Intel® Server Chassis H2000P Product Family

Technical Product Specification

An overview of product features, functions, architecture, and support specifications.

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April 2019

Intel® Server Products and Solutions

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Document Revision History

Date	Revision	Changes
December 2017	1.0	• Initial release.
September 2018	1.1	• New Note added in Thermal Configuration Table Notes
April 2019	2.1	• Updated Appendix C

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Table of Contents

List of Figures

List of Tables

1. Introduction

This Technical Product Specification (TPS) provides chassis specific information detailing the features, functionality, and high-level architecture of the Intel® Server Chassis H2000P product family.

- Intel® Server Chassis H2224XXLR3
- Intel® Server Chassis H2312XXLR3
- Intel® Server Chassis H2204XXLRE

Refer to respective product family TPS to obtain greater details on functionality and architecture of the compute module to be integrated into their respective server chassis. See Table 1 for detailed compatibility.

- Intel® Compute Module HNS2600BP product family
- Intel® Compute Module HNS7200AP product family

In addition, design-level information for specific subsystems can be obtained by ordering the External Product Specifications (EPS) or External Design Specifications (EDS) for a given subsystem. EPS and EDS documents are not publicly available. They are only made available under NDA with Intel and must be ordered through a local Intel representative. For a complete list of available documents, refer to the Appendix E at the end of this document.

The Intel Server Chassis H2000P product family may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Refer to corresponding *Intel® Server Board Product Family Specification Update* for published errata.

1.1 Chapter Outline

This document is divided into the following chapters:

- Chapter 1 – Introduction
- Chapter 2 – Product Overview
- Chapter 3 – Power Subsystem
- Chapter 4 – Cooling Subsystem
- Chapter 5 – Drive Support
- Chapter 6 – Front Panel Control and Indicators
- Appendix A – Integration and Usage Tips
- Appendix B – Statement of Volatility
- Appendix C – System Configuration Table for Thermal Compatibility
- Appendix D – Glossary
- Appendix E – Reference Documents

1.2 Server Board Use Disclaimer

Intel server boards support add-in peripherals and contain a number of high-density VLSI and power delivery components that need adequate airflow to cool. Intel ensures through its own chassis development and testing that when Intel server building blocks are used together, the fully integrated system will meet the intended thermal requirements of these components. It is the responsibility of the system integrator who chooses not to use Intel developed server building blocks to consult vendor datasheets and operating parameters to determine the amount of air flow required for their specific application and environmental conditions. Intel Corporation cannot be held responsible if components fail or the server board does not operate correctly when used outside any of their published operating or non-operating limits.

2. Product Overview

The Intel® Server Chassis H2000P product family is a rack mount 2U server chassis that can support up to four compute modules, purpose-built for high-density and lowest total cost of ownership in dense computing applications, such as High Performance Computing (HPC) and Internet Portal Data Center (IPDC). The chassis can be used to integrate with four compute modules, supporting various configurations of storage drivers and power supply units. The following table provides an overview of the chassis feature set.

Table 1. Chassis feature set

Feature	H2204XXLRE	H2312XXLR3	H2224XXLR3
Chassis Dimensions (mm)	L=733 W=438 H=86.9	L=771 W=438 H=86.9	L=733 W=438 H=86.9
Package Dimensions (mm) [1]	L=983 W=577 H=260	L=983 W=577 H=260	L=983 W=577 H=260
Net Weight	18.64 kg	21.5 kg	20.6 kg
Package Weight	26.75 kg	29.5 kg	28.9 kg
Compute Module Product Family Support	HNS2600BP	HNS2600BP HNS7200AP[3]	HNS2600BP24
Cooling System	One internal power supply fan for each installed power supply unit		
Power Supply Options	2130 W AC common redundant power supply (CRPS), 80 PLUS* Platinum, supporting CRPS configuration		
Storage Bay Options	4x 3.5" SATA/SAS [2]	12x 3.5" SATA/SAS	24x 2.5" SAS (includes 8x 2.5" PCIe* SFF devices)

[1] The outer dimensions of the package box.
[2] The H2204XXLRE chassis includes 4x3.5" drive carriers. However, to maintain thermal requirements to support 165W TDP processors, only 2.5" SSD drives are supported.
[3] In the H2312XXLR2 chassis, the HNS7200AP compute module supports up to 8x SATA/SAS drives.

WARNING: Be protected before accessing the system from the rear side since the temperature of an operating system exit air could be over 70 °C (158 °F).

CAUTION: The chassis has limited support on mixed compute module configuration, for example, compute modules based on different server boards can be installed in the same chassis for power-on only.

2.1 Chassis Views

Figure 1. Server chassis overview – 12 x 3.5" drive bay

Figure 2. Server chassis overview – 24 x 2.5" drive bay

Figure 3. Server chassis overview – 4 x 3.5" drive bay

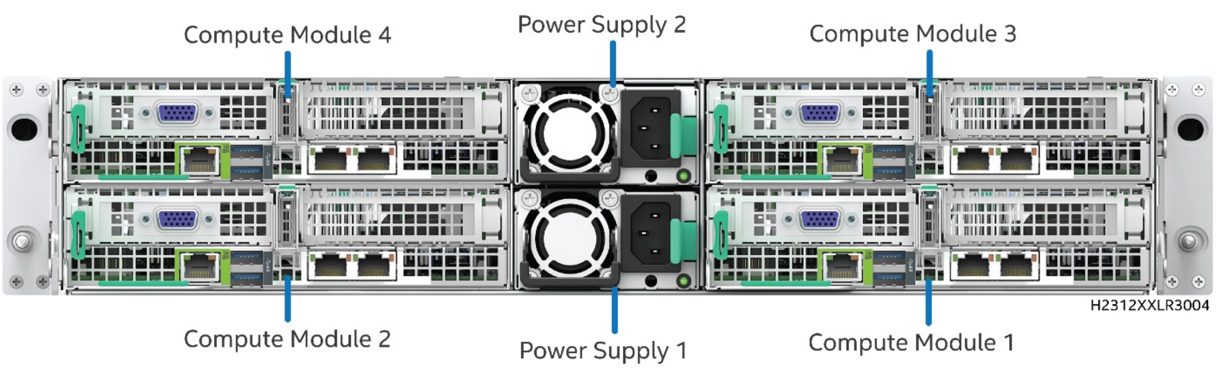


Figure 4. Server chassis rear sample view

Figure 5. Dummy tray cover

2.2 Environmental Limits

The following table defines the system level operating and non-operating environmental limits.

