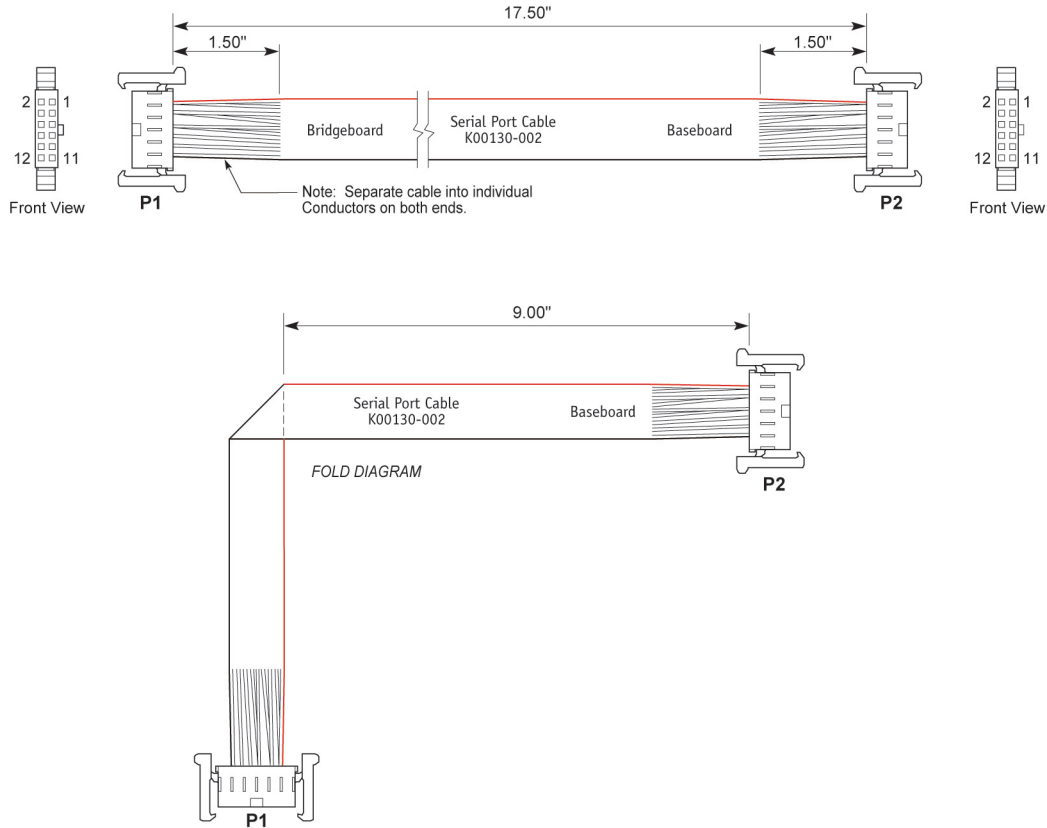
TS000599

3.2.7   TAM Front Panel cable

The TAM (Telco Alarms Module) front panel cable connects the Telco alarm signals between the TAM and the front panel board. The physical details of the TAM front panel cable are shown in Figure 21 TAM Front Panel Cable Mechanical Drawing.

Figure 21 TAM Front Panel Cable Mechanical Drawing
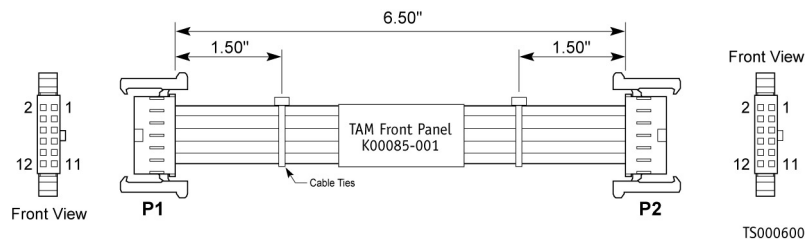
TS000600

3.2.8   USB SD Flash Cable

The USB SD flash cable connects the SD flash module signals to the front panel board and provides power to the SD flash module from the front panel board. The physical details of the USB SD flash cable are shown in Figure 22.

Figure 22 USB SD Flash Cable Mechanical Drawing
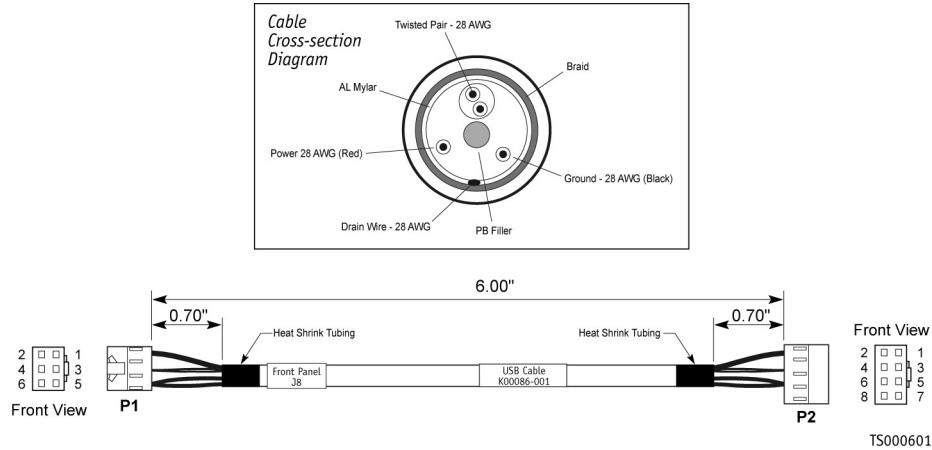
3.2.9 Alarms Cable

The alarms cable runs from the rear sheet metal panel of the system and connects to the TAM (Telco Alarms Module). The physical details of the alarms cable are shown in Figure 23 below.

Figure 23 Alarms Cable Mechanical Drawing
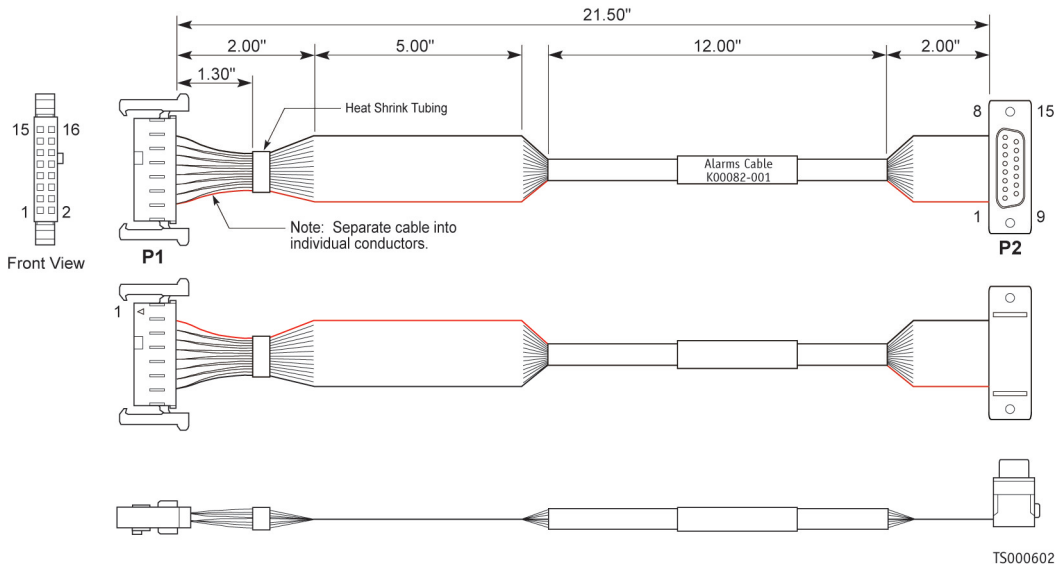
3.3 User-Accessible Interconnects

3.3.1 Keyboard and Mouse Ports

The keyboard and mouse connect to two of the four USB ports on the rear panel. Refer to Section 3.3.4 for the signal pin definitions for the USB ports.

3.3.2 Serial Port

Two serial ports with 8-pin RJ-45 connectors are provided; one on the front panel and one at the rear I/O. Each port connects to COM1. Connections can be made to either the front or the rear port, but never both. The front port is described in the front panel board chapter, Section 4.5, Front Panel Board USB Ports.

Figure 24. Serial Port Connector
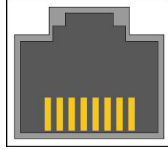
Pin	Signal
1	RTS (request to send)
2	DTR (data terminal ready)
3	TXD (transmit data)
4	GND
5	RIA (ring indicator)
6	RXD (receive data)
7	DSR/DCD (date set ready / data carrier detect
8	CTS (clear to send)

3.3.3 Video Port Connector

The video port interface is a standard VGA-compatible, 15-pin connector. Video is supplied by an on-board ServerEngines* video controller with 32 Mbytes of on-board video DDR2 SDRAM.

Figure 25. Video Connector
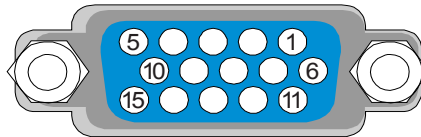
AF000839

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 (+5 V)
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 CG2100 server provides five externally accessible USB ports. Four ports are provided in the rear of the system and the one on the front panel is accessible without removing the front bezel The built-

in USB ports permit the direct connection of five (one front, four rear) USB peripherals without an external hub. If more devices are required, an external hub can be connected to any of the user accessible built-in ports. There are also two internal USB ports that can be used for embedded flash drives.

Figure 26. USB Connector

Pin	Signal
1	Fused VCC (+5 V 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
5	GND
6	GND

3.3.5   Ethernet Connector

The T5520UR server board provides two NIC RJ45 connectors oriented side-by-side on the back edge of the board and accessible at the rear I/O panel. The pin-outs for each connector are identical and defined in Table 5.

Figure 27. RJ45 Ethernet Connector
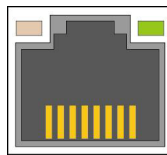
Table 5 RJ45 Ethernet Connector Pin-Out

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, -

Each network interface controller (NIC) drives two LEDs located on the RJ45 connector. The link / activity LED (at the right of the connector) indicates network connection when on, and transmit / receive activity when blinking. The speed LED (at the left of the connector) indicates 1000-Mbps operation when amber, 100-Mbps operation when green, and 10-Mbps when off. Table 6 defines the LEDs.

Table 6: NIC Status LED

LED Color	LED State	NIC State
Green/Amber (Left)	Off	10Mbps
	Green	100 Mbps
	Amber	1000 Mbps
Green (Right)	On	Active Connection
	Blinking	Transmit / Receive activity

4. Front Panel Board

This chapter provides an overview of the Kontron CG2100 Carrier Grade Server Front Panel (FP) board and includes information on board hardware, connectors, power subsystem, optional add-ins, and regulatory requirements. This chapter is organized into the following sections:

4.1 Introduction

The CG2100 server Front Panel (FP) board provides a connector interface and supporting logic for the Front Panel LED/switch board, which contains power, reset, and system ID switches, as well as various status LEDs. The FP board provides support for an external combined connector supporting both a USB and a serial (RJ45) connector, internal fan connectors, as well as an internal USB header

for internal USB flash drive support. Most signals pass from the front panel interface off the baseboard directly to the appropriate device (switch, LED, etc).

Figure 28 shows the FP board components.

Figure 28. CG2100 Server FP Board Layout (Primary Side)
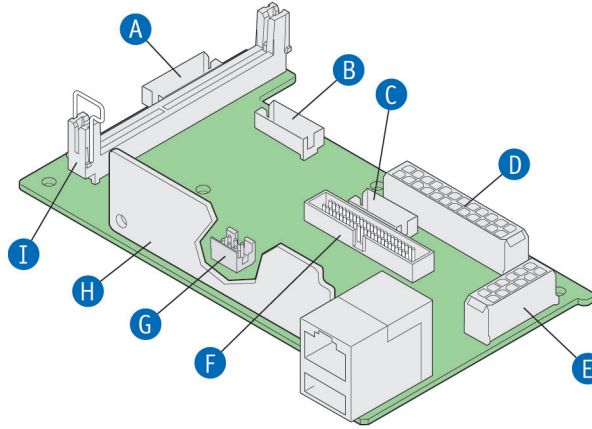
TS000607

Item	Description	Item	Description
A	60mm fan cable connector	**F**	LED/switch board power/signal cable connector
B	Internal USB flash drive connector	**G**	SD flash module connector
C	Telco alarms module connector	**H**	LED/switch board
D	80mm fan cable connector	**I**	Bridge board connector
E	Front panel input power cable connector		

4.2   Front Panel Board Features

The FP Board provides the following feature set:

- Three USB ports used for the USB solid-state drive connector, the combo RJ45 and USB connector, and the SD flash module connector
- Serial RS-232 signals
- Control circuitry for driving the NIC activity LED, the system status LED, the power LED and the disk activity LED, all located on the LED/switch board
- Control circuitry for driving a composite fan fault LED to the LED/switch board
- On-board LED indicating USB flash drive activity
- System power state and status indicators -- power, reset, and NMI switches

NOTE: There may be features (for future use) in addition to this list.

4.3   Front Panel Board Block Diagram

Figure 29 is a block diagram that shows the major hardware components and interconnections on the front panel board.

Figure 29: CG2100 Server FP Board Block Diagram
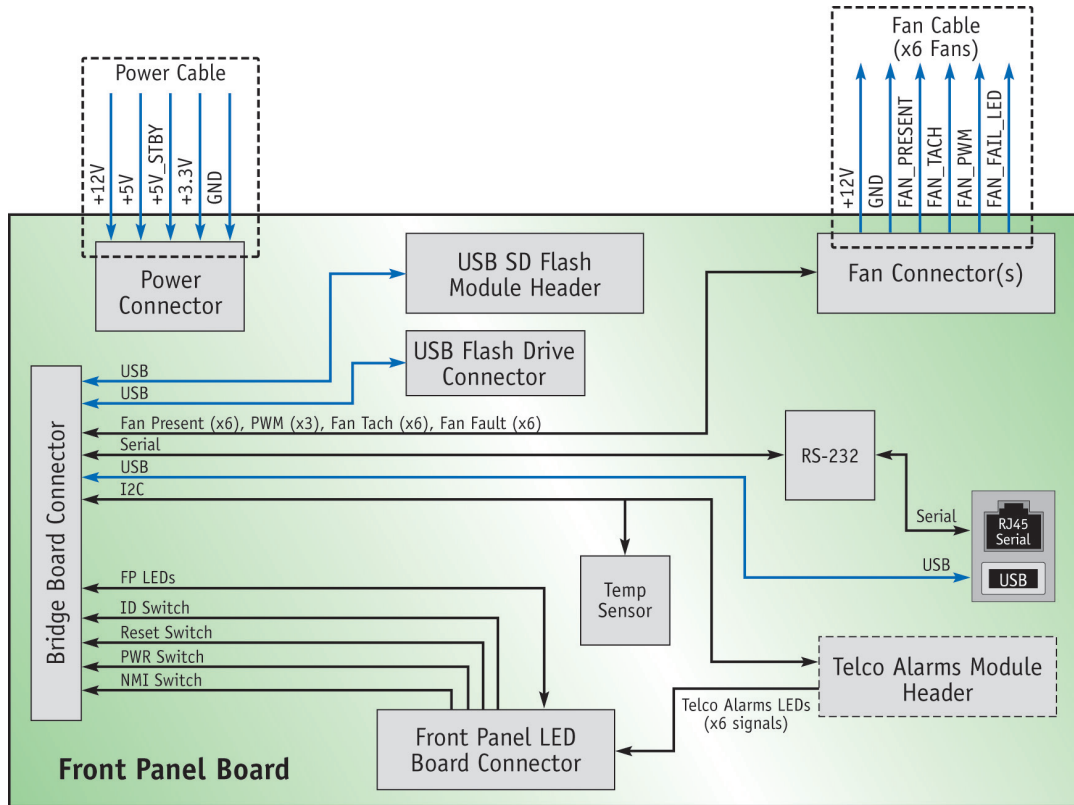
4.4 Front Panel Board Functional Description

This section provides a high-level description of the functions handled by the architectural blocks on the FP board.

4.5 Front Panel Board USB Ports

There are three USB channels on the CG2100 server FP board. One is used by the SMART* Embedded USB Solid-State Drive, the second is used by the SD flash module, and the third is used as an external USB port accessible through the combo RJ45/USB connector on the front of the chassis.

The FP board provides the P5V power to the external USB connector and over current monitoring for the external USB port.

4.6 Front Panel Board Serial Port Connector

A serial port connector (COM1) is provided on the front panel via the combo RJ45/USB connector. This serial port connector is cabled from the T5520UR baseboard to the bridge board and then routed to the front panel board. The baseboard provides the functionality for the serial port.

This serial port requires a special cable to enable the port from the baseboard. The cable must provide a ground to connector pin 5 to enable the serial port to the front panel connector.

NOTE: If the front panel serial cable is installed, the rear serial port is deactivated. Only the front port or the rear port can be used at a time, not both.

4.7   Front Panel Board Fan Controller

The front panel board provides two connectors and interface logic for the six system fans. The connectors provide P12V power for the fans as well as connections for the Pulse Width Modulation (PWM) fan speed control, and fan tachometer monitoring (FanTach). In addition, because the fans are hot-swappable, each connector contains a "fan present" signal and a "fan fault" LED signal.

All of the fan control and monitoring signals other than power are available via the bridge board connector interface from the baseboard. Fan management and control is handled on the baseboard and the front panel board just passes the signals through to the fans.

4.8   Front Panel Board Power Interface

DC power to the front panel (FP) board is provided by a 12-pin connector that is cabled to the front panel board from the HDD backplane board.

The FP board is a pass-through power source for

- the system fans

- the front panel LED/switch board

- the telco alarms module

4.9   Front Panel Board USB Solid-State Drive Connector

This connection is between the baseboard and the front panel board. The baseboard connector is covered in the Intel® S5520UR baseboard specification. The FP board connector is a small, low-profile blind-mate connector that allows USB signals to pass to the USB-to-flash controller on the device itself.

4.10   Front Panel Board Bridge Board Interconnect

The bridge board is an interconnect board that provides the electrical signals to operate the switches and indicators, PCIe, USB, and other signals between the FP board and the baseboard. It also carries serial signals from the serial port cable.

4.11   Front Panel Board USB SD Flash Connector

This is a connection point for the SD flash module cable. This interconnection provides power to the SD flash module and USB signals from the SD flash module to the front panel board USB bus connection.

4.12   Front Panel Temperature Sensor

An LM75BIMX-3 digital temperature sensor and thermal watchdog provides temperature sensing. The SMBus address is 0x9Ah.

4.13 Front Panel Board Power Distribution

The power distribution for the front panel board is shown in Figure 30.