Table 2. System environmental limits summary

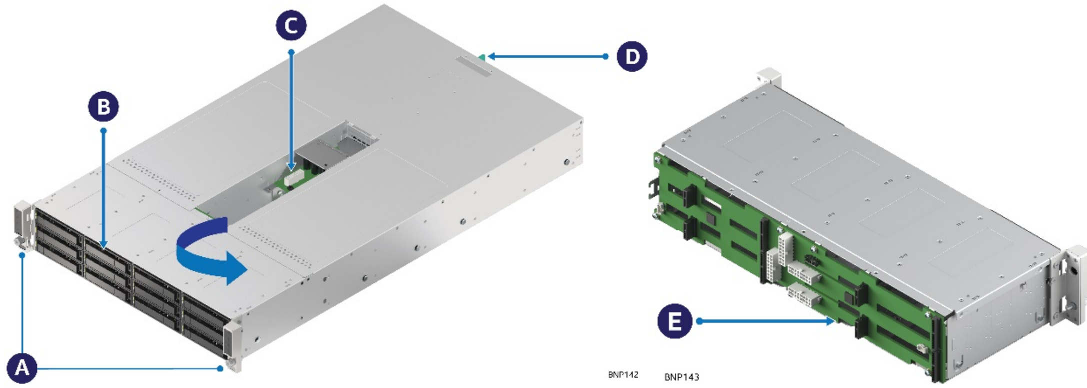
Parameter		Limits
Temperature	Operating	ASHRAE Class A2 – Continuous Operation. 10 °C to 35 °C (50 °F to 95 °F) with the maximum rate of change not to exceed 10 °C per hour
		ASHRAE Class A3 – Includes operation up to 40 °C for up to 900 hours per year
		ASHRAE Class A4 – Includes operation up to 45 ° for up to 90 hours per year
	Non-Operating	-40 °C to 70 °C (-40 °F to 158 °F)
Altitude	Operating	Support for operation up to 3050 m with ASHRAE class deratings.
Humidity	Non-Operating	50% to 90%, non-condensing with a maximum wet bulb of 28 °C (at temperatures from 25 °C to 35 °C)
Shock [1]	Operating	Half sine, 2G, 11 mSec
	Unpackaged	Trapezoidal, 25G, velocity change 175 inches/second
	Packaged	ISTA (International Safe Transit Association) Test Procedure 3A
Vibration	Unpackaged	5 Hz to 500 Hz 2.20G RMS random
	Packaged	ISTA (International Safe Transit Association) Test Procedure 3A
AC-DC	Voltage	90 V to 132 V and 180 V to 264 V
	Frequency	47 Hz to 63 Hz
	Source interrupt	No loss of data for power line drop-out of 12 mSec
	Surge non-operating and operating	Unidirectional
	Line to earth only	AC Leads 2.0 kV I/O Leads 1.0 kV DC Leads 0.5 kV
ESD	Air discharged	12.0 kV
	Contact discharge	8.0 kV

[1] **Disclaimer:** Intel ensures the unpackaged server board and chassis meet the shock requirement mentioned above through its own chassis development and configuration. It is the responsibility of the system integrator to determine the proper shock level of the board and chassis if the system integrator chooses different configuration or different chassis. Intel Corporation cannot be held responsible, if components fail or the server board does not operate correctly when used outside any of its published operating or non-operating limits.

2.3 Chassis Feature Set Identification

Notes:

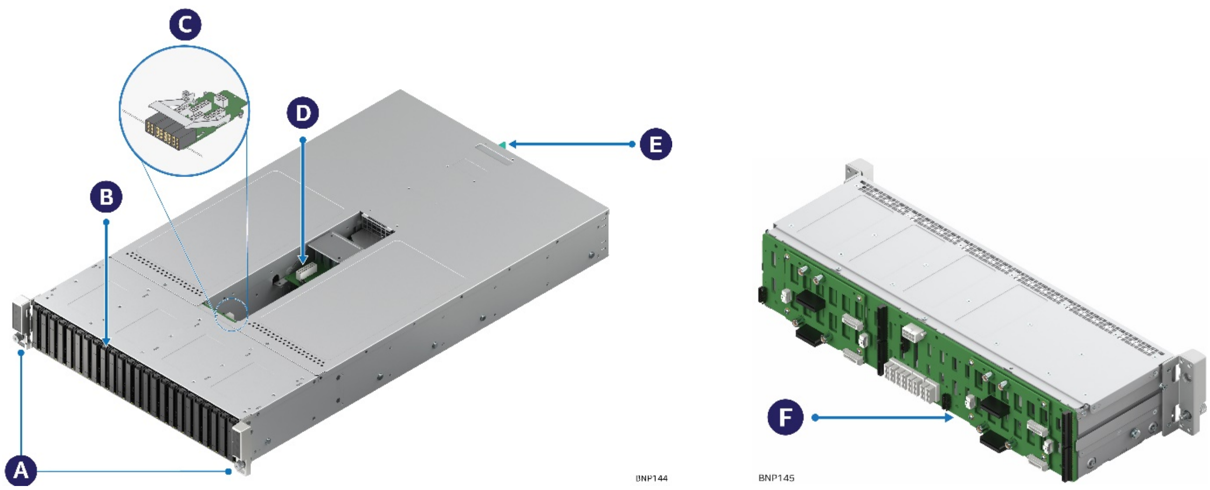
- The blank compute module bay must be covered by a dummy tray cover. When removed, keep the dummy tray cover properly for future use.
- The compute module bay in the chassis requires either a compute module being installed and powered up or a dummy tray cover installed to maintain proper thermal environment for the other running compute modules in the same chassis. In case of a compute module failure, remove the failed compute module, and replace with a dummy tray cover until the new compute module is installed.