Figure 30. FP Board Power Distribution
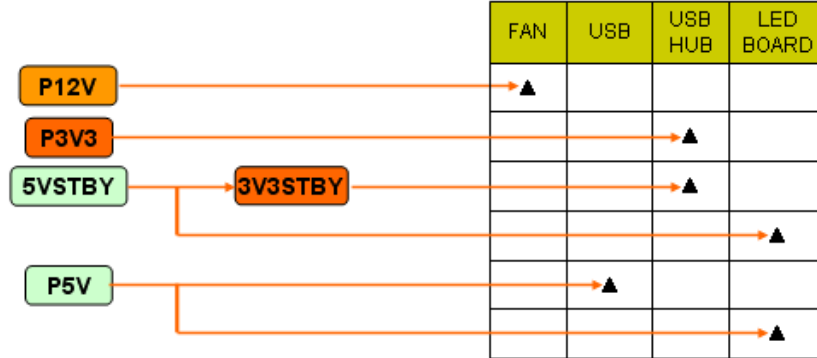
4.14 Front Panel Board Connector Specifications

The following sections provide the pin definitions for the FP board connectors.

4.14.1 Power Connector

Table 7 Power Connector Pin-Out

Pin	Signal Name	Description
1	GND	Power Supply Ground
2	GND	Power Supply Ground
3	GND	Power Supply Ground
4	GND	Power Supply Ground
5	P5V	Power Supply 5V
6	P5V	Power Supply 5V
7	P5V_STBY	Power Supply 5V Standby
8	P3V3	Power Supply 3.3V
9	P12V	Power Supply 12V
10	P12V	Power Supply 12V
11	P12V	Power Supply 12V
12	P12V	Power Supply 12V

4.14.2 Fan Connector

The fan connector signals are defined in Table 8. Fans 1 through 6 share PWM signals in each of the three groups, as shown in the signal definition.

Table 8 Fan Connector Pin-Out

Pin	Signal Name	Description
1	P12V	Power Supply 12V
2	GND	Power Supply Ground
3	FAN_PRSNT1_N	Present Signal
4	FAN_FAULT_LED1	Fan Fault Signal
5	FAN_TACH1_IN	Fan Tach Signal
6	FAN_CONN_PWM1	Fan PWM Signal from FAN_PWM1 of bridge board
7	P12V	Power Supply 12V
8	GND	Power Supply Ground
9	FAN_PRSNT2_N	Present Signal
10	FAN_FAULT_LED2	Fan Fault Signal
11	FAN_TACH2_IN	Fan Tach Signal
12	FAN_CONN_PWM2	Fan PWM Signal from FAN_PWM1 of bridge board
13	P12V	Power Supply 12V
14	GND	Power Supply Ground
15	FAN_PRSNT3_N	Present Signal
16	FAN_FAULT_LED3	Fan Fault Signal
17	FAN_TACH3_IN	Fan Tach Signal
18	FAN_CONN_PWM3	Fan PWM Signal from FAN_PWM2 of bridge board
19	P12V	Power Supply 12V
20	GND	Power Supply Ground
21	FAN_PRSNT4_N	Present Signal
22	FAN_FAULT_LED4	Fan Fault Signal
23	FAN_TACH4_IN	Fan Tach Signal
24	FAN_CONN_PWM4	Fan PWM Signal from FAN_PWM2 of bridge board
25	P12V	Power Supply 12V
26	GND	Power Supply Ground
27	FAN_PRSNT5_N	Present Signal
28	FAN_FAULT_LED5	Fan Fault Signal
29	FAN_TACH9_IN	Fan Tach Signal
30	FAN_CONN_PWM5	Fan PWM Signal from FAN_PWM3 of bridge board
31	P12V	Power Supply 12V
32	GND	Power Supply Ground
33	FAN_PRSNT6_N	Present Signal
34	FAN_FAULT_LED6	Fan Fault Signal
35	FAN_TACH10_IN	Fan Tach Signal
36	FAN_CONN_PWM6	Fan PWM Signal from FAN_PWM3 of bridge board

4.14.3   Front Panel Board Connector

Table 9 Front Panel Board Connector Pin-Out

Pin	Signal Name	Description
1	P5VSTBY	Power Supply 5V standby
3	P5VSTBY	Power Supply 5V standby
5	FP_PWR_LED1_N	Power LED 1 Signal
7	FP_PWR_LED2_N	Power LED 2 Signal
9	FP_ID_LED_W_N	System ID White LED signal
11	FP_ID_LED_B_N	System ID Blue LED signal
13	FP_STAT_LED_G_N	Status Green LED signal
15	FP_STAT_LED_A_N	Status Amber LED signal
17	FP_NIC_LED_N	NIC Activity LED signal
19	FP_HDD_LED_G_N	Hard disk Activity LED signal
21	FP_HDD_LED_A_N	Hard disk Fault LED signal
23	FP_BB_LED_A_N	Baseboard Fault LED signal
25	FP_PS_LED_A_N	Power Supply Fault LED signal
27	FP_FAN_LED_A_N	Fan Fault LED signal
29	NC	No connect
2	GND	Power Supply Ground
4	GND	Power Supply Ground
6	TELCO_PWR_LED_N	Telco Power LED signal
8	TELCO_MIN_LED_N	Telco Minor LED signal
10	TELCO_MAJ_LED_R_N	Telco Major Red LED signal
12	TELCO_MAJ_LED_Y_N	Telco Major Yellow LED signal
14	TELCO_CRIT_LED_R_N	Telco Critical Red LED signal
16	TELCO_CRIT_LED_Y_N	Telco Critical Yellow LED signal
18	FP_PWR_BTN_N	Power switch signal
20	FP_RST_BTN_N	Reset switch signal
22	FP_ID_BTN_N	ID switch signal
24	FP_NMI_BTN_N	NMI switch signal
26	P5V	Power Supply 5V
28	GND	Ground
30	NC	No connect

4.14.4   Bridge Board Connector

The bridge board connector provides all of the interface signals from the T5520UR baseboard to the front panel board.

Table 10 Bridge Board Connector Pin-Out

Pin	Signal Name	Description
A60	NC_FP_CONN_A60	No Connect
A59	NC_FP_CONN_A59	No Connect
A58	FP_PRESENT_N	Pull down to ground with 1K ohm resistor.
A57	GND	Ground
A56	NC_FP_CONN_A56	No Connect
A55	NC_FP_CONN_A55	No Connect
A54	GND	Ground
A53	FAN_PRSNT6_N	Connect to fan connector Molex 87831-3628
A52	GND	Ground
A51	NC_FP_CONN_A51	No Connect
A50	NC_FP_CONN_A50	No Connect
A49	GND	Ground
A48	FAN_PRSNT4_N	Connect to fan connector Molex 87831-3628
A47	GND	Ground
A46	EMP_DCD_L	Connect to ADM561
A45	EMP_SIN	Connect to ADM561
A44	GND	Ground
A43	EMP_SOUT	Connect to ADM561
A42	GND	Ground
A41	EMP_DTR_N	Connect to ADM561
A40	EMP_INUSE_L	Connect to ADM561
A39	GND	Ground
A38	FAN_PRSNT1_N	Connect to fan connector Molex 87831-3628
A37	FAN_PRSNT3_N	Connect to fan connector Molex 87831-3628
A36	FAN_PRSNT2_N	Connect to fan connector Molex 87831-3628
A35	GND	Ground
A34	USB1_ESB_DP	Connect to future USB connector
A33	USB1_ESB_DN	Connect to future USB connector
A32	GND	Ground
A31	USB1_ESB_OC_N	Connect to future USB connector over current sensor
A30	USB0_ESB_OC_N	Connect to external USB port over current sensor
A29	GND	Ground
A28	USB0_ESB_DP	Connect to external USB port
A27	USB0_ESB_DN	Connect to external USB port
A26	GND	Ground
A25	FP_NMI_BTN_N	Connect to front panel connector NMI push button
A24	BMC_RST_BTN_N	Connect to front panel connector reset push button
A23	FP_PWR_BTN_N	Connect to front panel connector power button
A22	FP_ID_SW_L	Connect to front panel connector ID push button
A21	GND	Ground
A20	NC_FP_CONN_A20	No Connect
A19	NC_FP_CONN_A19	No Connect
A18	GND	Ground
A17	BB_HDD_ACT_LED_G_N	Connect to front panel connector hard disk activity LED
A16	LED_HDD_3V_A	Connect to 0 ohm resistor and then to power supply 3.3V
A15	FP_PWR_LED_R_N	Connect to front panel connector power supply LED
A14	FP_PWR_LED_3VSB	Connect to 0 ohm resistor and then to power supply 3.3V Standby

Pin	Signal Name	Description
A13	FP_ID_LED_R1_N	Connect to front panel connector ID LED
A12	FM_SIO_TEMP_SENSOR	No Connect
A11	FAN_FAULT_LED3	Connect to fan connector Molex 87831-3628
A10	FAN_FAULT_LED2	Connect to fan connector Molex 87831-3628
A9	FAN_FAULT_LED1	Connect to fan connector Molex 87831-3628
A8	FAN_PWM1	Connect to FAN_CONN_PWM1 and FAN_CONN_PWM2 with appropriate buffer
A7	GND	Ground
A6	FAN_PWM2	Connect to FAN_CONN_PWM3 and FAN_CONN_PWM4 with appropriate buffer
A5	FAN_TACH9_IN	Connect to fan connector Molex 87831-3628
A4	FAN_TACH7_IN	No Connect
A3	FAN_TACH5_IN	No Connect
A2	FAN_TACH3_IN	Connect to fan connector Molex 87831-3628
A1	FAN_TACH1_IN	Connect to fan connector Molex 87831-3628
B60	GND	Ground
B59	NC_FP_CONN_B59	No Connect
B58	NC_FP_CONN_B58	No Connect
B57	GND	Ground
B56	PE_WAKE_N	No Connect
B55	GND	Ground
B54	NC_FP_CONN_B54	No Connect
B53	NC_FP_CONN_B53	No Connect
B52	GND	Ground
B51	FAN_PRSNT5_N	Connect to fan connector Molex 87831-3628
B50	GND	Ground
B49	NC_FP_CONN_B49	No Connect
B48	NC_FP_CONN_B48	No Connect
B47	GND	Ground
B46	NC_RST_PS_PWRGD	No Connect
B45	GND	Ground
B44	EMP_DSR_N	Connect to ADM211
B43	EMP_RTS_N	Connect to ADM211
B42	GND	Ground
B41	EMP_CTS_N	Connect to ADM211
B40	GND	Ground
B39	NC_FP_CONN_B39	No Connect
B38	NC_FP_CONN_B38	No Connect
B37	GND	Ground
B36	NC_FP_CONN_B36	No Connect
B35	NC_FP_CONN_B35	No Connect
B34	NC_FP_CONN_B34	No Connect
B33	NC_FP_CONN_B33	No Connect
B32	GND	Ground
B31	USB2_ESB_DP	Connect to USB Flash Drive Connector
B30	USB2_ESB_DN	Connect to USB Flash Drive Connector
B29	GND	Ground
B28	USB2_ESB_OC_N	Connect to USB Flash Drive Connector over current sensor
B27	LED_NIC1_LINK_N	No Connect
B26	LED_NIC1_ACT_N	Connect to ORing diode

Pin	Signal Name	Description
B25	LED_STATUS_GREEN_BUF_R1	Connect to front panel connector
B24	LED_NIC2_LINK_N	No Connect
B23	LED_NIC2_ACT_N	Connect to ORing diode
B22	LED_STATUS_AMBER_R1	Connect to front panel connector
B21	GND	Ground
B20	SMB_SEN_3V3SB_DAT	SMBus 3.3V data signal. Connect to FRU EEPROM
B19	SMB_SEN_3V3SB_CLK	SMBus 3.3V clock signal. Connect to FRU EEPROM SMBus clock signal
B18	GND	Ground
B17	SAS_LED_HDD_ACT_N	Connect to SAS Hard Disk Fault LED
B16	SAS_LED_HDD_FLT_N	Connect to SAS Hard Disk Activity LED
B15	GND	Ground
B14	NC_FP_CONN_B14	No Connect
B13	NC_FP_CONN_B13	No Connect
B12	NC_FP_CONN_B12	No Connect
B11	GND	Ground
B10	FAN_FAULT_LED6	Connect to fan connector Molex 87831-36xx
B9	FAN_FAULT_LED5	Connect to fan connector Molex 87831-36xx
B8	FAN_FAULT_LED4	Connect to fan connector Molex 87831-36xx
B7	FAN_PWM3	Connect to FAN_CONN_PWM5 and FAN_CONN_PWM6 with appropriate buffer
B6	GND	Ground
B5	FAN_TACH10_IN	Connect to fan connector Molex 87831-3628
B4	FAN_TACH8_IN	No Connect
B3	FAN_TACH6_IN	No Connect
B2	FAN_TACH4_IN	Connect to fan connector Molex 87831-3628
B1	FAN_TACH2_IN	Connect to fan connector Molex 87831-3628

4.14.5   Combo RJ45/USB Connector

Table 11 shows the pin definitions for the serial port (SP) on the combo RJ45/USB connector

Table 11 Combo RJ45 USB Connector Pin-Out

RJ45 Pin	SP Pin	Signal Name	Description
NA	12	NC	No Connect
NA	4	NC	No Connect
NA	6	NC	No Connect
NA	1	NC	No Connect
NA	7	NC	No Connect
1	11	RJ45_EMP_RTS_L	Connect to ADM561
2	10	RJ45_EMP_DTR_L	Connect to ADM561
3	4	RJ45_EMP_SOUT	Connect to ADM561
4	5	GND	Ground
5	3	RJ45_EMP_INUSE_L	Connect to ADM561
6	2	RJ45_EMP_SIN	Connect to ADM561
7	8	RJ45_EMP_DSR_DCD_L	Connect to ADM561
8	9	RJ45_EMP_CTS_L	Connect to ADM561

Table 12. **USB Port Connector Pin-Out**

Pin	Signal Name	Description
1	USB_GND	Connect to ferrite bead and filtered cap
2	USB0_DP	Connect to protection diode and choke
3	USB0_DN	Connect to protection diode and choke
4	USB_PWR	Connect to ferrite bead

4.14.6   Internal USB SSD Connector

The internal USB header is a Samtec* 10-pin connector, LTMM-105-01-S-D-02 that connects to the SMART Embedded USB Solid State Drive (eUSB SSD).

Table 13. CG2100 Front Panel Board eUSB SSD Connector

Pin	Signal Name	Description
1	P5V	Power Supply 5V
2	NC	No connect
3	USB2_ESB_DN	USB signal
4	NC	No connect
5	USB2_ESB_DP	USB signal
6	NC	No connect
7	GND	Power Supply Ground
8	NC	No connect
9	NC	No connect
10	ACT_LED_N	Tie to green LED for USB activity indication

4.14.7   USB SD Flash Module Connector

Table 14. CG2100 Front Panel Board SD Flash Module Connector

Pin	Signal Name	Description
1	GND	Power Supply Ground
2	NC	No connect
3	USB1_ESB_DP	USB signal
4	P5V_USB1	Power Supply 5V
5	USB1_ESB_DN	USB signal
6	GND	Power Supply Ground

5. LED/Switch Board

This chapter provides an overview of the Kontron Carrier Grade Server CG2100 LED/switch board, including information about the board hardware, connectors, power subsystem, optional add-ins, and regulatory requirements.

This chapter is organized into the following sections:

Section 5.1	**Introduction**	
	Provides an overview and mechanical image of the LED/switch board	
Section 5.2	**LED/Switch Board Features**	
	Describes the LED/switch board feature set	
Section 5.3	**LED/Switch Board Connector Specification**	
	Provides the connector and pin-out information for the LED/switch board components	

5.1 Introduction

The CG2100 LED/switch board provides input selection switches and LED status indicators for the server system. Figure 31 shows the front panel LED/switch panel layout.

Figure 31. Front Panel Buttons/LEDs

TS000610

5.2 LED/Switch Board Features

The front panel LED/switch board has the following features:

- Connects the front panel board signals and the front panel. There are four switches and six LEDs. The power status LED and the chassis ID LED are embedded in the switch and the other four are shown in Figure 31.

- On board switches for power, reset, ID, and NMI

- On board LEDs to indicate power status, chassis ID, system status, HDD activity/fault, NIC activity, and fan status.

NOTE: For information about the telco alarm LEDs that are also on the front panel, see Section 9.2.1, "Telco Alarms Fault LEDs".

5.2.1 Front Panel System Control Buttons

The LED/switch board houses a system control button for each of the four switches. The function of each is listed in Table 15.

Table 15. Control Button Functions

Switch/Button	Feature	Function
A	Power / Sleep button	Toggles the system power on/off, also functions as a sleep button if enabled by an ACPI-compliant operating system. A status LED is embedded in this switch and displayed on the button
B	Reset Button	Reboots and initializes the system
G	Chassis ID Button	Toggles the front panel chassis ID LED and the rear server board chassis ID LED on/off. The front panel LED is embedded in the switch and displayed on the button.
H	NMI Button	Puts the system in a halt state for diagnostic purposes and allows issuance of a non-maskable interrupt when pressed. After issuing the interrupt, a memory download can be performed to determine the cause of the problem. **NOTE:** This button is for diagnostic purposes only and can only be accessed by using a thin stylus or a paper clip.

5.2.2   Front Panel Status LEDs

The front panel LED/switch board contains six status LEDs; four separate and two embedded and displayed with their buttons. The functions of each LED are listed in Table 16.

Table 16. Front Panel LED Functions

LED Description	LED Power	Color	Condition	Description
Power/Sleep (on button)	P5V	Green	On	Legacy power on / ACPI S0 state
		Green	Blinking	Sleep / ACPI S1 state
		-	Off	Power off / ACPI S4 or S5 state
Chassis Identification (on button)	P5VSTBY	White	On	Chassis identification active via command or button
			Off	Chassis identification inactive
System Status (see Table 17)	P5VSTBY	Green	On	System ready/normal operation
		Green	Blinking	System ready but degraded
	P5VSTBY	Amber	On	Critical or non-recoverable condition
		Amber	Blinking	Non-critical alarm
		-	OFF	System not ready: POST/system stop
HDD[1]	P5V	Green	BLINK	Hard disk drive activity
	P5V	Amber	ON	Hard disk drive fault
			OFF	No access and no hard disk drive fault
NIC1/NIC2 Activity	P5V	Green	ON	LAN link for NIC1 and NIC2
		Green	BLINK	LAN activity for NIC1 and NIC2
		-	OFF	Idle / No link
Fan Status	P5VSTBY	Amber	ON	Fan fault
		-	OFF	Fan subsystem OK - no fault

NOTE: [1]For detailed information about the HDD LED settings, see Section 6.3 "Hard Disk Drive Activity and Fault LEDs".

5.2.2.1   System Status LED

Table 17 describes the meaning of each state on the system status LED.

Table 17. System Status LED Description

Color	State	Criticality	Description
Off	N/A	Not ready	AC (or DC if DC power supplies used) power is off.
Green	On	OK	System booted and ready
Green	Blinking	Degraded	System degraded Including, but not limited to: Unable to use all of the installed memory (more than one DIMM installed) Correctable errors over a threshold of 10 and migrating to a spare DIMM (memory sparing). This indicates that the user no longer has spare DIMMs specifying a redundancy lost condition. The corresponding DIMM LED should light up. In a mirrored configuration, when memory mirroring takes place and system loses memory redundancy (This is not covered by the second bullet above) Redundancy loss, such as power supply or fan (This does not apply to non-redundant subsystems) PCI Express* link errors CPU failure/disabled – if there are two processors and one of them fails Fan alarm – Fan failure. Number of operational fans should be more than the minimum number needed to cool the system Non-critical threshold crossed – temperature and/or voltage
Amber	Blinking	Non-critical	Non-fatal alarm – system is likely to fail Including, but not limited to: • Critical voltage threshold crossed • VRD hot asserted • Minimum number of fans to cool the system are not present or have failed • In non-sparing and non-mirroring mode if the threshold of ten correctable errors is crossed within the window
Amber	On	Critical, non-recoverable	Fatal alarm – system has failed or shut down Including, but not limited to: • DIMM failure when there is one DIMM and no good memory present • Run-time memory uncorrectable error in non-redundant mode • IERR signal asserted • Processor 1 missing • Temperature (e.g., CPU ThermTrip, memory TempHi, critical threshold crossed) • No power good – power fault • Processor configuration error (e.g., processor stepping mismatch)

5.2.2.2 Chassis Identification LED

The blue chassis identification LED is used to help identify a system for servicing. This is especially useful when the system is installed in a high-density rack or cabinet with several similar systems.

The white chassis ID LED can be turned on by:

- Pressing the chassis ID button on the front panel, The chassis ID LED remains blue until the button is pressed again.
- Issuing the appropriate hex IPMI system identify value, The chassis ID LED either blinks blue for 15 seconds and turns off or blinks indefinitely until the appropriate hex IPMI system identify value is issued to turn it off.

5.3 LED/Switch Board Connector Specification

The LED/switch board has a 2x15-pin connector to the front panel (FP) board. The connector pin definitions are shown in Table 18.

Table 18 LED/Switch Board Connector Pin-Out

Pin	Definition	Pin	Definition
1	P5VSTBY	16	TELCO_CRIT_LED_Y_N
2	GND	17	FP_NIC_LED_N
3	P5VSTBY	18	FP_PWR_BTN_N
4	GND	19	FP_HDD_LED_G_N
5	FP_PWR_LED1_N	20	FP_RST_BTN_N
6	TELCO_PWR_LED_N	21	FP_HDD_LED_A_N
7	FP_PWR_LED2_N	22	FP_ID_BTN_N
8	TELCO_MIN_LED_N	23	FP_BB_LED_A_N
9	FP_ID_LED_W_N	24	FP_NMI_BTN_N
10	TELCO_MAJ_LED_R_N	25	FP_PS_LED_A_N
11	FP_ID_LED_B_N	26	P5V
12	TELCO_MAJ_LED_Y_N	27	FP_FAN_LED_A_N
13	FP_STAT_LED_G_N	28	GND
14	TELCO_CRIT_LED_R_N	29	NC
15	FP_STAT_LED_A_N	30	NC

6. SAS/SATA Backplane Board

This chapter describes the features of the Kontron Carrier Grade Server CG2100 SAS/SATA backplane board. The chapter is organized into the following sections:

Section 6.1 Introduction

Section 6.2 SAS/SATA Backplane Board Features

Section 6.3 Hard Disk Drive Activity and Fault LEDs

Section 6.4 SAS/SATA Backplane Board Power Connectors

Section 6.5 SAS/SATA Backplane Card Edge Finger Connector

6.1 Introduction

The CG2100 server contains a single SAS/SATA backplane board that provides support for six 2.5" SAS or SATA hard disk drives (HDDs). The backplane connects with either a SAS/SATA control module or a SAS/SATA RAID module via a 2x49-pin card edge connector to support six SAS or SATA drives. This interface contains six SAS or SATA HDD signals, control signals, and SMBus signals.

Fault and activity LEDs are provided for each of the six HDD positions. Composite fault and activity LED signals for all six drives are sent to the front panel board to drive the front panel drive activity/fault LED.

Figure 32 shows the SAS/SATA backplane.

Figure 32. SAS/SATA Backplane Board
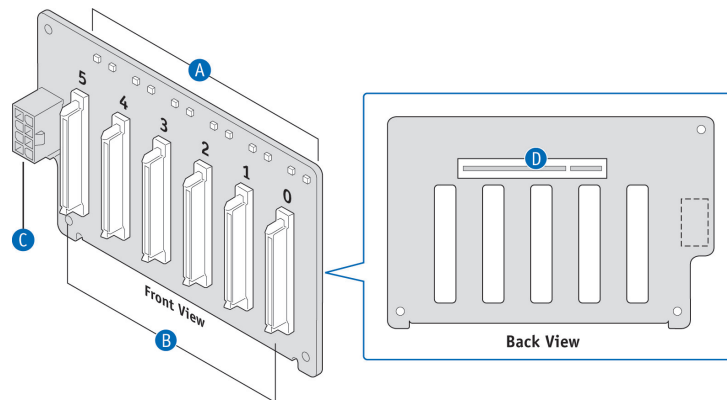
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Item	Description
A	SAS/SATA hard disk drive LEDs
B	Six hard disk drive connectors
C	Power connector
D	SAS/SATA control module or hardware RAID module edge connector

6.2   SAS/SATA Backplane Board Features

The backplane board contains the following features:

- SAS/SATA connectors for six hot-swappable disk drives
- Enclosure management via an embedded controller
- Serial EEPROM for hot swap controller firmware for the embedded controller
- Control circuitry for driving the disk drive activity and fault LED.
- Control circuitry for driving a composite disk drive fault and activity LED
- Digital temperature sensor

Figure 33 is an overall block diagram of the SAS/SATA backplane board.

Figure 33: SAS/SATA Backplane Board Block Diagram
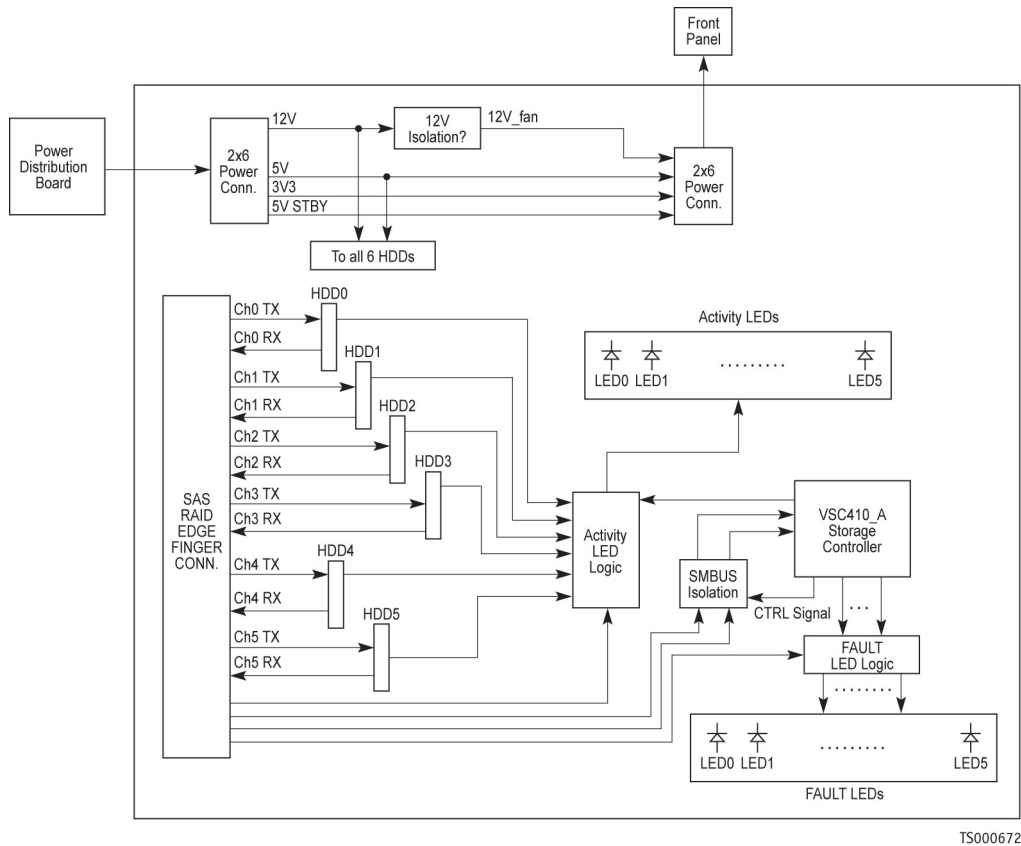
There are two main sections:

Power Distribution: The main supply rails are P12V and P5V, which come from the PDB through a 2X6 power connector, as specified in Figure 33. They are connected directly to all six HDDs.

Storage Management: The storage management controller coordinates the hard disk drive fault LED indicators.

Figure 34 shows the physical ordering of the hard disk drives.

Figure 34: Hard Disk Drive Bay Numbering
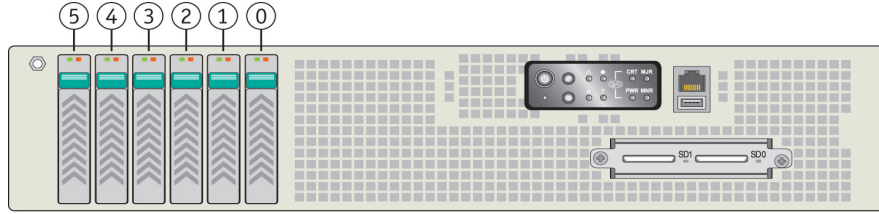
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6.3   Hard Disk Drive Activity and Fault LEDs

The backplane board supports an activity/fault LED for each of the hard drive connections. The LED is green for activity or amber for a drive fault. The green activity setting is driven by the SAS/SATA HDD directly. The amber fault LED is driven by the enclosure management controller whenever a fault condition is detected.

NOTE: When drives are used in a RAID configuration, the RAID controller manages the fault LED and it may exhibit different behavior.

Table 19. Hard Drive LED Function Definitions

Status LED	Definition
Green	HDD activity
Amber	HDD fault

The activity LED is controlled directly by the hard drives and the behavior is different between SAS and SATA drives. Table 20 shows the expected behavior for each condition. However, the ready signal states can be defined differently by SAS drive vendors, and for SATA drives, the ready signal is optional and the function of this signal varies among the SATA drive vendors.

Table 20. HDD Activity LED Definitions

Condition	Drive Type	Behavior
Power on with no drive activity	SAS	Ready LED stays on
	SATA	Ready LED stays off
Power on with drive activity	SAS	Ready LED blinks off when processing a command
	SATA	Ready LED blinks on when processing a command
Power on and drive powered down	SAS	Ready LED stays off
	SATA	Ready LED stays off
Power on and drive starting up	SAS	Ready LED blinks
	SATA	Ready LED stays off

6.4   SAS/SATA Backplane Board Power Connector

There is one power connector on the backplane board that connects to the power distribution board.

The pin definitions and power rating of the P5V, P12V, P5V_STBY, P3V3 and GND rails coming from the Power Distribution Board (PDB) through a 2x4-pin power connector are shown in Table 21.

Table 21: Backplane Power Connector Pin-Out

Pin #	Definition	Pin #	Definition
1	P5V	5	P5V
2	P12V4	6	P5V_STBY
3	P3V3	7	GND
4	GND	8	GND

6.5   SAS/SATA Backplane Card Edge Finger Connector

The main connector on the backplane connects with either the SAS/SATA control module or the SAS RAID module. Table 22 shows the pin definitions for the connector.

Table 22: SAS/SATA Backplane Board Edge Finger Connector Pin-Out

Pin #	Definition	Pin #	Definition
A1	SGPIO_CLOCK	B1	P12V
A2	SGPIO_LOAD	B2	P12V
A3	P3V3	B3	P5V
A4	SGPIO_DATAOUT0	B4	P5V
A5	SGPIO_DATAOUT1	B5	P5V
A6	P5V_STBY	B6	P5V
A7	LED_HDD_FLT_L	B7	RSVD_B7
A8	LED_HDD_ACT_L	B8	RSVD_B8
A9	SMB_SAS_3V3_SCL	B9	GND
A10	SMB_SAS_3V3_SDA	B10	SMB_IPMB_5VSB_CLK
A11	RST_PS_PWRGD	B11	SMB_IPMB_5VSB_DAT
A12	GND	B12	GND
A13	RSVD_A13	B13	GND
A14	GND	B14	SAS4_TX_P
A15	GND	B15	SAS4_TX_N
A16	SAS4_RX_P	B16	GND
A17	SAS4_RX_N	B17	GND
A18	GND	B18	SAS5_TX_P
A19	GND	B19	SAS5_TX_N
A20	SAS5_RX_P	B20	GND
A21	SAS5_RX_N	B21	GND
A22	GND	B22	SAS6_TX_P
A23	GND	B23	SAS6_TX_N
A24	SAS6_RX_P	B24	GND
A25	SAS6_RX_N	B25	GND
A26	GND	B26	SAS7_TX_P
A27	GND	B27	SAS7_TX_N
A28	SAS7_RX_P	B28	GND
A29	SAS7_RX_N	B29	GND
A30	GND	B30	SAS0_TX_P
A31	GND	B31	SAS0_TX_N

Pin #	Definition	Pin #	Definition
A1	SGPIO_CLOCK	B1	P12V
A32	SAS0_RX_P	B32	GND
A33	SAS0_RX_N	B33	GND
A34	GND	B34	SAS1_TX_P
A35	GND	B35	SAS1_TX_N
A36	SAS1_RX_P	B36	GND
A37	SAS1_RX_N	B37	GND
A38	GND	B38	SAS2_TX_P
A39	GND	B39	SAS2_TX_N
A40	SAS2_RX_P	B40	GND
A41	SAS2_RX_N	B41	GND
A42	GND	B42	SAS3_TX_P
A43	GND	B43	SAS3_TX_N
A44	SAS3_RX_P	B44	GND
A45	SAS3_RX_N	B45	GND
A46	GND	B46	RSVD_B46
A47	RSVD_A47	B47	RSVD_B47
A48	RSVD_A48	B48	RSVD_B48
A49	GND	B49	GND

7.   SAS/SATA Control Module

This chapter provides an overview of Kontron Carrier Grade Server CG2100 SAS/SATA control module, including information about the module hardware, connectors, power subsystem, optional add-ins, and regulatory requirements.

This chapter is organized into the following sections:

7.1   Introduction

The CG2100 server SAS/SATA control module adds SAS/SATA support for the server. The module interface to the baseboard is through a PCI Express bus. The control module provides integrated software RAID 0/1/10 capability. Figure 35 shows the placement of the major components and connectors on the SAS/SATA control module.

Figure 35: SAS/SATA Control Module
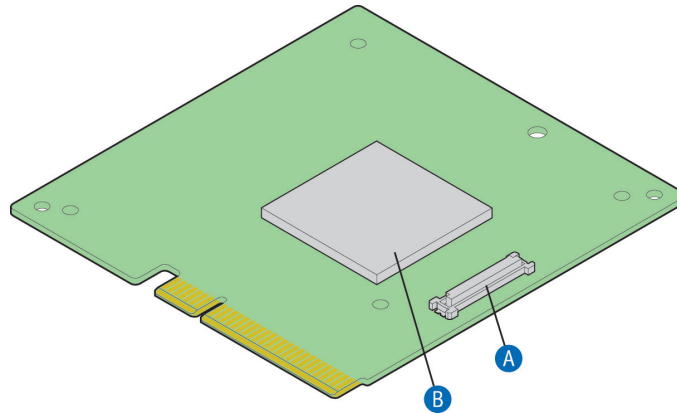
7.2   SAS/SATA Control Module Features

The SAS/SATA control module provides the following features:

- Differential SAS/SATA signals from an LSI Logic LSISAS1068E* SAS/SATA controller (Figure 35, "B") to the server HDD backplane through an edge finger connector;
  Supports 3.0 Gbps throughput for up to eight ports
- Differential PCIe x4 (Gen1) signals from the server bridge board through a flex cable connector (Figure 35 "A") to the SAS/SATA controller

7.3   SAS/SATA Control Module Block Diagram

Figure 36 is a system block diagram of the SAS/SATA control module.

Figure 36. SAS/SATA Control Module Block Diagram
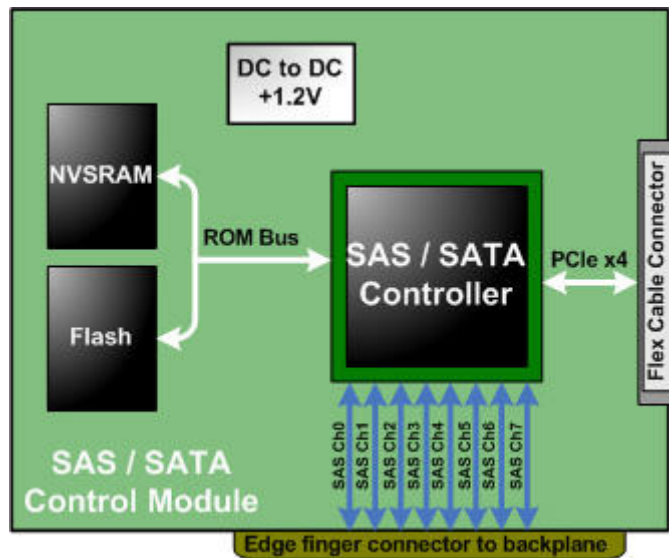
7.4   SAS/SATA Control Module Functional Description

This section provides a high-level description of the architectural blocks of the SAS/SATA control module as shown in the block diagram (Figure 36).

7.4.1   SAS Features

This section describes the control module features common to both SAS and SATA options:

- Six fully independent SAS PHYs
- SAS data transfers of 3.0 Gbps and 1.5 Gbps
- A serial, point-to-point, enterprise-level storage interface
- Simplified cabling among devices

7.4.2   SATA Features

This section describes the SATA features.

- Six fully independent SATA PHYs
- SATA data transfers of 3.0 Gbps and 1.5 Gbps
- STP data transfers of 3.0 Gbps and 1.5 Gbps

- A serial, point-to-point enterprise-level storage interface
- Simplified cabling among devices

7.5   SAS/SATA Control Module Flex Cable Connector

The SAS/SATA control module has a flex cable connector with PCI Express x4 signals through the connector to the LSISAS1068E controller. The pin definitions are covered in Table 23.