A	Front Control Panels
B	Drive bays (Only four Drive bays on H2204XXLRE)
C	Power Distribution Module
D	Power Supply Modules
E	Hot Swap Back Plane (attached to the drive cage)

Note: Not shown – Rack slide rail and power distribution module cover

Figure 6. Major server chassis parts (12x and 4x 3.5" drive bay)



A	Front Control Panels
B	Drive bays
C	Power Interposer Board (24 x 2.5" drive chassis only)
D	Power Distribution Module
E	Power Supply Modules
F	Hot Swap Backplane (attached to the drive cage)

Note: Not shown – Rack slide rail and power distribution module cover

Figure 7. Major server chassis parts (24x 2.5" drive bay)

2.4 Drive and Peripheral Bays

Table 3. Supported drive and peripheral bays

Drive Type	H2204XXLRE	H2312XXLR3	H2224XXLR3
3.5" SATA/SAS drive	Up to 4	Up to 12	Not supported
2.5" SATA/SAS drive	Up to 4 [3]	Up to 12	Up to 24 (SAS drive only) [1]
PCIe* SFF device	Not supported	Not supported	Up to 8 [2]

[1] Intel verified only the SAS drive on the H2224XXLR3 chassis.
[2] The PCIe* SFF device (NVMe* SSD) shares the drive slots with the SAS drive; when supporting 8 NVMe SSD, the SAS drive number decreases from 24 to 16.
[3] The H2204XXLRE chassis includes 4x3.5" tool less drive carriers. However, to maintain the thermal requirements to support 165 W TDP processors, only 2.5" SSD drives are supported.

Figure 8. 12x 3.5" drive chassis front view

Figure 9. 24x 2.5" drive chassis front view

Figure 10. 4x 3.5" drive chassis front view

2.4.1 Drive support for the Intel® Compute Module HNS7200AP family

The Intel® Compute Module HNS7200AP family, supports the following chassis and drive configurations.

Table 4. Supported drive and peripheral bays for Intel® Compute Module HNS7200AP family

Drive Type	H2312XXLR3	H2204XXLRE
3.5" SATA/SAS drive	Up to 8	Up to 4
2.5" SATA/SAS drive	Up to 8	Up to 4[1]
PCIe* SFF device	Not supported	Not supported

[1]The H2204XXLRE chassis includes 4x3.5" drive carriers. However, to maintain thermal requirements to support 165W TDP processors, only 2.5" SSD drives are supported

Figure 11. 12x 3.5" drive chassis front view for the Intel® Compute Module HNS7200AP

2.5 Rack and Cabinet Mounting Options

The server chassis is designed to support server cabinets 19 inches wide by up to 30 inches deep. The server chassis bundles with the following Intel® rack mount option:

- The basic slide rail kit (iPC – AXXELVRAIL) is designed to mount the chassis into a standard (19 inches wide by up to 30 inches deep) EIA-310D compatible server cabinet.
- The premium quality rails (iPC – AXXFULLRAIL) can support the travel distance 780 mm, full extension from rack.

CAUTION: the maximum recommended server weight for the rack rails can be found at http://www.intel.com/support/motherboards/server/sb/CS-033655.htm. Exceeding the maximum recommended weight or misalignment of the server may result in failure of the rack rails holding the server. Use of a mechanical assist to install and align server into the rack rails is recommended.

Note: Slide/rail mounted equipment is not to be used as a shelf or a work space.

Advisory Note: To support shipment of the server chassis while installed in a rack with the rack mount rail kit, user should ensure the server cabinet and its package can support the shipment under the actual transport conditions.

3. Power Subsystem

The server chassis supports a 2130 W AC 1+1 hot-swap power supply module and two power distribution boards which can support 2U rack high density server.

3.1 Power Supply Overview

The power supply module has a simple retention mechanism to retain the module self once it is inserted. This mechanism withstands the specified mechanical shock and vibration requirements. The power distribution board is fixed in the chassis with screws. Using existing power supply module provided by vendor with updated PMBus* and custom-made power connector board the server chassis supports four compute modules. The power supply has two outputs: 12 V and 12 V standby. The input is auto ranging and power factor corrected. The PMBus features are requirements for AC silver rated box power supply for use in server systems based on the Intel® Server Chassis H2000P product family. This specification is based on the *PMBus Specifications* part I and II, revision 1.1.

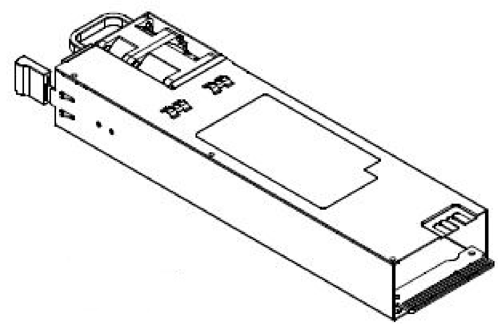


Figure 12. 2130 W AC power supply module overview

3.1.1 Power Supply Dimensions

The physical size of the power supply enclosure is 39/40 mm × 73.5 mm × 265 mm. The power supply contains a single 40 mm fan. The power supply has a card edge output that interfaces with a 2x25 card edge connector in the chassis. The AC plugs directly into the external face of the power supply.

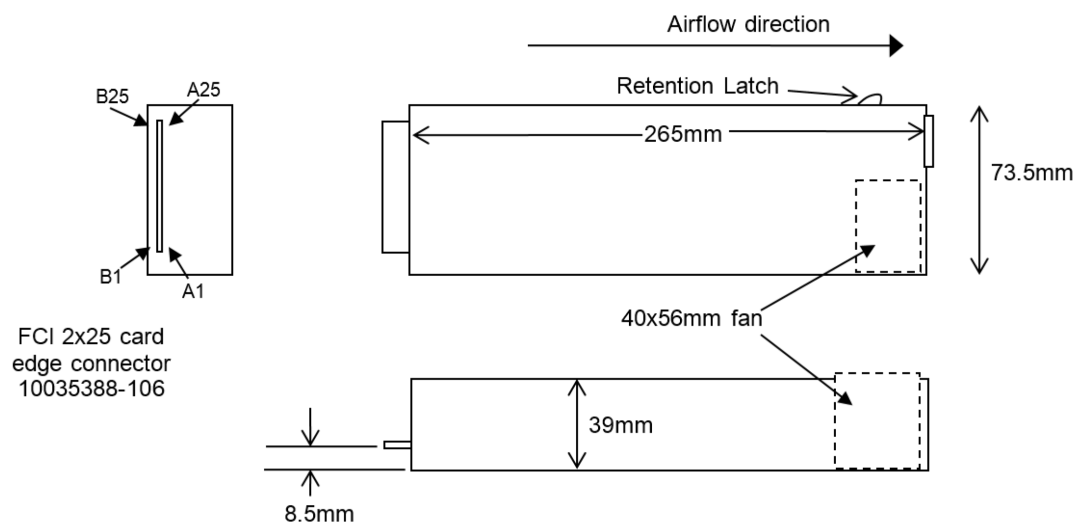


Figure 13. AC power supply unit dimension overview

3.1.2 AC Power Supply Unit General Data

Below is general specification data for the AC power supply unit.

Table 5. Specification data for AC power supply unit

Specification	Description
Wattage	2130 W (Energy Smart)
Voltage	90-264 VAC, auto-ranging, 47 Hz-63 Hz
Heat Dissipation	7268 BTU/hr
Maximum Inrush Current	Under typical line conditions and over the entire chassis ambient operating range, the inrush current may reach 65 A per power supply for 5 ms
80 PLUS* Rating	Platinum

3.1.3 AC Input Connector

The power supply has an internal IEC320 C14 power inlet. The inlet is rated for a minimum of 10 A at 250 VAC.

3.1.4 AC Power Cord Specification Requirements

The AC power cord used meets the following specification requirements.

Table 6. AC power cord specification

Cable Type	SJT
Wire Size	16 AWG
Temperature Rating	105º C
Amperage Rating	13A
Cable Type	SJT

3.1.5 Power Supply Unit DC Output Connector

The DC output connector pinout is defined as follows.

Table 7. DC output power connector pinout

Pin	Description	Pin	Description
A1	GND	B1	GND
A2	GND	B2	GND
A3	GND	B3	GND
A4	GND	B4	GND
A5	GND	B5	GND
A6	GND	B6	GND
A7	GND	B7	GND
A8	GND	B8	GND
A9	GND	B9	GND
A10	+12V	B10	+12V
A11	+12V	B11	+12V
A12	+12V	B12	+12V
A13	+12V	B13	+12V
A14	+12V	B14	+12V
A15	+12V	B15	+12V
A16	+12V	B16	+12V

Pin	Description	Pin	Description
A17	+12V	B17	+12V
A18	+12V	B18	+12V
A19	PMBus SDA*	B19	A0* (SMBus address)
A20	PMBus SCL*	B20	A1* (SMBus address)
A21	PSON	B21	12V STBY
A22	SMBAlert#	B22	Cold Redundancy Bus*
A23	Return Sense	B23	12V load share bus
A24	+12V Remote Sense	B24	No connection
A25	PWOK	B25	CRPS compatibility check pin [1]

[1] Refer to the specification of CRPS Common Requirements Specification.

3.1.6 Handle Retention

The power supply has a handle to assist extraction. The module is able to be inserted and extracted without the assistance of tools. The power supply also has a latch which retains the power supply into the chassis and prevents the power supply from being inserted or extracted from the chassis when the AC power cord is pulled into the power supply.

The handle protects the operator from any burn hazard through the use of industrial designed plastic handle or equivalent material isolator.

3.1.7 LED Marking and Identification

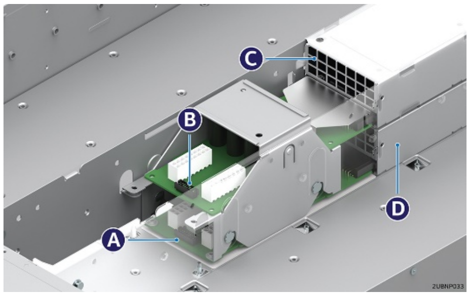
The power supply uses a bi-color LED – amber and green – for status indication. The following table shows the LED states for each power supply operating state.

Table 8. Power supply status LED

Power Supply Condition	LED State
Output on and okay	Solid green
No AC power to all power supplies	Off
AC present/only 12 VSB on (PS off) or PS in cold redundant state	1 Hz blinking green
AC cord unplugged or AC power lost; with a second power supply in parallel still with AC input power.	Solid amber
Power supply warning events where the power supply continues to operate; high temp, high power, high current, slow fan.	1 Hz blinking amber
Power supply critical event causing a shutdown; failure, OCP, OVP, fan fail	Solid amber
Power supply firmware updating	2 Hz blinking green

3.1.8 Power Distribution Module

The power distribution module is at the middle of the chassis and consists of two power distribution boards (PDBs) to support CRPS.

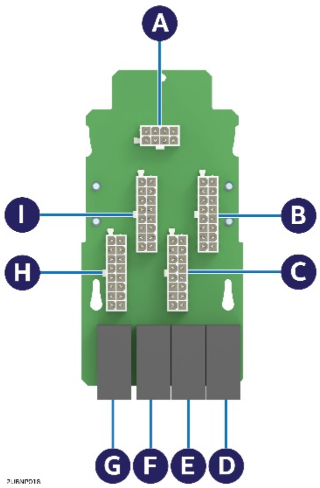


A	Power Distribution Board 1
B	Power Distribution Board 2
C	Power Supply Unit #2 (upper) and #1 (lower)
D	PSU cage

Figure 14. Power cage overview

3.1.9 Power Interposer Board

The power interposer board is only used in 24x 2.5" drive chassis as the interposer between power distribution board and the backplane.