Table 23: SAS/SATA Control Module Flex Cable Connector Pin-Out

Pin #	Definition	Pin #	Definition
1	SMB_HOST_3V3_CLK	31	GND
2	FLEX_PRESENT1	32	EXP_SB_0P
3	SMB_HOST_3V3_DAT	33	EXP_NB_0P
4	GND	34	GND
5	GND	35	EXP_NB_0N
6	EXP_SB_3N	36	GND
7	GND	37	GND
8	EXP_SB_3P	38	CK_100M_SAS_EXP_DN
9	EXP_NB_3P	39	GND
10	GND	40	CK_100M_SAS_EXP_DP
11	EXP_NB_3N	41	NC_SGPIO_DATAOUT0
12	GND	42	GND
13	GND	43	BBU_KEY_PRSNT
14	EXP_SB_2N	44	GND
15	GND	45	SMB_IPMB_5VSB_DAT
16	EXP_SB_2P	46	NC_PE_WAKE_N
17	EXP_NB_2P	47	SMB_IPMB_5VSB_CLK
18	GND	48	RST_PS_PWRGD
19	EXP_NB_2N	49	GND
20	GND	50	NC_SW_RAID_MODE
21	GND	51	NC_SGPIO_DATAOUT1
22	EXP_SB_1N	52	GND
23	GND	53	SMB_SEN_3V3SB_CLK
24	EXP_SB_1P	54	NC_SGPIO_CLOCK
25	EXP_NB_1P	55	SMB_SEN_3V3SB_DAT
26	GND	56	NC_SGPIO_LOAD
27	EXP_NB_1N	57	LED_HDD_FLT_R_L
28	GND	58	LED_HDD_ACT_R_L
29	GND	59	FLEX_PRESENT2
30	EXP_SB_0N	60	GND

7.6   SAS/SATA Control Module Card Edge

The SAS/SATA module has a 2x49-pin edge finger for the SAS/SATA backplane. Table 24 lists the pin definitions.

Table 24. SAS/SATA Control Module 2x49 Card Edge Finger Pin-Out

Pin#	Pin Definition	Pin#	Pin Definition
A1	SGPIO_CLOCK	B1	P12V
A2	SGPIO_LOAD	B2	P12V
A3	P3V3	B3	P5V
A4	SGPIO_DATAOUT0	B4	P5V
A5	SGPIO_DATAOUT1	B5	P5V
A6	NC_RSVD_A6 [1]	B6	P5V
A7	LED_HDD_FLT_L	B7	RSVD_B7
A8	LED_HDD_ACT_L	B8	RSVD_B8
A9	SMB_SAS_3V3_SCL	B9	GND
A10	SMB_SAS_3V3_SDA	B10	SMB_IPMB_5VSB_CLK
A11	RST_PS_PWRGD	B11	SMB_IPMB_5VSB_DAT
A12	GND	B12	GND
A13	RSVD_A13	B13	GND
A14	GND	B14	SAS4_TX_P
A15	GND	B15	SAS4_TX_N
A16	SAS4_RX_P	B16	GND
A17	SAS4_RX_N	B17	GND
A18	GND	B18	SAS5_TX_P
A19	GND	B19	SAS5_TX_N
A20	SAS5_RX_P	B20	GND
A21	SAS5_RX_N	B21	GND
A22	GND	B22	SAS6_TX_P
A23	GND	B23	SAS6_TX_N
A24	SAS6_RX_P	B24	GND
A25	SAS6_RX_N	B25	GND
A26	GND	B26	SAS7_TX_P
A27	GND	B27	SAS7_TX_N
A28	SAS7_RX_P	B28	GND
A29	SAS7_RX_N	B29	GND
A30	GND	B30	SAS0_TX_P
A31	GND	B31	SAS0_TX_N
A32	SAS0_RX_P	B32	GND
A33	SAS0_RX_N	B33	GND
A34	GND	B34	SAS1_TX_P
A35	GND	B35	SAS1_TX_N
A36	SAS1_RX_P	B36	GND
A37	SAS1_RX_N	B37	GND
A38	GND	B38	SAS2_TX_P
A39	GND	B39	SAS2_TX_N
A40	SAS2_RX_P	B40	GND
A41	SAS2_RX_N	B41	GND
A42	GND	B42	SAS3_TX_P
A43	GND	B43	SAS3_TX_N
A44	SAS3_RX_P	B44	GND
A45	SAS3_RX_N	B54	GND
A46	GND	B46	RSVD_B46
A47	RSVD_A47	B47	RSVD_B47
A48	RSVD_A48	B48	RSVD_B48
A49	GND	B49	GND

[1]P5V_STBY is not used in the SAS/SATA control module.

8. SAS/SATA RAID Module

This chapter describes the features of the Kontron Carrier Grade Server CG2100 SAS/SATA RAID module. The chapter is organized into the following sections:

8.1   Introduction

This section provides an overview of the features of the CG2100 server SAS/SATA RAID module that shows how the SAS RAID module interconnects with the other components of the CG2100 server. Figure 37 shows the SAS RAID module.

Figure 37: SAS/SATA RAID Module Major Components
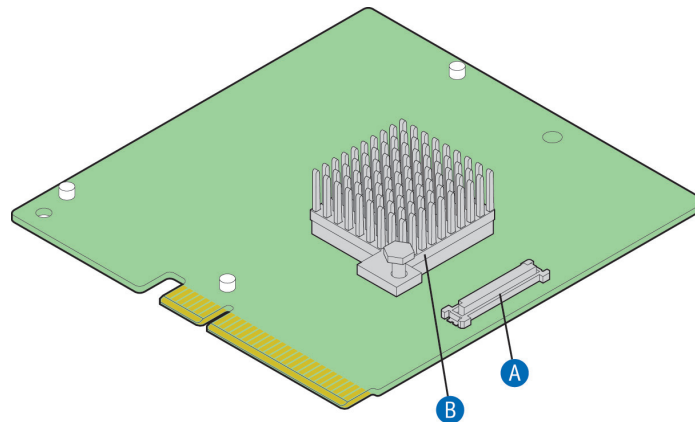
8.2   SAS/SATA RAID Module Features

The SAS/SATA RAID module provides the internal SAS/SATA RAID functionality for the CG2100 server using an LSI Logic LSISAS1078* hardware RAID controller (Figure 37, "B") The controller interface to the system is through a PCIe bus flex cable connection (Figure 37, "A"). The SAS/SATA

RAID module provides a cost-effective and performance-optimized configurable hardware RAID controller for the CG2100 server.

The block diagram in Figure 38 shows the major hardware components of the SAS RAID module on the CG2100 server.

Figure 38: SAS/SATA RAID Module Block Diagram
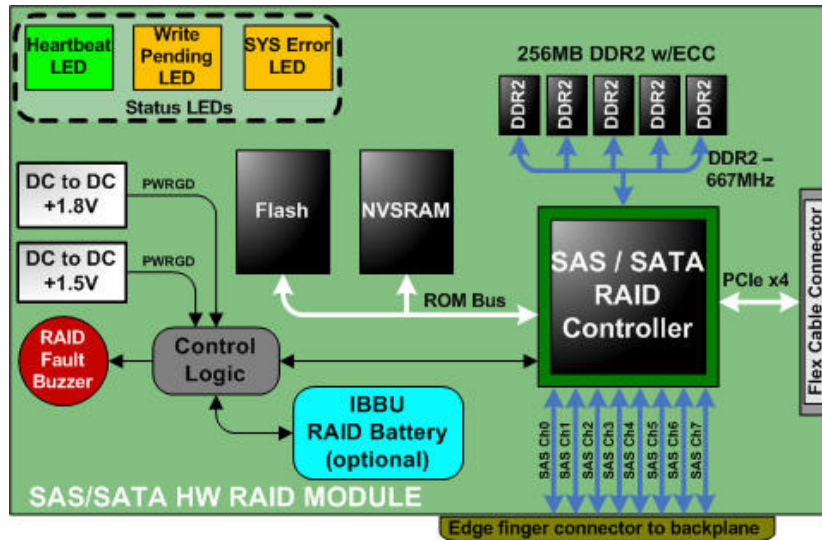
The following sections use the block diagram in Figure 38 to provide a more detailed description of each of the functional blocks.

8.3   SAS/SATA Hardware RAID Module Functional Blocks

The hardware RAID controller, along with associated LSI Logic* firmware, provides the major functions of the SAS/SATA hardware RAID module. The controller interface to the system is through the PCIe bus

8.3.1   Hardware RAID Configurations

The hardware RAID controller provides support for hardware RAID levels 0, 1, 10, 5 and 6. The controller provides virtual disk arrays for the system to use. These disk arrays can be in any of the supported RAID modes. The on board DDRII memory provides 256 Mbytes of cache support. The cache support can speed up transaction timing, depending on the cache configuration.

8.3.2   PCIe Interface

The hardware RAID controller interconnects with the T5520UR baseboard through a 4-lane PCIe interface.

8.3.3   Flash

A 32-Mbit flash holds the hardware RAID controller executable code. The code in this flash configures the LSI 1078 RAID controller to fully support the hardware RAID functions.

8.3.4   NVRAM

The NVRAM is 256 Kbits of accessible static RAM. The NVRAM is used to store hardware RAID controller configuration information and disk drive RAID configuration information.

8.3.5   DDRII Bus

The SAS/SATA RAID module DDRII bus runs at speeds up to 667 MHz and supports 256 Mbytes of registered DDRII memory. The memory is integrated onto the board, so there are no user-replaceable DIMMs.

8.3.6   Intelligent Battery Backup Unit (IBBU)

The battery backup preserves the contents of the DIMM if power drops below specifications. VBAT_RAID is the 1.8V used by the DDRII memory and is supplied by P1V8, P3V3_STBY, or the Intel® RAID Smart Battery (battery backup module). Under normal operation, full power (P1V8) is applied to VBAT_RAID and is generated from 5V to 1.8V by a separate PWM controlled switching regulator. If this rail drops out, VBAT_RAID is powered from the server power supply standby rail (P3V3_STBY) through an SC1565 LDO regulator. If P3V3_STBY_PWRGD is de-asserted, the RAID smart battery takes over as the VBAT_RAID source (assuming cache data is present in DDRII memory).

When the hardware RAID controller senses power has dropped below 2.96V ('Power Good' de-asserts) and its POWER_DELAY signal is asserted, it initiates a power fail sequence that safely puts the ROMB DIMM into a self-refresh state. The POWER_DELAY circuit generates enough delay to allow the RAID controller processor to complete its power fail sequence. After the power fail sequence is completed, additional logic (powered by VBAT_RAID) holds the DIMM clock enable signals low to keep the DDRII memory in self-refresh mode. Once power is restored, data from the DDRII memory can be written to the disk array.

8.3.7   GPIOs

The SAS/SATA RAID module has 21 GPIOs that handle various input and output functions. The GPIOs are used to control the IBBU, system indicators, and debug support.

Table 25: GPIO Descriptions

LSI GPIO #	GPIO Description
GPIO 0	RSVD
GPIO 1	RSVD
GPIO 2	FW Reads to determine if BIOS should be disabled by FW
GPIO 3	Output on HW RAID Error -- Enables Speaker
GPIO 4	Serial Input Data from RAID Key (iButton)
GPIO 5	DDRII Memory Write Pending (Drives Status LED)
GPIO 6	Output IBBU BBE signal (Battery Backup Enable)
GPIO 7	Input IBBU Status
GPIO 8	Input IBBU Present
GPIO 9	Output NVRAM Strobe
GPIO 10	RSVD
GPIO 11	RSVD
GPIO 12	Alternate input for IBBU Status (Not used)
GPIO 13	RSVD
GPIO 14	RSVD
GPIO 15	RSVD
GPIO 16	RSVD
GPIO 17	Heartbeat Status (Drives LED)
GPIO 18	Server Management (SM) Bus Reset
GPIO 19	Backplane Type 0 (Not used)
GPIO 20	Backplane Type 1 (Not used)

8.3.8   I-Button

The i-button is a pre-programmed serial device that acts as an activation key to enable hardware RAID. This device is integrated onto the board and is not user serviceable.

8.3.9   SMBus

The SAS/SATA RAID module SMBus0 and SMBus1 enable communication with the boot EEPROM, the DDRII SPD EEPROM, and the IBBU. The SAS/SATA RAID module also provides a pass-through of the IPMB from the baseboard to the SAS/SATA backplane.

Figure 39 SMBus Block Diagram
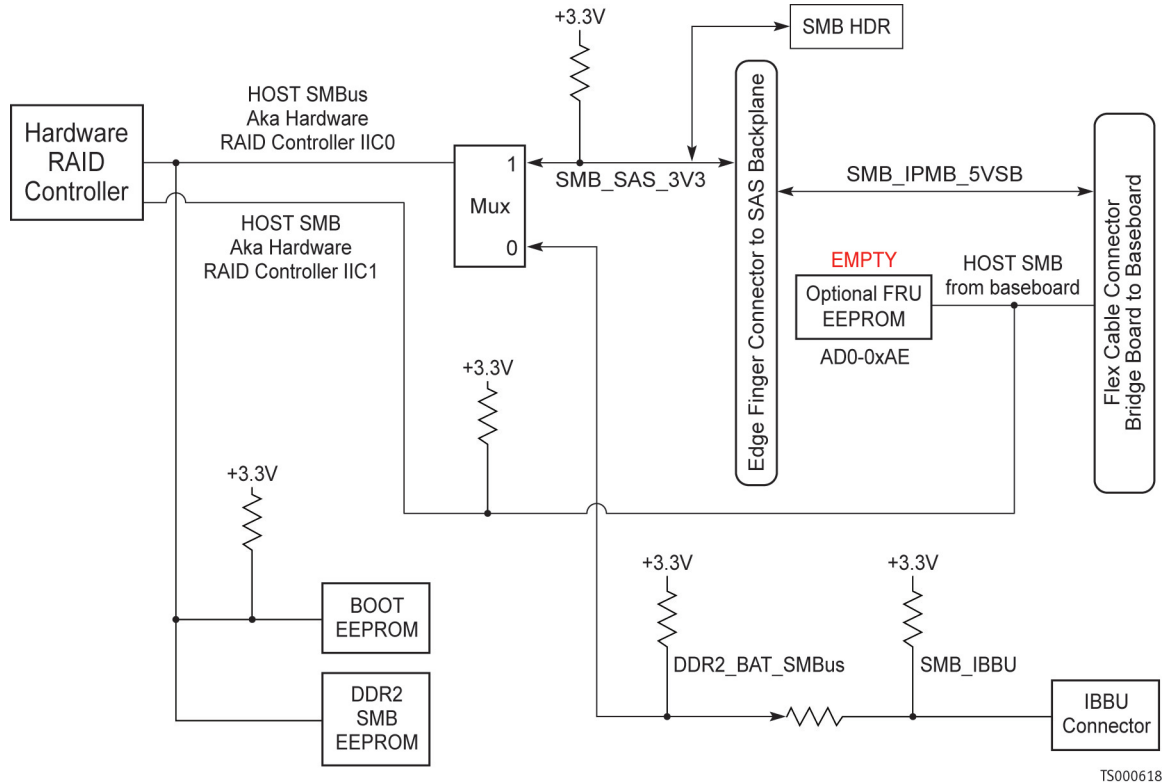
8.3.10   Battery Backup Power Control

The Battery backup voltage supports the DDRII SDRAM memory to maintain data integrity during a power failure. The Battery backup voltage (VBAT_RAID) power rail can be supplied from several sources and the battery backup power controller determines the appropriate source to activate.

- During normal operation VBAT_RAID is supplied by the 1.8V power rail.

- If main system power is turned off and standby power is available, the 3.3V to 1.8V linear regulator supplies power to VBAT_RAID

- If all system power fails and the DDRII SDRAM has critical data stored, VBAT_RAID is supplied by the IBBU (Intelligent Battery Backup Unit).

8.4   SAS/SATA RAID Module Buzzer

The SAS/SATA RAID module provides an audible alarm driven by the hardware RAID controller when it detects a RAID failure. The hardware RAID controller drives a GPIO 3 high to indicate the failure. This GPIO enables a 2 KHz oscillator on board that is used to drive a buzzer.

8.5   SAS/SATA RAID Module Clock Generation/Distribution

The SAS/SATA RAID module uses several on-board clock sources and a system-generated 100 MHz clock (PCI Express).

Figure 40 Clock Generation/Distribution

TS000619
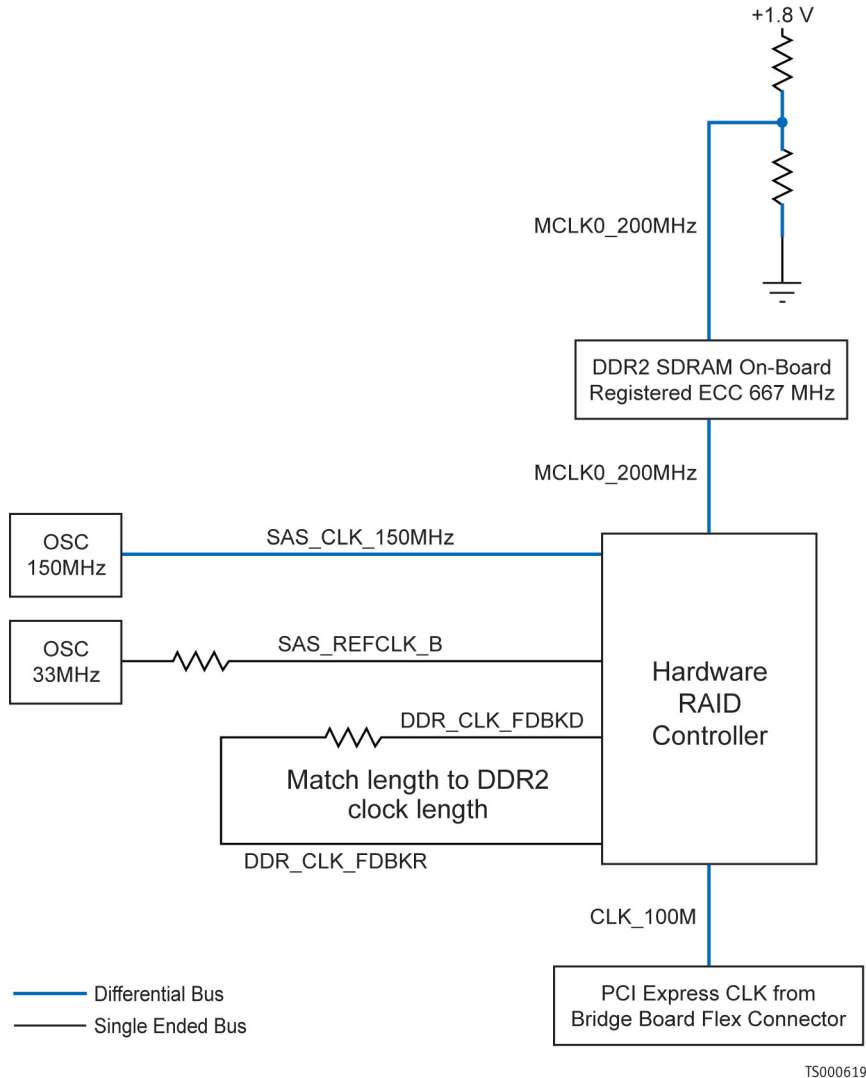
8.5.1 33 MHz System Reference Clock

The 33 MHz clock is generated by an on-board oscillator and is used by the hardware RAID controller.