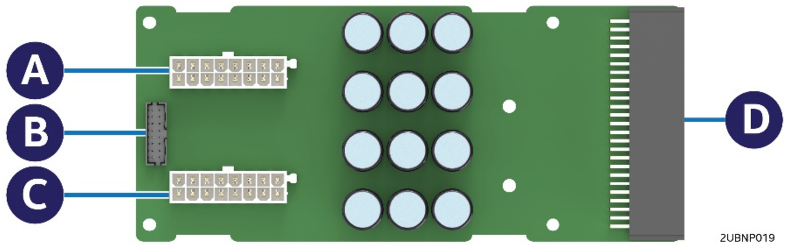


A	2x4 pin 5V Power Connector
B	2x8 pin 12V Power Connector (to PDB)
C	2x8 pin 12V Power Connector (to PDB)
D	12V Power Connector (to backplane)
E	12V Power Connector (to backplane)
F	12V Power Connector (to backplane)
G	12V Power Connector (to backplane)
H	2x8 pin 12V Power Connector (to PDB)
I	2x8 pin 12V Power Connector (to PDB)

Figure 15. Power interposer board top view

3.1.10 Power Cage Output Pin Assignment

The power cage provides +12V and $+12V_{STB}$ output to the server chassis. Each PDB has two 2x9 power output cable to chassis backplane, together with one 2x8 signal control cable for power management. Refer to the following table for PDB pin assignment.



A	Main Power Output Connector
B	Control Signal Connector
C	Main Power Output Connector
D	Power Supply Unit Connector

Figure 16. Power distribution board

Table 9. Power output connector pinout

Pin	Description	Pin	Description
1	GND	9	+12V
2	GND	10	+12V
3	GND	11	+12V
4	GND	12	+12V
5	GND	13	+12V
6	GND	14	+12V
7	GND	15	+12V
8	GND	16	+12V

Table 10. Control signal connector pinout

Pin	Description	Pin	Description
1	PMBus* SDA	2	For A0 addressing
3	PMBus SCL	4	PSON#
5	OCP_SHTDN#	6	12V Load Share Bus
7	SMBAlert#	8	Cold Redundancy Bus
9	Reserved	10	PWOK
11	Reserved	12	Compatibility Bus
13	Reserved	14	+12VSB
15	+12VSB	16	Key Pin (removed)

3.2 AC Input Specification

3.2.1 Input Voltage and Frequency

The power supply operates within all specified limits over the following input voltage range.

Table 11. AC input rating

Parameter	Min	Rated	Max	Start-up VAC	Power-off VAC
110 VAC	90 Vrms	100-127 Vrms	140 Vrms	85 VAC± 4VAC	75VAC±5VAC
220 VAC	180 Vrms	200-240 Vrms	264 Vrms		
Frequency	47 Hz	50/60 Hz	63 Hz		

Maximum input current at low input voltage range is measured at 90 VAC, 110 VAC, and 120 VAC at max load.
Maximum input current at high input voltage range is measured at 180 VAC, 220VAC, 230 VAC and 240 VAC at max load.
This requirement is not to be used for determining agency input current markings.

3.2.2 AC input Power Factor

The power supply meets the power factor requirements stated in the ENERGY STAR* Program Requirements for Computer Servers. These requirements are stated below.

Table 12. Typical power factor

Output Power	10% Load	20% Load	50% Load	100% Load
Power factor	> 0.80	> 0.90	> 0.90	> 0.95

3.2.3 Efficiency

The following table provides the required minimum efficiency level at various loading conditions. These are provided at different load levels; 100%, 50%, 20%, and 10%. Output is loaded according to the proportional loading method defined by 80 PLUS* in *Generalized Internal Power Supply Efficiency Testing Protocol*, Rev 6.6

Table 13. Platinum efficiency requirement

Loading	100% of Maximum	50% of Maximum	20% of Maximum	10% of Maximum
Minimum Efficiency	91%	94%	90%	82%

3.2.4 AC Line Fuse

The power supply has one line fused in the single line fuse on the line (hot) wire of the AC input. The line fusing is acceptable for all safety agency requirements. The input fuse is a slow blow type. AC inrush current does not cause the AC line fuse to blow under any conditions. All protection circuits in the power supply do not cause the AC fuse to blow unless a component in the power supply has failed. This includes DC output load short conditions.

3.2.5 AC Line Inrush

AC line inrush current shall not exceed 65 A peak, for up to one-quarter of the AC cycle, after which, the input current should be no more than the specified maximum input current. The peak inrush current shall be less than the ratings of its critical components (including input fuse, bulk rectifiers, and surge limiting device).

The power supply meets the inrush requirements for any rated AC voltage, during turn on at any phase of AC voltage, during a single cycle AC dropout condition as well as upon recovery after AC dropout of any duration, and over the specified temperature range ($T_{op1\ and}$ T_{op2}).

3.2.6 AC Line Dropout/Holdup

An AC line dropout is defined to be when the AC input drops to 0 VAC at any phase of the AC line for any length of time. During an AC dropout the power supply meets dynamic voltage regulation requirements. An

AC line dropout of any duration shall not cause tripping of control signals or protection circuits. If the AC dropout lasts longer than the holdup time, the power supply should recover and meet all turn on requirements. The power supply shall meet the AC dropout requirement over rated AC voltages and frequencies. A dropout of the AC line for any duration shall not cause damage to the power supply.

Table 14. AC power holdup requirement

Loading	Holdup Time
75%	10 msec

The 12 V_{STB} output voltage should stay in regulation under its full load (static or dynamic) during an AC dropout of 70 ms min (=12 VSB holdup time) whether the power supply is in ON or OFF state (PSON asserted or de-asserted).

3.2.7 AC Line Fast Transient (EFT) Specification

The power supply meets the *EN61000-4-5* directive and any additional requirements in *IEC1000-4-5: 1995* and the Level 3 requirements for surge-withstand capability, with the following conditions and exceptions:

- These input transients do not cause any out-of-regulation conditions, such as overshoot and undershoot, nor do they cause any nuisance trips of any of the power supply protection circuits.
- The surge-withstand test does not produce damage to the power supply.

The supply meets surge-withstand test conditions under maximum and minimum DC-output load conditions.