8.5.2 150 MHz SAS Clock

The 150 MHz clock is generated by an on-board oscillator and is used by the hardware RAID controller.

8.5.3 200 MHz Clock

The hardware RAID controller generates a 200 MHz clock for the DDRII interface.

8.5.4 100 MHz Clock

The base board provides a 100 MHz PCIe clock for the hardware RAID controller.

8.6 SAS/SATA RAID Module Status LEDs

Table 26 shows the system status LEDs that can be used to determine system operation.

Table 26: Clock Generation/Distribution Status LED Functions

LED	Color	Function
Write Pending (DS2D1)	Amber	Indicates a write to DDRII memory is pending
Heartbeat (DS2C1)	Green	Indicates RAID controller is operating
SYS_ERR (DS2B1)	Amber	Indicates system error has occurred

8.7 SAS/SATA RAID Module Reset Control

The board resets are generated by on-board logic controlled by voltage 'Power Good' signals as well as the PCIe reset signal (RST_PS_PWRGD) from the T5520UR baseboard.

8.8 SAS/SATA RAID Module Flex Connector (J4B1)

The flex connection provides the interface to the server baseboard through the bridge board. The signals include the four PCIe channels, PCIe clocks, PCIe reset, the SMBus, and control signals.

Table 27: Flex Connector Pin-Out

Pin #	Definition	Pin#	Definition
1	SMB_HOST_3V3_SCL	2	GND
3	SMB_HOST_3V3_SCL	4	GND
5	NC_RSVD_5	6	EXP_SB_3N
7	GND	8	EXP_SB_3P
9	EXP_NB_3P	10	GND
11	EXP_NB_3N	12	GND
13	GND	14	EXP_SB_2N
15	GND	16	EXP_SB_2P
17	EXP_NB_2P	18	GND
19	EXP_NB_2N	20	GND
21	GND	22	EXP_SB_1N
23	GND	24	EXP_SB_1P
25	EXP_NB_1P	26	GND
27	EXP_NB_1N	28	GND
29	GND	30	EXP_SB_0N
31	GND	32	EXP_SB_0P
33	EXP_NB_0P	34	GND
35	EXP_NB_0N	36	GND
37	GND	38	CLK_1078_PCIe_N
39	GND	40	CLK_1078_PCIe_P
41	NC_SGPIO_DATAOUT0	42	GND
43	BBU_KEY_PRSNT	44	GND
45	SMB_IPMB_5VSB_DAT	46	NC_PE_WAKE_N
47	SMB_IPMB_5VSB_CLK	48	RST_PS_PWRGD
49	GND	50	NC_SW_RAID_MODE
51	NC_SGPIO_DATAOUT1	52	GND
53	NC_SMB_SEN_3V3SB_CLK	54	NC_SGPIO_CLOCK
55	NC_SMB_SEN_3V3SB_DAT	56	NC_SGPIO_LOAD
57	LED_HDD_FLT_R_L	58	LED_HDD_ACT_R_L
59	GND	60	GND

8.9   SAS/SATA RAID Module Edge Connector (J2D1)

This connector provides the connection for the six SAS/SATA channels from the hardware RAID controller to the SAS/SATA backplane. It also provides the SMBus connection to and from the backplane and status signals. The power to the SAS/SATA RAID module is provided by the backplane through this edge finger connection

Table 28: Backplane Edge Finger Connector Pin-Out

Pin #	Definition	Pin #	Definition
A1	SGPIO_CLOCK	B1	P12V
A2	SGPIO_LOAD	B2	P12V
A3	P3V3	B3	P5V
A4	SGPIO_DATAOUT0	B4	P5V
A5	SGPIO_DATAOUT1	B5	P5V
A6	LED_HDD_FLT_L	B6	P5V
A7	LED_HDD_ACT_L	B7	RSVD_B7
A8	P5V_STBY	B8	RSVD_B8
A9	SMB_SAS_3V3_SCL	B9	GND
A10	SMB_SAS_3V3_SDA	B10	SMB_IPMB_5VSB_CLK
A11	RST_PS_PWRGD	B11	SMB_IPMB_5VSB_DAT
A12	GND	B12	GND
A13	RSVD_A13	B13	GND
A14	GND	B14	SAS4_TX_P
A15	GND	B15	SAS4_TX_N
A16	SAS4_RX_P	B16	GND
A17	SAS4_RX_N	B17	GND
A18	GND	B18	SAS5_TX_P
A19	GND	B19	SAS5_TX_N
A20	SAS5_RX_P	B20	GND
A21	SAS5_RX_N	B21	GND
A22	GND	B22	SAS6_TX_P
A23	GND	B23	SAS6_TX_N
A24	SAS6_RX_P	B24	GND
A25	SAS6_RX_N	B25	GND
A26	GND	B26	SAS7_TX_P
A27	GND	B27	SAS7_TX_N
A28	SAS7_RX_P	B28	GND
A29	SAS7_RX_N	B29	GND
A30	GND	B30	SAS0_TX_P
A31	GND	B31	SAS0_TX_N
A32	SAS0_RX_P	B32	GND
A33	SAS0_RX_N	B33	GND
A34	GND	B34	SAS1_TX_P
A35	GND	B35	SAS1_TX_N
A36	SAS1_RX_P	B36	GND
A37	SAS1_RX_N	B37	GND
A38	GND	B38	SAS2_TX_P
A39	GND	B39	SAS2_TX_N
A40	SAS2_RX_P	B40	GND
A41	SAS2_RX_N	B41	GND
A42	GND	B42	SAS3_TX_P
A43	GND	B43	SAS3_TX_N
A44	SAS3_RX_P	B44	GND
A45	SAS3_RX_N	B45	GND
A46	GND	B46	RSVD_B46
A47	RSVD_A47	B47	RSVD_B47

Pin #	Definition	Pin #	Definition
A48	RSVD_A48	B48	RSVD_B48
A49	GND	B49	GND

8.10 SAS/SATA RAID Module IBBU Connector (J4L1)

The intelligent battery backup unit (IBBU) connector carries signals between the SAS/SATA RAID module and the IBBU. The signals carried are power, I^2C, and control signals.

Table 29: IBBU Connector Pin-Out

Pin #	Definition	Pin #	Definition
1	P1V8_VBAT_RAID	2	GND
3	P12V	4	GND
5	IBBU_PFAIL_N	6	IBBU_BBE
7	P1V8_SAS	8	NC_IBBU_8
9	P3V3_STBY_IBBU	10	GND
11	GND	12	P3V3
13	SMB_IBBU_CLK_R	14	GND
15	SMB_IBBU_DAT_R	16	IBBU_STATUS
17	GND	18	IBBU_BBSTROBE
19	GND	20	P1V8_VBAT_RAID

9.   Telco Alarms Module (TAM)

This chapter describes the design and external interface of the Kontron Carrier Grade Server CG2100 Telco Alarms Module assembly. The chapter is organized into the following sections:

9.1   Introduction

The CG2100 server Telco Alarms Module provides the connector interface and supporting logic for the telco alarms function. The TAM board also provides an alarms function with fault relays, providing access via cable to the back of the system to the fault relay contacts. A ribbon cable connects the TAM board to the front panel board.

Figure 41 shows the Telco Alarms Module components.

Figure 41. Telco Alarms Module Layout (Primary Side)
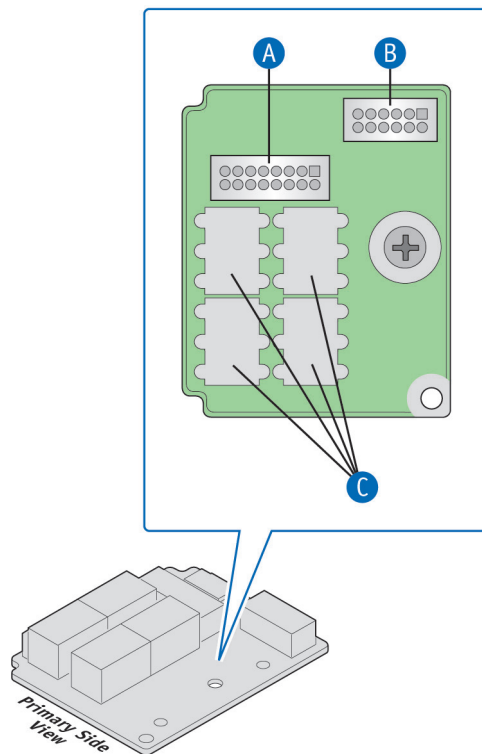
TS000620

Item	Description
A	System Interface Connector
B	External Telco Alarms Connector
C	Telco Alarm Relays

9.2   Telco Alarms Module Features

The Telco Alarms Module provides the logic and relays for controlling the telco alarm LEDs displayed on the front panel board. Figure 42 is the TAM block diagram

Figure 42. TAM Block Diagram
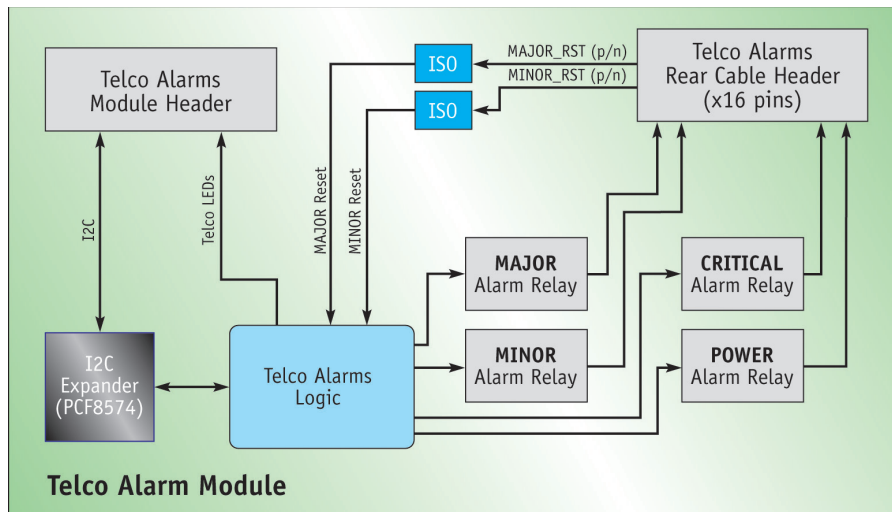
9.2.1   Telco Alarms Fault LEDs

Switch	Function
Critical	The critical alarm LED can be either amber (default) or red (set with an FRUSDR update). This LED is illuminated by the BMC private I^2C bus, and can only be turned off through BMC private I^2C control. When continuously lit, this alarm LED indicates the presence of a "critical system fault". A critical system fault is a system-detected error or event that has a fatal impact to the system,which means the system cannot continue to operate. An example is the loss of a large section of memory, or other corruption, that renders the system non-operational. The TAM board critical alarm relay is engaged.
Major	The major alarm LED can be either amber (default) or red (set with an FRUSDR update). This LED is illuminated by the BMC private I^2C bus, and can be turned off via BMC private I^2C control or alarm connector reset. When continuously lit, this alarm LED indicates the presence of a "major system fault". A major system fault is a system-detected error or event that has discernable impact to system operation, which means the system can continue to operate, but in a "degraded" fashion (reduced performance or loss of non-fatal feature reduction). An example is the loss of one of two mirrored disks. The TAM board major alarm relay is engaged.
Minor	The minor alarm LED is amber. The LED is illuminated by the BMC private I^2C bus, and can be turned off via BMC private I^2C control or alarm connector reset. When continuously lit, this alarm LED indicates the presence of a "minor system fault". A minor system fault is a system-detected error or event that has little impact to system operation. An example is a correctable ECC error. The front panel minor alarm relay is engaged.
Power	The power alarm LED is amber. The LED is illuminated by the BMC private I^2C bus or the SYS_FLT_LED_L signal, and can only be turned off via BMC private I^2C control. When continuously lit, this alarm LED indicates the presence of a "power system fault". The TAM board power alarm relay is engaged.

9.2.2   Telco Alarms Relays

The TAM board contains four relays for power, critical, major, and minor alarms. The relays are controlled by the SMBus. Section 9.3.1, "Telco Alarms External Interface Connector" describes the relay outputs.

9.3   Telco Alarms Module Connector Specifications

9.3.1   Telco Alarms External Interface Connector

The telco alarms external interface connector enables interconnection between the TAM board and the alarms port on the back of the system. The alarms port interface is a standard DB15 connector. Each alarm (major, minor, critical, and power) is the output of a Single Pole, Double Throw (SPDT) relay contact. A common contact with normally-open and normally-closed connections is included. The power alarm has common and normally-open contacts only. Reset circuit contacts are provided for the major and minor alarms.

Table 30 shows the pin definitions for the 2x8 alarms external interface connector on the TAM board.

Table 30 Telco Alarms External Interface Connector Pin-Out

Pin	Signal Name	Description
1	MINOR_RST_POS	Minor reset positive
2	MINOR_RST_NEG	Minor reset negative
3	MAJOR_RST_POS	Major reset positive
4	MAJOR_RST_NEG	Major reset negative
5	CRITICAL_NO	Critical alarm normally open
6	CRITICAL_NC	Critical alarm normally closed
7	CRITICAL_COMM	Critical alarm common
8	MINOR_NO	Minor alarm normally open
9	MINOR_NC	Minor alarm normally closed
10	MINOR_COMM	Minor alarm common
11	MAJOR_NO	Major alarm normally open
12	MINOR_NC	Major alarm normally closed
13	MAJOR_COMM	Major alarm common
14	PWR_NO	Power alarm normally open
15	PWR_COMM	Power alarm common
16	GND	Ground

9.3.2   Telco Alarms System Interface Connector

The telco alarms system interface connector is used for the interface from the telco alarms module to the front panel board through a signal ribbon cable. Table 31 shows the pin definitions for the 2x6 system interface connector on the TAM board.

Table 31 Telco Alarms System Interface Connector Pin-Out

Pin	Signal Name	Description
1	TELCO_PWR_LED_N	Telco Power Alarm LED indicator signal
2	TELCO_MIN_LED_N	Telco Minor Alarm LED indicator signal
3	TELCO_MAJ_LED_R_N	Telco Major Alarm Red LED indicator signal
4	TELCO_MAJ_LED_Y_N	Telco Major Alarm Yellow LED indicator signal
5	TELCO_CRIT_LED_R_N	Telco Critical Alarm Red LED indicator signal
6	TELCO_CRIT_LED_Y_N	Telco Critical Alarm Yellow LED indicator signal
7	TELCO_ALRM_PRST_N	Telco Alarm Module present indicator
8	P5V_STBY	+5V standby power
9	SMB_SEN_3V3SB_CLK	SMBus Clock
10	SMB_SEN_3V3SB_DAT	SMBus Data
11	P3V3_STBY	+3.3V standby power
12	GND	Ground

9.4   Telco Alarms Module Mechanical Drawing

Figure 43. Telco Alarms Module Mechanical Drawing
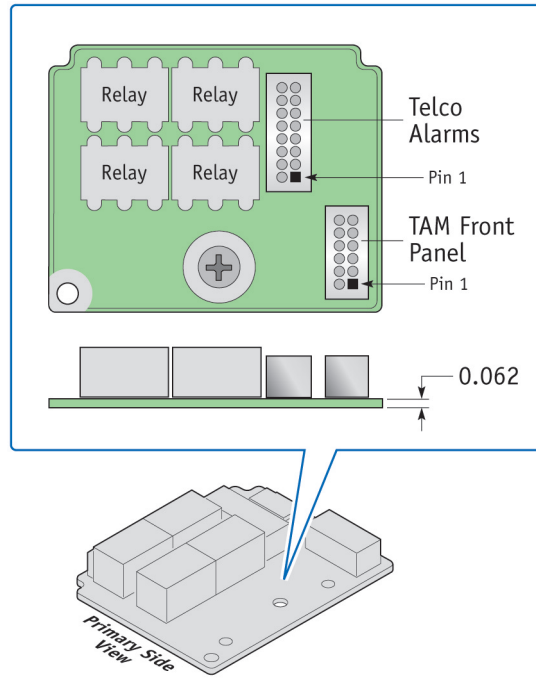
10. **USB SD Flash Module**

This chapter describes the design and external interface of the Kontron Carrier Grade Server CG2100 USB SD flash module assembly. The chapter is organized into the following sections:

Section 10.1   **Introduction**

Section 10.2   **USB SD Flash Module Features**

Section 10.3   **USB SD Flash Module Connector Specification**

10.1 Introduction

The CG2100 server USB SD flash module board provides connectors and supporting logic for two SD flash memory card slots.

Figure 44 shows the SD flash module components.

Figure 44. SD Flash Module Layout (Primary Side)
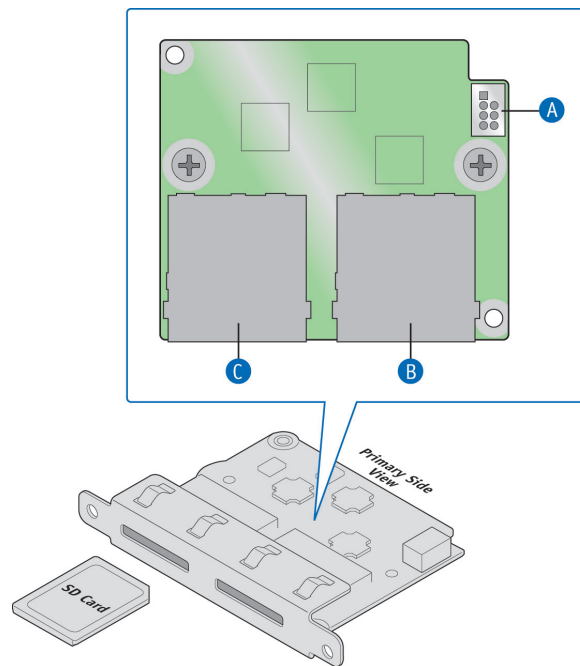
Item	Description
A	Internal USB cable connector
B	SD Card connector 0
C	SD Card connector 1

10.2 USB SD Flash Module Features

Figure 45 shows the SD flash module block diagram.