3.2.8 Hot Plug

The power supply is designed to allow connection into and removal from the chassis without removing power to the chassis. During any phase of insertion, start-up, shutdown, or removal, the power supply does not cause any other like modules in the chassis to deviate outside of their specifications. When AC power is applied, the auxiliary supply shall turn on providing bias power internal to the supply and the 5 VSB standby output.

3.2.9 Susceptibility Requirements

The power supply meets the following electrical immunity requirements when connected to a cage with an external EMI filter, which meets the criteria, defined in the SSI document EPS Power Supply Specification. For further information on customer standards, request a copy of the customer *Environmental Standards Handbook*.

Table 15. Performance criteria

Level	Description
A	The apparatus shall continue to operate as intended. No degradation of performance.
B	The apparatus shall continue to operate as intended. No degradation of performance beyond spec limits.
C	Temporary loss of function is allowed provided the function is self-recoverable or can be restored by the operation of the controls.

3.2.10 Electrostatic Discharge Susceptibility

The power supply complies with the limits defined in EN 55024: 1998 using the IEC 61000-4-2:1995 test standard and performance criteria B defined in Annex B of CISPR 24.

3.2.11 Fast Transient/Burst

The power supply complies with the limits defined in EN 55024: 1998 using the IEC 61000-4-4:1995 test standard and performance criteria B defined in Annex B of CISPR 24.

3.2.12 Radiated Immunity

The power supply complies with the limits defined in EN 55024: 1998 using the IEC 61000-4-3:1995 test standard and performance criteria A defined in Annex B of CISPR 24.

3.2.13 Surge Immunity

The power supply is tested with the chassis for immunity to AC Ring wave and AC Unidirectional wave, both up to 2kV, per EN 55024:1998, EN 61000-4-5:1995 and ANSI C62.45: 1992.

The pass criteria include the following:

- No unsafe operation is allowed under any condition
- All power supply output voltage levels to stay within proper spec levels
- No change in operating state or loss of data during and after the test profile
- No component damage under any condition

The power supply complies with the limits defined in EN 55024: 1998 using the IEC 61000-4-5:1995 test standard and performance criteria B defined in Annex B of CISPR 24.

3.2.14 AC Line Transient Specification

AC line transient conditions are defined as “sag” and “surge” conditions. “Sag” conditions are also commonly referred to as “brownout”; these conditions are defined as the AC line voltage dropping below nominal voltage conditions. “Surge” is defined to refer to conditions when the AC line voltage rises above nominal voltage.

The power supply meets the requirements under the following AC line sag and surge conditions.

Table 16. AC line sag transient performance (10 sec interval between each sagging)

Duration	Sag	Operating AC Voltage	Line Frequency	Performance Criteria.
0 to ½ AC cycle	95%	Nominal AC Voltage ranges	50/60Hz	No loss of function or performance.
> 1 AC cycle	>30%	Nominal AC Voltage ranges	50/60Hz	Loss of function acceptable, self-recoverable.

Table 17. AC line surge transient performance

Duration	Surge	Operating AC Voltage	Line Frequency	Performance Criteria
Continuous	10%	Nominal AC Voltages	50/60Hz	No loss of function or performance
0 to ½ AC cycle	30%	Mid-point of nominal AC Voltages	50/60Hz	No loss of function or performance

3.2.15 Power Recovery

The power supply recovers automatically after an AC power failure. AC power failure is defined to be any loss of AC power that exceeds the dropout criteria.

3.2.16 Voltage Interruptions

The power supply complies with the limits defined in EN 55024: 1998/A1: 2001/A2: 2003 using the IEC 61000-4-11: Second Edition: 2004-03 test standard and performance criteria C defined in Annex B of CISPR 24.

3.2.17 AC Line Isolation

The power supply meets all safety agency requirements for dielectric strength. Transformers’ isolation between primary and secondary windings complies with the 3000 Vac (4242 Vdc) dielectric strength criteria. If the working voltage between primary and secondary dictates a higher dielectric strength test voltage, the highest test voltage will be used. In addition the insulation chassis complies with reinforced insulation per safety standard IEC 950. Separation between the primary and secondary circuits, and primary to ground circuits, complies with the IEC 950 spacing requirements.

3.2.18 AC Power Inlet

The AC input connector is an *IEC 320 C-14* power inlet. This inlet is rated for 10A/250 VAC.

The AC power cord meets the following specification requirements.

Table 18. AC power cord specification requirements

Cable Type	SJT
Wire Size	16 AWG
Temperature Rating	105ºC
Amperage Rating	13 A
Voltage Rating	125 V

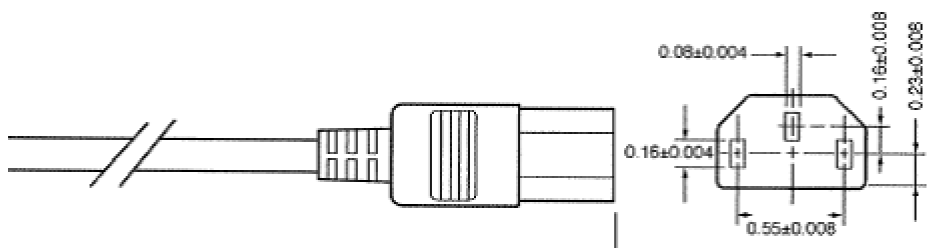


Figure 17. AC power cord specification

3.3 DC Output Specification

3.3.1 Output Power/Currents

The following table defines the minimum power and current ratings. The power supply meets both static and dynamic voltage regulation requirements for all conditions.