Figure 45: SD Flash Module Block Diagram
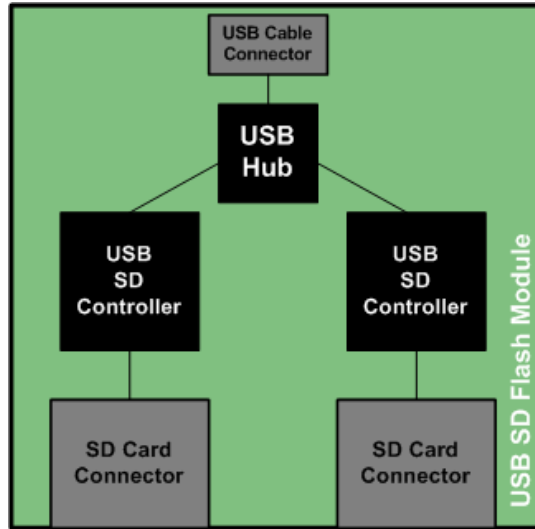
10.3 USB SD Flash Module Connector Specifications

This section provides the pin definitions for the SD flash module connectors.

10.3.1   USB Connector

The USB connector is the system interface for the SD flash module. It carries the USB signals, power, and an indicator signal. Figure 46 shows the USB connector location on the module.

Figure 46. SD Flash Module Mechanical Drawing
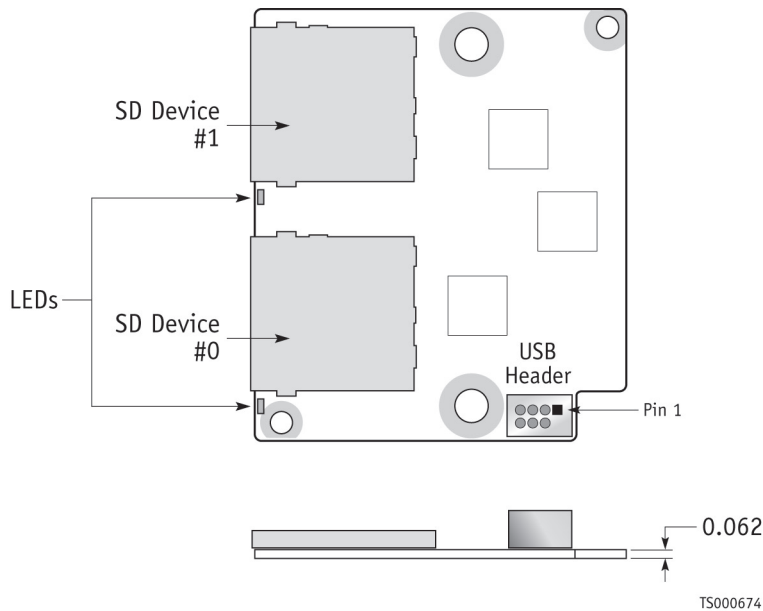
Table 32 SD Flash Module USB Connector Pin-Out

Pin	Signal Name	Description
1	GND	Ground
2	n/a	Pin pulled for connector keying
3	USB_DP	USB Differential Pair (+)
4	P5V	Power (+5V)
5	USB_DN	USB Differential Pair (-)
6	GND	Ground
7	ACT_LED_N	Activity LED
8	NC	No Connection

10.3.2   SD Card Connector

The SD card connector provides the interface to standard plug-in SD Card memory devices. Pin 1 on the SD flash connectors is the bottom pin when looking at the module as shown in Figure 46.

Table 33. SD Flash Module SD Card Connector Pin-Out

Pin	Signal Name	Description
1	SD1_D3	Data Line 3
2	SD1_CMD	Command Line
3	GND	Ground
4	SD1_CARD_PWR	SD Card Power
5	SD1_CLK	Clock
6	GND	Ground
7	SD1_D0	Data Line 0
8	SD1_D1	Data Line 1
9	SD1_D2	Data Line 2
10	SD1_nCD	SD Card Detect
11	SD1_WP	SD Write Protect Detection
12	GND	Ground

11. **PCI Riser Card Assembly**

This chapter describes the design and external interface of the Kontron Carrier Grade Server CG2100 PCI riser card assembly. This chapter is organized into the following sections:

      Section 11.1   **Introduction**

      Section 11.2   **Riser Card Options**

      Section 11.3   **Riser Card Mechanical Drawings**

11.1 Introduction

The CG2100 server supports different riser card options depending on which add-in card configuration option is selected. Riser card(s) are installed in the PCI cage assembly using two keyhole features and two 6/32 screws for each riser.

11.2 Riser Card Options

The Intel® Server Board T5520UR has one riser slot capable of supporting riser cards for both 1U and 2U system configurations. The riser slot (J4E1) implements Intel® Adaptive Slot Technology. This 280-pin connector is capable of supporting riser cards that meet either the PCI-X or PCI Express* technology specifications. Some risers can support both full-height and low-profile add-in cards by using a 'butterfly' configuration. See Section 11.3 for detailed mechanical information about the riser cards.

Table 34 identifies the card configurations and the connector types used.

Table 34 Riser Card Configurations

Riser Card Option	Slot Configuration
2U PCI Express Passive Riser (Product Order Code – ASR26XXFHR)	Three full-height PCI Express connectors (one x16 connector* and two x8 connectors)
2U Butterfly PCI Express/PCI-X Active Riser (Product Order Code – ASR26XXFHXR)	Two full-height PCI-X 133 connectors One full-height PCI Express connector Two low-profile PCI Express connectors
2U Butterfly PCI Express Active Riser (Product Order Code – ASR26XXFHLPR)	Three full-height PCI Express connectors Two low-profile PCI Express* connectors

**NOTE: ***All PCI Express add-in cards run at x8 speeds independent of population. The PCI Express x16 connectors utilize an x8 electrical connection.

Figure 47 shows the three different configuration options.

Figure 47. PCI Add-In Card Options
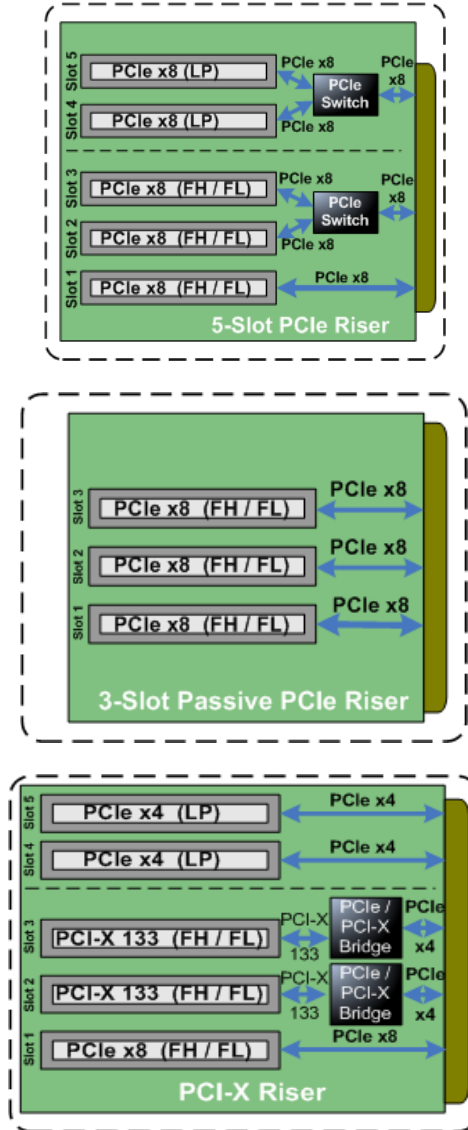
11.3 Riser Card Mechanical Drawings

Figure 48, Figure 49, and Figure 50 are mechanical drawings for both primary and secondary sides of each of the three riser card options.

Figure 48: 2U Butterfly PCI Express* Riser

Primary Side
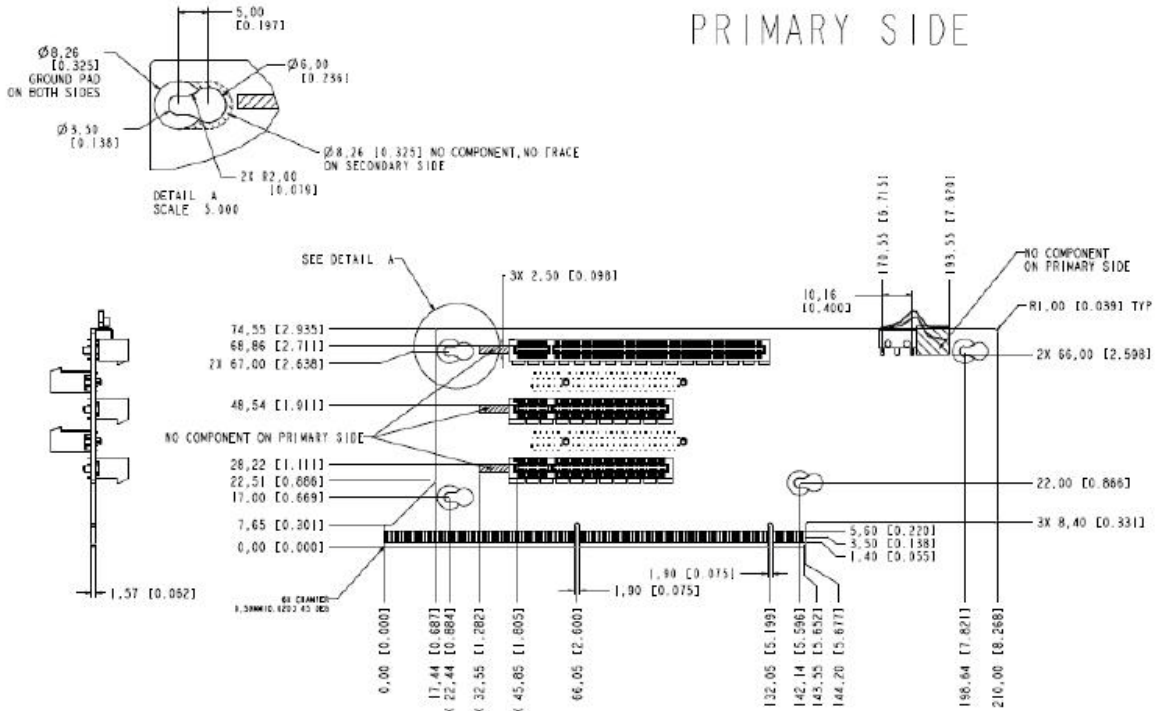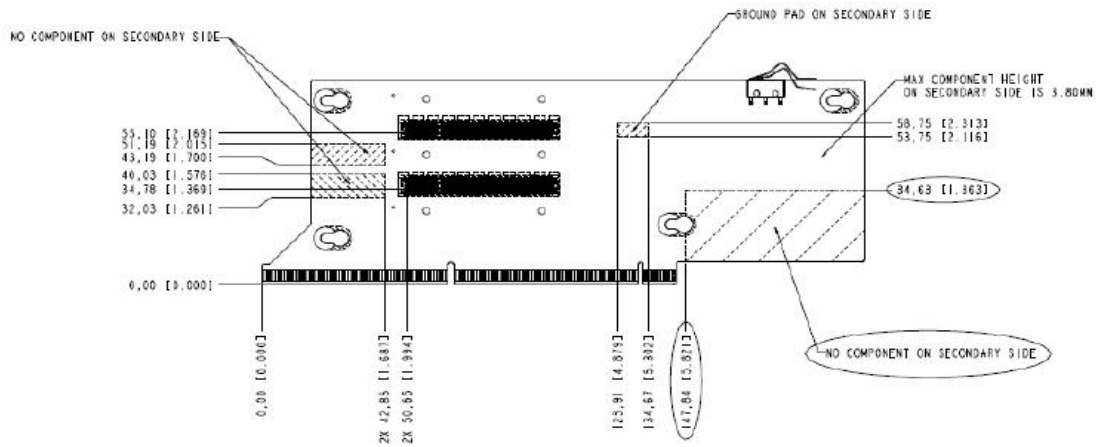
Secondary Side

Figure 49: 2U Butterfly PCI-X/PCI Express Active Riser

Primary Side
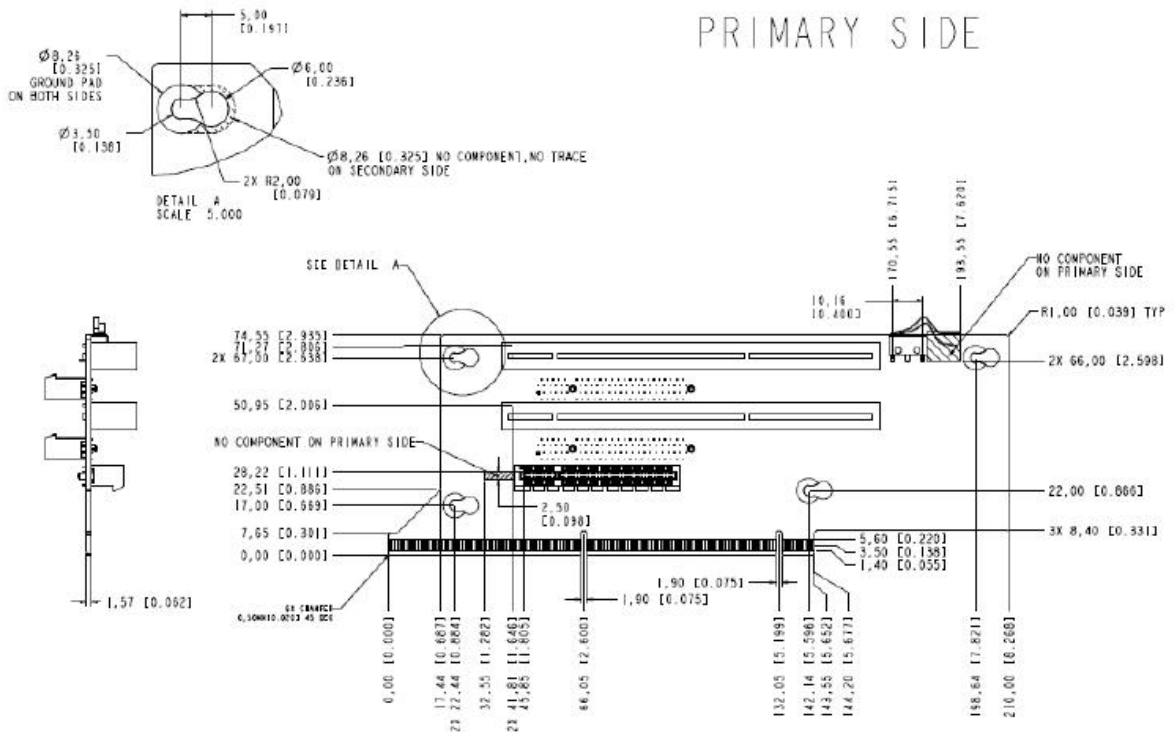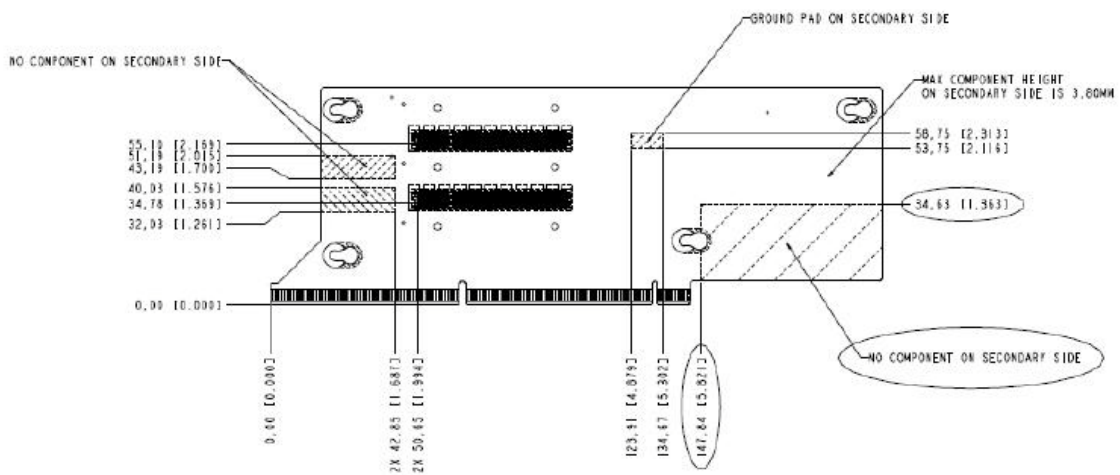
Secondary Side

Figure 50: 2U PCI Express Passive Riser

Primary Side
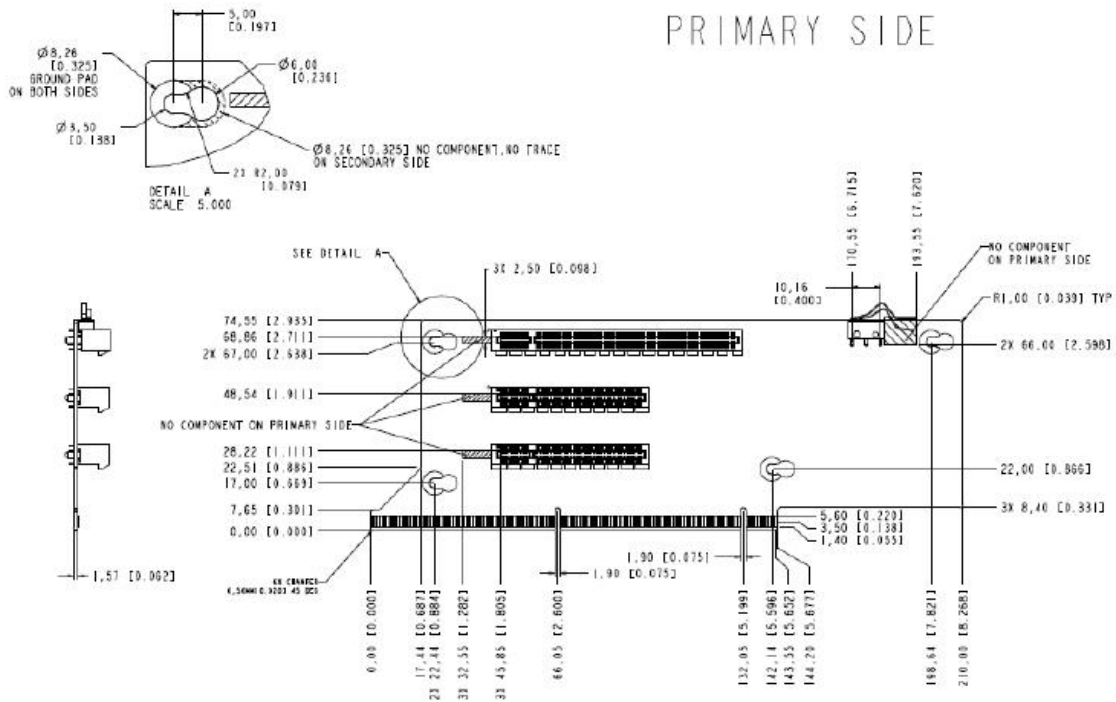
Secondary Side
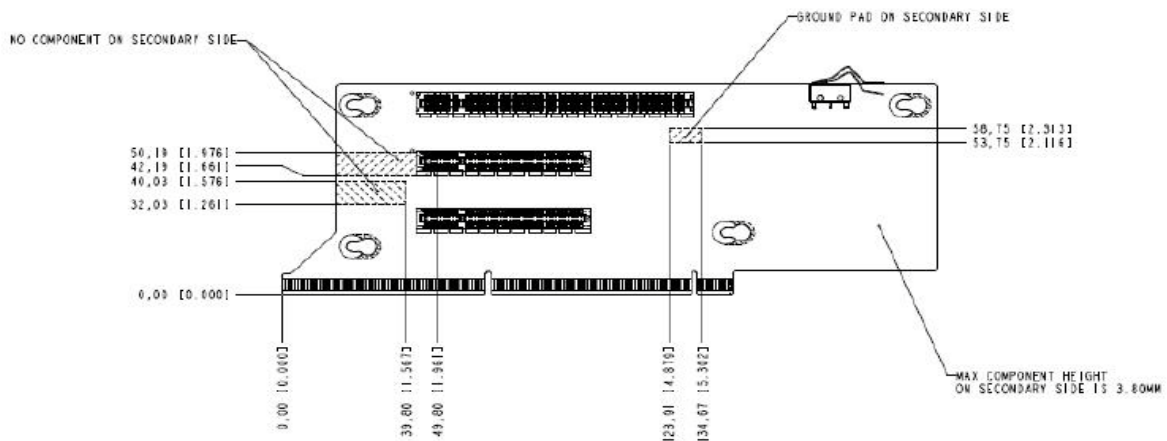
12. **DC Power Subsystem**

This chapter defines the features and functionality of the DC-input switching power supply subsystem. The information contained in this chapter is organized the following sections:

The CG2100 DC power supply is mechanically identical to another DC power supply used in several other systems as show in the table below. Either power supply can be installed into the CG2100 system as well as the other systems. The difference is only in the protocol of the power system management bus.