Table 19. Load ratings for single 2130 W power supply unit

Parameter	VAC Rating	Power Rating (W)	Min Current (A)	Current Rating (A)	20sec Peak Current (A) [2, 3]	25msec Peak Current (A)
12V main (90-110VAC)	100	1120	0.0	93	-	-
12V main (110-120VAC)	110/115	1250	0.0	104	-	-
12V main (120-140VAC)	120/127	1370	0.0	114	-	-
12V main (180-208VAC)	200	1780	0.0	148	210	250
12V main (208-220VAC)	208	1850	0.0	154	210	250
12V main (220-240VAC)	220/230	1960	0.0	163	210	250
12V main (240-264VAC)	240	2130	0.0	178	210	250
12Vstby[1]	0.0	3.5	4.0			

[1]12VSTB provides 4.0A peak load with single power supply. The power supply fan is allowed to run in standby mode for loads > 1.5A.
[2]Length of time peak power can be supported based on thermal sensor and assertion of the SMBAlert# signal. Minimum peak power duration is 20 seconds without asserting the SMBAlert# signal. The peak load requirement applies to full operating temperature range.
[3]The setting of IPeak < IOCW < IOCP is followed to make the CLST work reasonably.

Notes:
- Power supply must protect itself in case system doesn't take any action to reduce load based on SMBAlert# signal asserting.
- The power supply supports 25msec peak power at 20% duty cycle step loading for an average current at the current rating.
- With two power supplies in parallel; the power supplies must support 2130W at any AC voltage range.

3.3.2 Standby Output

The 12 VSB output will be present when an AC input greater than the power supply turn on voltage is applied.

3.3.3 Voltage Regulation

The power supply output voltages stay within the following voltage limits when operating at steady state and dynamic loading conditions. These limits include the peak-peak ripple/noise. These are measured at the output connectors.

Table 20. Voltage regulation limits

Parameter	Min	Nom	Max	Unit	Tolerance
+12 VSTB	+11.40 V	+12.000 V	+12.60 V	Vrms	±5%
+12 V	+11.40 V	+12.000 V	+12.60 V	Vrms	±5%

The combined output continuous power of all outputs does not exceed 4260 W (2130 W from each 2130 W power supply unit). Each output has a maximum and minimum current rating. The power supply meets both static and dynamic voltage regulation requirements for the minimum dynamic loading conditions. The power supply meets only the static load voltage regulation requirements for the minimum static load conditions.

3.3.4 Dynamic Loading

The output voltages remain within limits specified for the step loading and capacitive loading specified in the table below. The load transient repetition rate is tested between 50 Hz and 5 kHz at duty cycles ranging from 10%-90%. The load transient repetition rate is only a test specification. The Δ step load may occur anywhere within the MIN load to the MAX load conditions.

Table 21. Transient load requirements

Output	Δ Step Load Size	Load Slew Rate	Test Capacitive Load
+12 VSTB	1.0 A	0.25 A/µsec	20 µF
+12 V	60% of max load	0.25 A/µsec	2000 µF

Note: For dynamic condition +12 V min loading is 1 A.

3.3.5 Capacitive Loading

The power supply is stable and meets all requirements, with the following capacitive loading conditions.

Table 22. Capacitive loading conditions

Output	Min (Cold Redundancy)	Max	Units
+12 V	1000	70,000	µF
+12 VSTB	20	3100	µF

3.3.6 Ripple/Noise

The maximum allowed ripple/noise output of the power supply is defined in the table below. This is measured over a bandwidth of 10 Hz to 20 MHz at the power supply output connectors. A 10 μF tantalum capacitor in parallel with a 0.1 μF ceramic capacitor is placed at the point of measurement.

Table 23. Ripple and noise

+12 V	+12 VSTB
120 mVp-p	120 mVp-p

3.3.7 Grounding

The output ground of the pins of the power supply provides the output power return path. The output connector ground pins are connected to the safety ground (power supply enclosure). This grounding is well designed to ensure passing the max allowed Common Mode Noise levels.

The power supply is provided with a reliable protective earth ground. All secondary circuits are connected to protective earth ground. Resistance of the ground returns to chassis does not exceed 1.0 mΩ. This path may be used to carry DC current.

3.3.8 Closed Loop Stability

The power supply is unconditionally stable under all line/load/transient load conditions including capacitive load ranges specified in Section 3.3.5. A minimum of 45 degrees phase margin and -10 dB-gain margin is required. The power supply manufacturer shall provide proof of the unit's closed-loop stability with local sensing through the submission of Bode plots. Closed-loop stability must be ensured at the maximum and minimum loads as applicable.

3.3.9 Residual Voltage Immunity in Standby Mode

The power supply is immune to any residual voltage placed on its outputs (typically a leakage voltage through the chassis from standby output) up to 500 mV. There is no additional heat generated, nor stressing of any internal components with this voltage applied to any individual or all outputs simultaneously. It also does not trip the protection circuits during turn on.

The residual voltage at the power supply outputs for no load condition will not exceed 100 mV when AC voltage is applied and the PSON# signal is de-asserted.

3.3.10 Common Mode Noise

The Common Mode noise on any output does not exceed 350 mVp-p over the frequency band of 10 Hz to 20 MHz.

- The measurement is made across a 100 Ω resistor between each of DC outputs, including ground at the DC power connector and chassis ground (power subsystem enclosure).
- The test setup uses a FET probe such as Tektronix model P6046 or equivalent.

3.3.11 Soft Starting

The power supply contains control circuit which provides monotonic soft start for its outputs without overstress of the AC line or any power supply components at any specified AC line or load conditions.

3.3.12 Zero Load Stability Requirement

When the power subsystem operates in a no load condition, it does not need to meet the output regulation specification, but it must operate without any tripping of over-voltage or other fault circuitry. When the power subsystem is subsequently loaded, it must begin to regulate and source current without fault.

3.3.13 Hot Swap Requirement

Hot swapping a power supply is the process of inserting and extracting a power supply from an operating power system. During this process the output voltages remain within the limits with the capacitive load specified. The hot swap test must be conducted when the system is operating under static, dynamic, and zero loading conditions. The power supply will use a latching mechanism to prevent insertion and extraction of the power supply when the AC power cord is inserted into the power supply.

3.3.14 Forced Load Sharing

The +12V output has active load sharing. The output will share within 10% at full load. The failure of a power supply will not affect the load sharing or output voltages of the other supplies still operating. The supplies are able to load share in parallel and operate in a hot-swap/redundant 1+1 configurations. The 12 VSB output is not required to actively share current between power supplies (passive sharing). The 12 VSB output of the power supplies is connected together in the system so that a failure or hot swap of a redundant power supply does not cause these outputs to go out of regulation in the system.