No damage to the power supplies or systems will occur when either power supply is installed in any of the systems listed below. Improper power supply status will be reported and the FRUSDR may require re-flashing should the incorrect power supply be installed. Please insure that the correct power supply is installed per the following table:

Table 35 DC Power Supply

Server Product Name	DC Power Supply Model #	PS Management Bus Protocol
CG2100	DPS-600TB-1 A	PMBus™ protocol
NSN2U		
TIGH2U	DPS-600RB-1 A	SMBus™ protocol
NSC2U		
TIGI2U		
NSI2U		

Section 12.1   **Introduction**

Section 12.2   **DC Power Supply to Power Distribution Board Interconnect**

Section 12.3:   **DC Power Supply Input Connector Pin Definitions**

Section 12.4:   **DC 48V Input Power Mating Connector**

Section 12.5:   **DC Power Supply Output Connector Pin Definitions**

Section 12.6:   **DC Power Supply Input Voltage and Current Requirements**

Section 12.7:   **DC Power Supply Output Current Requirements**

Section 12.8:   **DC Power Supply LED Indicator**

Section 12.9   **DC Power Supply Thermal Protection**

12.1 Introduction

The DC power subsystem supports up to two DC power supply modules capable of operating in redundant mode and a power distribution board (PDB). The features of the DC input power supply subsystem are:

- 600W power module output capability in full DC input voltage range

- 600W subsystem output capability in full DC input voltage range
- Power Good indication LEDs
- Predictive failure warning
- Internal cooling fans with multi-speed capability
- Remote sense of 3.3 V, 5 V, and 12 Vdc (on the PDB) outputs
- DC_OK circuitry for brown-out protection and recovery
- Built-in load sharing capability
- Built-in overloading protection capability
- Onboard field replaceable unit (FRU) information
- PMBus interface for server management functions
- Integral handle for insertion/extraction

Figure 51 is a mechanical drawing of the power supply module.

Figure 51. Power Supply Module Mechanical Drawing

-
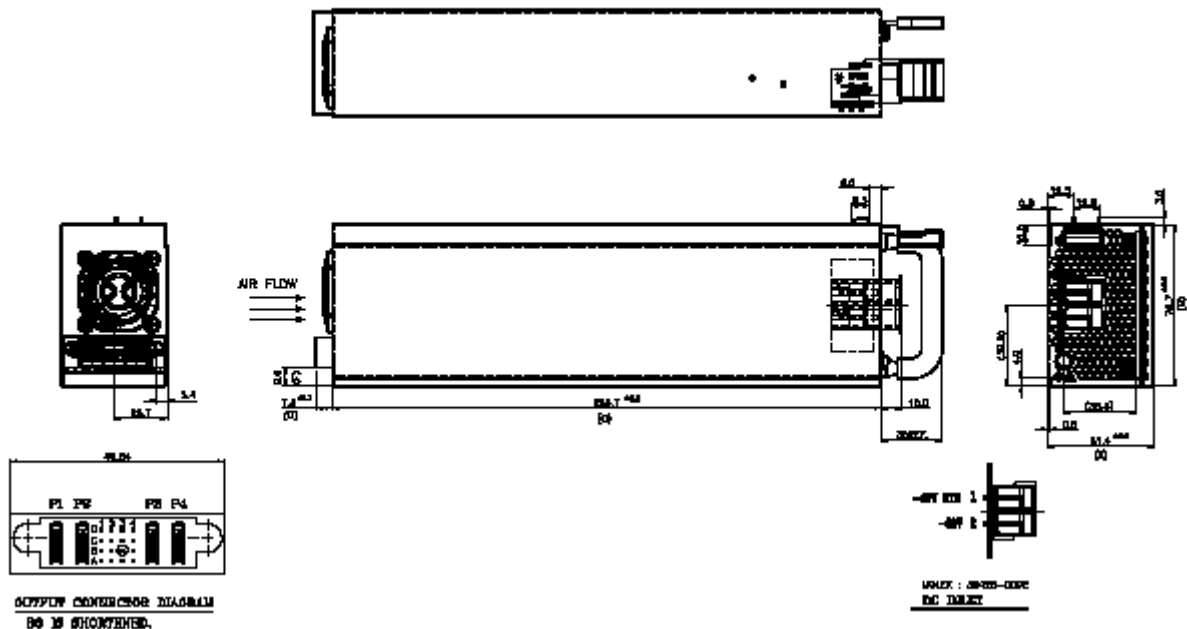
12.2 DC Power Supply to PDB Interconnect

The power supply provides a blind mate connection to the PDB to transfer the power module output voltages and signals to the PDB.

The power supply module has a protective earth ground with all secondary circuits connected to it. Resistance of the ground returns to chassis does not exceed 1.0 mΩ. This path can be used to carry DC current.

12.3 DC Power Supply Input Connector

Figure 52 shows the power input connector on the DC-input power supply module.

Figure 52. DC Power Supply Input Connector

The polarity for the connector is marked on the power supply housing; in this view, "-"is on the left and "+" is on the right.

12.4 DC Power Supply 48V Input Power Mating Connector

A Molex PN 0394210002 is the mating connector for the DC power supply module input connector. It connects 48V input power to the system. The input wiring is connected as shown in Figure 53. The DC input polarity is marked on the DC power supply module case; in Figure 53 "-"is on the left and "+" is on the right.

Figure 53 DC Power Supply Mating Connector
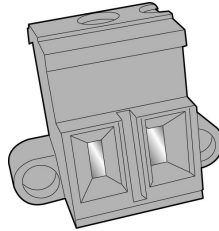
12.5 DC Power Supply Output Connector

This connector blind mates to the input connector of the power distribution module (PDB).

Figure 54. DC Power Supply Output Connector
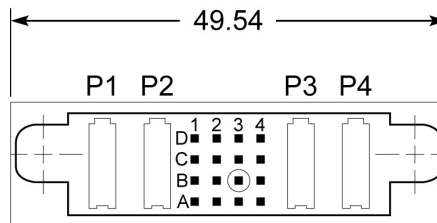
Table 36. Output Connector Pin-Out

Signal Pins				
Position	1	2	3	4
D	+12VRS	-12V	+5VSB	15VCC
C	PWOK	RS RTN	+5VSB	A0
B	+12VLS	RESERVE	PS KILL	A1
A	PS ON#	SDA	SCL	PS ALERT#
Power Blades				
P1	P2	P3	P4	
+12V	+12V	RTN	RTN	

12.6 DC Power Supply Input Voltage and Current Requirements

The DC power supply input voltage and input current requirements are listed in Table 37.

Table 37. DC Power Supply Input Requirements

DC Input Voltage	
Nominal	-48Vdc
Minimum[1]	$-38V_{rms}$
Rated	-48Vdc to -60Vdc
Maximum	-75Vdc
DC Input Current	
Maximum	13A @ -38Vdc

[*]The minimum steady-state DC input voltage at which the equipment remains fully operational is -38VDC.

12.7 DC Power Supply Output Current Requirements

The power supply module provides three main outputs; +12V, -12V, and 5V standby, along with the 15 VBIAS voltage. 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 38.

Table 38. DC Power Supply 600W Load Ratings

	+12V	+5Vsb	-12V
Max Load	49.0A	2.0A	0.5A
Min Dynamic Load	2.5A	0.1A	0A
Min Static Load	0.5A	0.1A	0A
PEAK Load (12 seconds max)	56.0A	2.5A	N/A
Max Output Power (continuous), see note	12V x 49A = 588W max	5V x 2A = 10W max	-12V x 0.5A = 6W max
Peak Output Power (for 12s max), see note	12V x 56A = 672W peak	5V x 2.5A = 12.5W peak	N/A

NOTE: At max and peak loads the 12V output voltage is allowed to sag to –4 %(11.52V)

12.8 DC Power Supply LED Indicator

The power supply module 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 green when all the power outputs are available.

The LED is amber when the power supply module has failed and is shut down because of over-current or over-temperature. See Table 39 for possible LED conditions.

Table 39. LED Indicators

Power Supply Condition	Bi-Color LED
No DC power to all power supplies	Off
No DC power to this PSU only (for 1+1 configuration) or Power supply critical event causing a shutdown: failure, fuse blown (1+1 only), OCP(12V), OVP(12V), fan failed	Amber
Power supply warning events where the power supply continues to operate: high temp, high power/high current, slow fan.	1Hz blinking amber
DC present / Only 5Vsb on (PS Off)	1Hz blinking green
Output ON and OK	Green

12.9 DC Power Supply Thermal Protection

The power supply subsystem is protected against over-temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the PSU shuts down. When the power supply temperature drops to within specified limits, the power supply restores power automatically while the 5VSB remains on always. The OTP circuit has built in hysteresis so the power supply does not oscillate on and off because of a temperature recovering condition. The OTP trip level has a minimum of 4°C of ambient temperature hysteresis.

13. **Power Distribution Board (PDB)**

This chapter defines the features and functionality of the power distribution board (PDB), which is used in conjunction with a DC or AC input power supply module to complete the power subsystem. The information in this chapter is presented in the following sections:

Section 13.1   **Introduction**

Section 13.2   **PDB DC Output Specification**

Section 13.3   **PDB +12V Outputs Load Requirements**

Section 13.4   **PDB D2D Converters Loading**

Section 13.5   **PDB Output Voltage Regulation**

Section 13.6   **PDB Protection Circuits**

Section 13.7   **PDB PMBus Requirements**

Section 13.8   **PDB Output Interface Connectors**

13.1 Introduction

The power distribution board (PDB) is designed to plug directly into the system baseboard, eliminating cumbersome wire harnesses. The AC or DC power supply modules blind mate into the PDB which then provides the system with five isolated +12V power rails. Each power rail provides 240VA protection, +3.3VDC and +5VDC DC to DC converter outputs, along with additional protection circuitry and a FRU EEPROM. Figure 55 shows the PDB.

Figure 55: Power Distribution Board
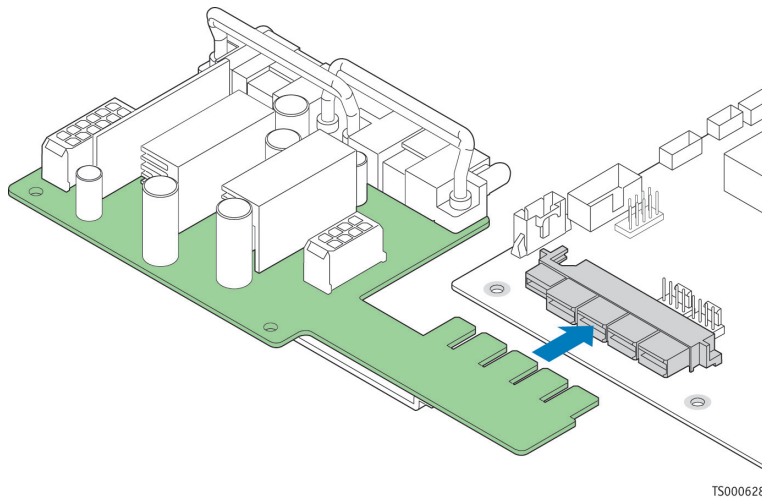
13.2 PDB DC Output Specification

The power distribution board (PDB) has a female connector that mates to a male connector located on the power supply module.

Figure 56: PDB Input Connector
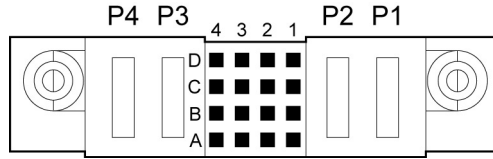
Table 40. PDB Input Connector Pin-Out

Signal Pins				
Position	1	2	3	4
D	+12VRS	-12V	+5VSB	15VCC
C	PWOK	RS RTN	+5VSB	A0
B	+12VLS	RS RTN	PS KILL	A1
A	PS ON#	SDA	SDL	PS ALERT#
Power Blades				
P1	P2	P3	P4	
+12V	+12V	RTN	RTN	

13.3   PDB +12V Output Load Requirements

This section describes the +12V output power requirements from the power distribution board with either one or two (redundant) ERP600W power supplies plugged into the input connector on the power distribution board.

NOTE: The combined total power limit for ALL outputs is 680W max. However, total system power is limited to 600W to enable system 1+1 power redundancy.

Table 41: PDB +12V Outputs Load Ratings

	+12V1/2/3/4/5 combined output limit = 44A / 56A peak max				
	+12V1	+12V2	+12V3	+12V4	+12V5
MAX Load	16A	16A	16A	18A	16A
MIN Static / Dynamic Load	0.75A	0.75A	0.5A	0.5A	0.5A
Peak load (12 seconds)	18A	18A	18A	18A	18A
Max Output Power	12V x16A =192W	12V x16A =192W	12V x16A =192W	12V x18A =216W	12V x16A =192W

13.4   PDB D2D Converters Loading

Table 42 defines power and current ratings for the three D2D converters located on the PDB, each powered from +12V rail. The three converters meet both static and dynamic voltage regulation requirements for the minimum and maximum loading conditions.

NOTE: The 3.3V/5V combined power limit is 150W maximum.

Table 42. PDB D2D Converter Load Ratings

+12VDC Input DC/DC Converters	+3.3V Converter	+5V Converter
Maximum Load	20A	26A
Minimum Static/Dynamic Load	0.5A	0.5A
Maximum Output Power	3.3V x20A =66W	5V x26A =130W

13.5 PDB Output Voltage Regulation

The output voltages must stay within the following voltage limits when operating at steady state and dynamic loading conditions. These limits include the peak-peak ripple/noise specified in Table 43. All outputs are measured with reference to the return remote sense signal (ReturnS). The 3.3V and 5V outputs are measured at the remote sense point, all other voltages measured at the output interface connector.

Table 43. CG2100 PDB Voltage Regulation Limits

Converter Output	Tolerance	Minimum	Nominal	Maximum	Units
+3.3VDC	-3%/+5%	+3.20	+3.30	+3.46	VDC
+5VDC	-4%/+5%	+4.80	+5.00	+5.25	VDC
+12VDC (12V1/2/3/4/5)	-4%/+5%	+11.52	+12.00	+12.60	VDC
-12VDC	-5%/+9%	-13.08	-12.00	-11.40	VDC
5Vsb	-4%/+5%	+4.80	+5.00	+5.25	VDC

13.6 PDB Protection Circuits

Protection circuits inside the power distribution board and the power supply can cause either the power supply main +12V output to shut down, which in turn shuts down the other 3 outputs on the PDB, or first shut down any of the three outputs on the PDB, which in turn also shuts down entire power supply subsystem. If the power supply latches off because of a protection circuit tripping, an AC or DC cycle OFF for 15 seconds minimum and a PSON# cycle HIGH for 1 second resets the power supply and the PDB.

13.7   PDB PMBus Requirements

The power supply subsystem meets the requirements of PMBus specifications parts I and II, revision 1.2.

The following related documents give more detailed information about PMBus requirements:

- PMBus™ Power System Management Protocol Specification Part I – General Requirements, Transport And Electrical Interface; Revision 1.2

- PMBus™ Power System Management Protocol Specification Part II – Command Language; Revision 1.2
- System Management Bus (SMBus) Specification Version 2.0

13.8 PDB Output Interface Connectors

13.8.1   Baseboard Connector Card Edge

The PDB has a card edge connection to the baseboard. The card edge has gold plated contacts. It mates with a Molex connector 45984-0010 (12 signals and

Figure 57 PDB Baseboard Card Edge Connector Mechanical Drawing
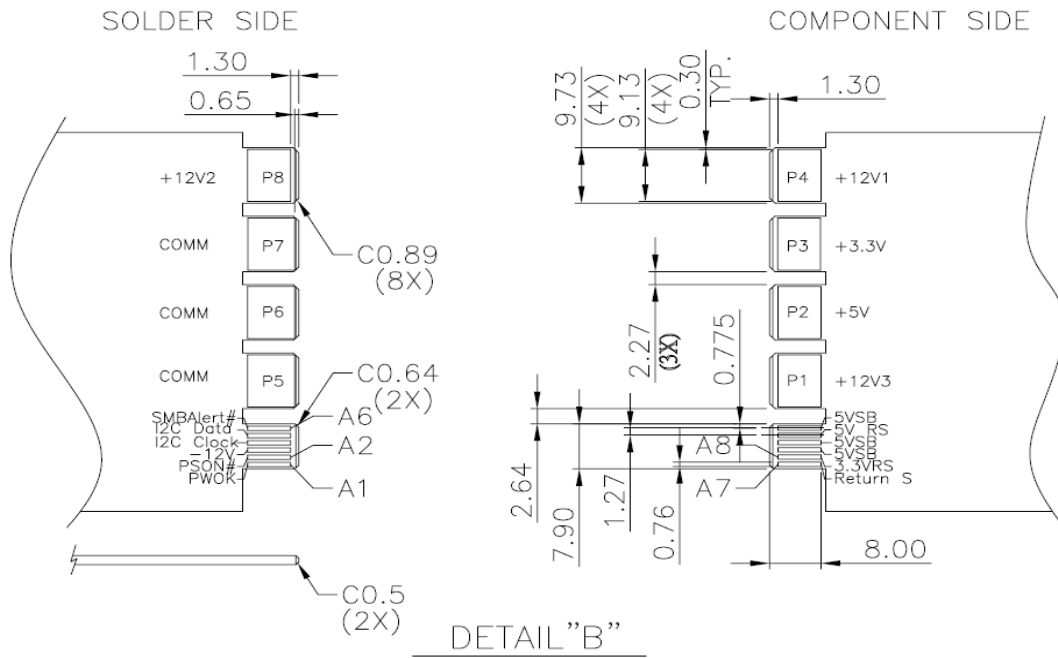
Table 44. PDB Card Edge Connector Pin-Out

	Pin#	Definition
Signal pins	1	PWOK
	2	PSON#
	3	-12VDC
	4	SMBus Clock
	5	SMBus Data
	6	SMBAlert#
	7	Return Sense
	8	3.3V remote sense
	9	+5VSB
	10	+5VSB
	11	5V remote sense
	12	+5VSB
Power segments	P1	12V3
	P5	COMM
	P2	+5VDC
	P6	COMM
	P3	+3.3V
	P7	COMM
	P4	+12V1
	P8	+12V2

13.8.2   HDD Backplane Power Connector (FPIO)

The HDD backplane power connector is a 2x6-pin connector that carries power to the SAS/SATA backplane board. +12V4, +3.3VDC, +5VDC, +5VSB, COM.

Table 45. Drive Backplane Power Connector Pin-Out

Pin #	Definition	Pin #	Definition
1	COMM	7	COMM
2	COMM	8	COMM
3	COMM	9	12V4
4	12V4	10	12V4
5	+3.3V	11	+5VSB
6	+5VDC	12	+5VDC

13.8.3   PDB I/O Power Connector

The I/O power connector is a 2x4-pin connector that carries power to the I/O peripherals -- +12V5, +5VDC, COM.

Table 46. I/O Power Connector Pin-Out

Pin #	Definition
1	12V5
2	+5VDC
3	12V5
4	+5VDC
5	COMM
6	COMM
7	COMM
8	COMM

14. **AC Power Subsystem**

This chapter defines the features and functionality of the AC-input switching power subsystem. The information contained in this chapter is organized into the following sections:

The CG2100 AC power supply is mechanically identical to another AC power supply used in several other systems as show in the table below. Either power supply can be installed into the CG2100 system as well as the other systems. The difference is only in the protocol of the power system management bus.

No damage to the power supplies or systems will occur when either power supply is installed in any of the systems listed below. Improper power supply status will be reported and the FRUSDR may require re-flashing should the incorrect power supply be installed. Please ensure that the correct power supply is installed as specified in Table 47:

Table 47. Power Supply Models

Server Product Name	AC Power Supply Model #	PS Management Bus Protocol
CG2100	DPS-600TB A	PMBus™
NSN2U		
TIGH2U	DPS-600RB A	SMBus™
NSC2U		
TIGI2U		
NSI2U		

Section 0   Introduction

Section 14.2   AC Power Supply Input Voltage Requirements

Section 14.1:   AC Power Supply Output Current Requirements

Section 14.3: AC Power Supply LED Indicator

Section 14.4: AC Power Supply Air Flow

Section 14.5: AC Power Supply Thermal Protection

Introduction
The AC power subsystem has up to two redundant AC power supply modules and a power distribution board (PDB). The AC input power supply subsystem has the following features:

- 600 W module output capability in full AC input voltage range
- 600 W subsystem output capability in full AC input voltage range
- Power Good indication LEDs
- Predictive failure warning
- Internal cooling fans with multi-speed capability

- Remote sense of 3.3 V, 5 V, and 12 Vdc outputs
- AC_OK circuitry for brown out protection and recovery
- Brown out protection and recovery
- Built-in overloading protection capability
- Onboard field replaceable unit (FRU) information
- PMBus interface for server management functions
- Integral handle for insertion/extraction

The power supply module, which is shown in Figure 58, contains one 40mm fan. The module provides a handle to assist in insertion and extraction so it can be inserted and extracted without using tools.

Figure 58. AC Power Supply Module Mechanical Drawing
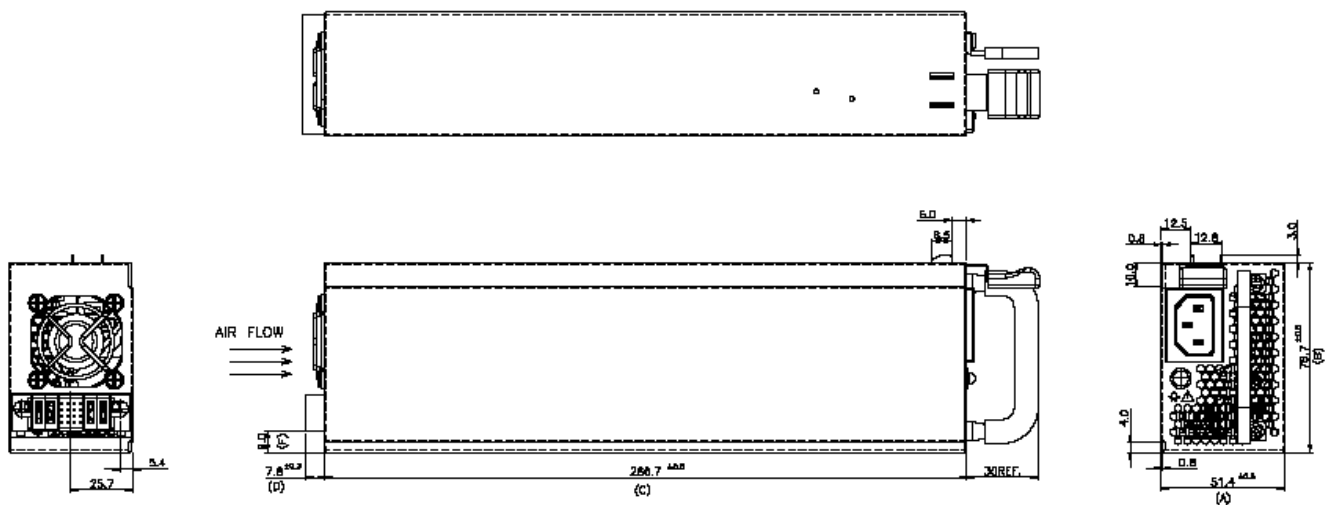
The power supply provides a pluggable terminal block that mates to a connector on the PDB. This is a blind mating connector that connects the power supply output voltages and signals.

The power supply provides a reliable protective earth ground with all secondary circuits connected. Resistance of the ground returns to chassis does not exceed 1.0 mΩ. This path can be used to carry DC current.

Figure 59: AC Power Supply Module Output Connector
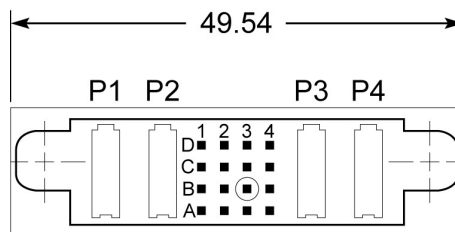
Table 48. AC Output Connector Pin-Out

Signal Pins				
Position	1	2	3	4
D	+12VRS	-12V	+5VSB	15VCC
C	PWOK	RS RTN	+5VSB	A0
B	+12VLS	RESERVE	PS KILL	A1
A	PS ON#	SDA	SCL	PS ALERT#
Power Blades				
P1	P2	P3	P4	
+12V	+12V	RTN	RTN	

14.1 AC Power Supply Input Voltage and Current Requirements

The AC power supply input voltage and current requirements are listed in Table 49.

Table 49. AC Input Rating

Line Voltage	
Nominal110Vrms	
Minimum	90V$_{rms}$
Rated	100-127 V$_{rms}$
Maximum	140V$_{rms}$
Nominal 220Vrms	
Minimum	180V$_{rms}$
Rated	200-240 V$_{rms}$
Maximum	264V$_{rms}$
Start-up Voltage	85Vrms +/-4Vrms
Power-Off Voltage	75Vrms +/-5Vrms
Line Current	

Maximum	6A @90Vrms / 3A @180Vrms
Frequency	
Minimum	47 Hz
Rated	50/60 Hz
Maximum	63 Hz

14.2 AC Power Supply Output Current Requirements

The power supply module provides three main outputs; +12V, -12V, and 5V standby, along with the 15VBIAS voltage. Two D2D converters located in the cage provide the 3.3V and 5V rails from the 12V provided by the power supply module.

The combined maximum output power of all outputs is 600W (680 W peak). Each output has a maximum and minimum current rating as shown in Table 50.

Table 50. AC Power Supply 600W Load Ratings

	+12V	+5Vsb	-12V
Maximum Load	49.0A	2.0A	0.5A
Minimum Dynamic Load	2.5A	0.1A	0A
Minimum Static Load	0.5A	0.1A	0A
Peak Load (12 Seconds Maximum)	56.0A	2.5A	N/A
Maximum Output Power (Continuous), See Note 1	12V x 49A = 588W max	5V x 2A = 10W max	-12V x 0.5A = 6W max
Peak Output Power (for 10s Maximum), See Note 2	12V x 56A = 672W peak	5V x 2.5A = 12.5W peak	N/A

NOTES:
1. At max load the 12V output voltage is allowed to sag to –4%, which is 11.52V; so the actual max power is then: 11.52V x 49A = 564.5 W, and this applies also for 5VSB: 4.80Vx2A=9.6W; total max continuous power = 564.5+9.6=574.1W .
2. At peak load the 12V output voltage is allowed to sag to –4%, which is 11.52V; so the actual peak power is: 11.52V x 56A = 645W; and this applies also to 5VSB: 4.80Vx2.5A=12W; the total peak power = 657 W peak

14.3   AC Power Supply LED Indicator

The power supply module provides a single external bi-color LED to indicate the status of the power supply. When AC is applied to the power supply module and standby voltages are available, the LED is blinking green.

The LED is green when all power outputs are available.

The LED is amber when the power supply fails for shutdown because of over- current or shutdown because of over-temperature. See Table 51 for definitions of the LED conditions.

Table 51: LED Indicator Status Conditions

Power Supply Condition	Bi-color LED
No AC power to all power supplies	Off
No AC power to this PSU only (for 1+1 configuration) or Power supply critical event causing a shutdown: failure, fuse blown (1+1 only), OCP(12V), OVP(12V), fan failed	Amber
Power supply warning events where the power supply continues to operate: high temperature, high power/high current, slow fan.	1Hz blinking amber
AC present / only 5Vsb on (PS Off)	1Hz blinking green
Output on and OK	Green
No AC power to all power supplies	Off

14.4 AC Power Supply Air Flow

Each power supply has one 40mm fan for self-cooling that is also used for partial system cooling. The fans provide 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). Variable fan speed is based on output load and ambient temperature. Under standby mode, the fans must run minimum the RPM.

14.5 AC Power Supply Thermal Protection

The power supply is protected against over-temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the PSU shuts down. When the power supply temperature drops to within specified limits, the power supply I restores power automatically, while the 5VSB remains on always. The OTP circuit has built in hysteresis so the power supply does not oscillate on and off because of temperature recovering conditions. The OTP trip level has a minimum of 4°C of ambient temperature hysteresis.

15. Regulatory Specifications

The Kontron CG2100 Carrier Grade Server meets the specifications and regulations for safety and EMC defined in this chapter.

15.1 Safety Compliance

USA/Canada	UL 60950-1 1st Edition/CSA C22.2 No. 950-1
Europe	Nemko/GS EN 60950-1, 2nd Edition
	Low Voltage Directive, 73/23/EEC
International	CB Certificate and Report to IEC60950-1, 2nd Edition and all international deviations

15.2 Electromagnetic Compatibility

USA	FCC 47 CFR Parts 15, Verified Class A Limit
Canada	IC ICES-003 Class A Limit
Europe	EMC Directive, 2004/108/EC
	EN55022, Class A Limit, Radiated & Conducted Emissions
	EN55024 Immunity Characteristics for ITE
	EN61000-4-2 ESD Immunity
	EN61000-4-3 Radiated Immunity
	EN61000-4-4 Electrical Fast Transient
	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	KCC 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

15.3 CE Mark

The CE marking on this product indicates that it is in compliance with the European Union EMC Directive 2004/108/EC, and Low Voltage Directive, 73/23/EEC.

15.4 NEBS Compliance

The CG2100 Carrier Grade Server system with DC input is compliant with the NEBS.Level 3 criteria and the system with AC input is compliant with NEBS Level 1 criteria from the following NEBS specifications:

- NEBS GR-63-CORE, Issue 3 — Physical Protection
- NEBS GR-1089-CORE, Issue 4 — Electromagnetic Compatibility and Electrical Safety
- ETSI Standards Compliance (DC Input Only)

The CG2100 Carrier Grade Server system with DC input is compliant with the following ETSI specifications:

- ETSI EN 300 386 — EMC requirements for Telecom Equip.
- ETS 300-019-2-1 — Storage Tests, Class T1.2
- ETS 300-019-2-2 — Transportation Tests, Class T2.3
- ETS 300-019-2-3 — Operational Tests, Class T3.2

- ETS 753 — Acoustic Noise

Appendix A: Glossary

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

Term	Definition
A, Amp	Ampere
A/µs	Amps per microsecond
AC	Alternating current
ACPI	Advanced Configuration and Power Interface
ANSI	American National Standards Institute
APIC	Advanced Programmable Interrupt Controller
ASIC	Application specific integrated circuit
AWG	American wire gauge
BIOS	Basic input/output system
BMC	Bus management controller
Bridge	Circuitry that connects one computer bus to another
Byte	8-bit quantity
C	Centigrade
CE	Community European (EU mark)
CFM	Cubic feet per minute
CISPR	International Special Committee on Radio Interference
CSA	Canadian Standards Organization
CTS	Clear to send
DAT	Digital audio tape
dB	Decibel
dBA	Acoustic decibel
B	Acoustic Bel
DC	Direct current
DC/DC	DC to DC (converter); also termed D2D
DIMM	Dual inline memory module
DMI	Desktop management interface
DOS	Disk operating system
DRAM	Dynamic random access memory
DSR	Data set ready
DTR	Data terminal ready
DWORD	Double word – 32-bit quantity
ECC	Error checking and correcting
EEPROM	Electrically erasable programmable read-only memory
EFP	Ethernet Front Panel
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
EMP	Emergency management port
EN	European Standard (Norme Européenne or Europäische Norm)
EPS	External product specification
ESCD	Extended system configuration data
ESD	Electrostatic discharge
ESR	Equivalent series resistance

Term	Definition
F	Fahrenheit
FCC	Federal Communications Commission
FFC	Flexible flat connector
Flash ROM	EEPROM
FPC	Front panel controller
FRB	Fault resilient booting
FRU	Field replaceable unit
G	Acceleration in gravity units, 1G = 980665 m/s2
Gb, Gbit	Gigabit
GB, Gbyte	Gigabyte – 1024 MB
GND	Ground
GPIO	General purpose input/output
Grms	Root mean square of acceleration in gravity units
GUI	Graphical user interface
HDD	Hard disk drive
HPIB	Hot-plug indicator board
HSC	Hot-swap controller
Hz	Hertz – 1 cycle/second
I/O	Input/output
I^{2}C*	Inter-integrated circuit bus
ICMB	Intelligent Chassis Management Bus
IDE	Integrated drive electronics
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IFLASH	Utility to update flash EEPROM
IMB	Intelligent management bus
IPMB	Intelligent Platform Management Bus
IPMI	Intelligent Platform Management Initiative
IRQ	Interrupt request line
ITE	Information technology equipment
ITP	In-target probe
JAE	Japan Aviation Electronics
KB, Kbyte	Kilobyte – 1024 bytes
kV	Kilovolt – 1,000 volts
L2	Second-level cache
LAN	Local Area Network
LED	Light-Emitting Diode
LVDS	Low Voltage Differential SCSI
mA	Milliamp
MB, Mbyte	Megabyte – 1024 KB
MEC	Memory expansion card
mm	Millimeter
MPS	Multiprocessor specification
MTTR	Mean time to repair
m□	Milliohm
NEMKO	Norges Elektriske Materiellkontroll (Norwegian Board of Testing and Approval of Electrical Equipment)

Term	Definition
NIC	Network interface card
NMI	Non-maskable interrupt
NWPA	NetWare* Peripheral Architecture
ODI	Open data-link interface
OEM	Original equipment manufacturer
OPROM	Option ROM (expansion BIOS for a peripheral)
OS	Operating system
OTP	Over-temperature protection
OVP	Over-voltage protection
PC-100	Collection of specifications for 100 MHz memory modules
PCB	Printed circuit board
PCI	Peripheral component interconnect
PHP	PCI hot-plug
PID	Programmable interrupt device
PIRQ	PCI interrupt request line
PMM	POST memory manager
PnP	Plug and play
POST	Power-On Self Test
PSU	Power Supply Unit
PVC	Polyvinyl chloride
PWM	Pulse Width Modulation
RAS	Reliability, Availability, and Serviceability
RIA	Ring indicator
RPM	Revolutions Per Minute
RTS	Request To Send
SAF-TE	SCSI Accessed Fault-Tolerant Enclosures
SCA	Single Connector Attachment
SCL	Serial clock
SCSI	Small Computer Systems Interface
SDR	Sensor Data Records
SDRAM	Synchronous Dynamic RAM
SEC	Single Edge Connector
SEL	System Event Log
SELV	Safety Extra Low Voltage
SEMKO	Sverge Elektriske Materiellkontroll (Swedish Board of Testing and Approval of Electrical Equipment)
FP	(SAS) Front Panel
SGRAM	Synchronous Graphics RAM
SM	Server Management
SMBIOS	System Management BIOS
SMBus	Subset of I^2C bus/protocol (developed by Intel), System Management Bus
SMI	System Management Interrupt
SMM	Server Management Mode
SMP	Symmetric multiprocessing
SMRAM	System Management RAM
SMS	Server Management Software

Term	Definition
SPD	Serial Presence Detect
SSI	Server System Infrastructure
TUV	Technischer Uberwachungs-Verein (A safety testing laboratory with headquarters in Germany)
UL	Underwriters Laboratories, Inc.
USB	Universal Serial Bus
UV	Under-Voltage
V	Volt
VA	Volt-amps (volts multiplied by amps)
Vac	Volts alternating current
VCCI	Voluntary Control Council for Interference
Vdc	Volts direct current
VDE	Verband Deutscher Electrotechniker (German Institute of Electrical Engineers)
VGA	Video Graphics Array
VRM	Voltage Regulator Module
VSB	Voltage standby
W	Watt
WfM	Wired for Management
Word	A 16-bit quantity
Ω	Ohm
µf	Microfarad
µs	Microsecond

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