3.3.15 Timing Requirement

These are the timing requirements for the power supply operation. The output voltages must rise from 10% to within regulation limits (T_{vout_rise}) within 5 ms to 70 ms. For 12 VSB, it is allowed to rise from 5.0 ms to 10 ms. All outputs must rise monotonically. The following table shows the timing requirements for the power supply being turned on and off through the AC input, with PSON held low and the PSON signal, with the AC input applied. The PSU remains off for 1 second minimum after POK I de-asserted.

Table 24. Timing requirement

Item	Description	Min.	Max.	Units
T_{vout_rise}	Output voltage rise time	5.0 [1]	70 [1]	ms
$T_{sb\_on\_delay}$	Delay from AC being applied to 12VSBbeing within regulation.		1500	ms
$T_{ac\_on\_delay}$	Delay from AC being applied to all output voltages being within regulation.		3000	ms
T_{vout_holdup}	Time 12Vl output voltage stay within regulation after loss of AC.	11		ms
T_{pwok_holdup}	Delay from loss of AC to de-assertion of PWOK	10		ms
$T_{pson\_on\_delay}$	Delay from PSON# active to output voltages within regulation limits.	5	400	ms
T_{pson_pwok}	Delay from PSON# deactivate to PWOK being de-asserted.		5	ms
T_{pwok_on}	Delay from output voltages within regulation limits to PWOK asserted at turn on.	100	500	ms
T_{pwok_off}	Delay from PWOK de-asserted to output voltages dropping out of regulation limits.	1		ms
T_{pwok_low}	Duration of PWOK being in the de-asserted state during an off/on cycle using AC or the PSON signal.	100		ms
T_{sb_vout}	Delay from 12VSBbeing in regulation to O/Ps being in regulation at AC turn on.	50	1000	ms
T_{12VSB_holdup}	Time the 12VSBoutput voltage stays within regulation after loss of AC.	70		ms

[1] The 12 VSTB output voltage rise time is from 5.0 ms to 10 ms.

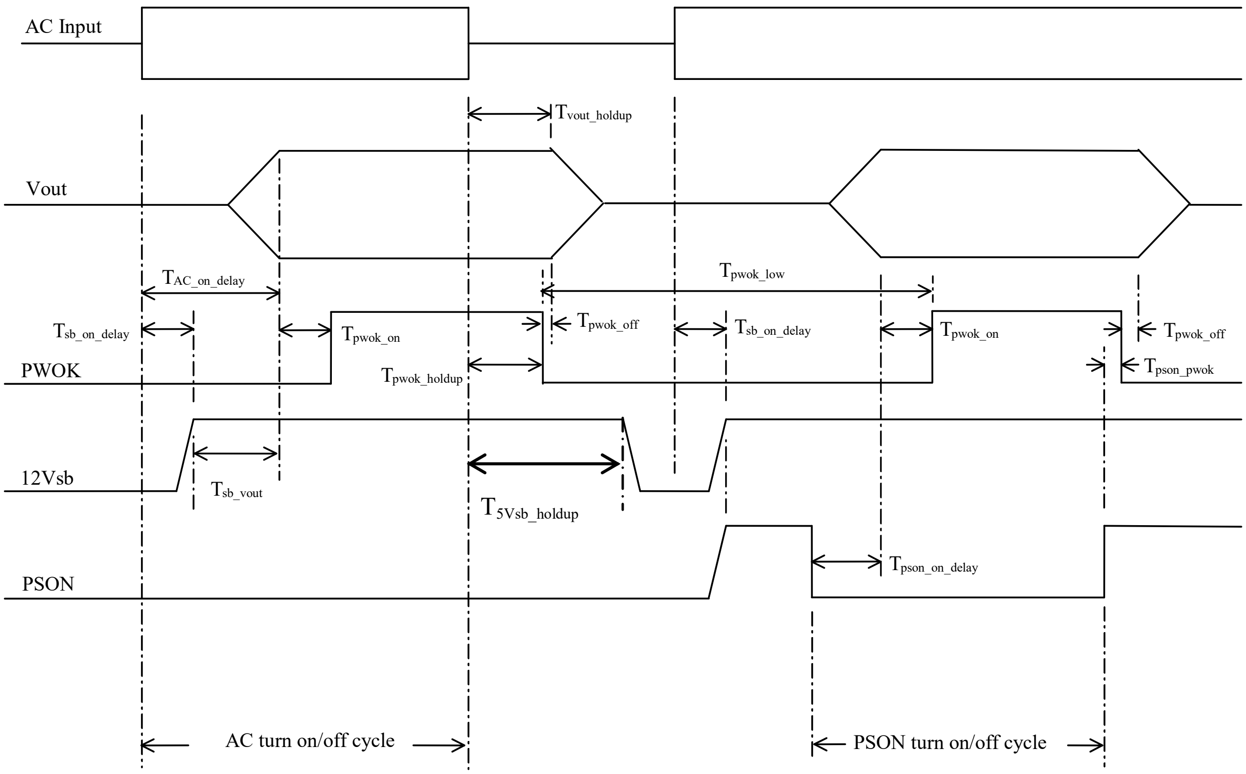


Figure 18. Turn on/off timing (power supply signals)

3.4 Power Supply Cold Redundancy Support

Power supplies that support cold redundancy can be enabled to go into a low-power state (that is, cold redundant state) in order to provide increased power usage efficiency when system loads are such that both power supplies are not needed. When the power subsystem is in cold redundant mode, only the needed power supply to support the best power delivery efficiency is ON. Any additional power supply including the redundant power supply, is in cold standby state.

Each power supply has an additional signal that is dedicated to supporting cold redundancy; CR_BUS. This signal is a common bus between all power supplies in the system. CR_BUS is asserted when there is a fault in any power supply OR the power supplies output voltage falls below the Vfault threshold. Asserting the CR_BUS signal causes all power supplies in cold standby state to power ON.

Enabling power supplies to maintain best efficiency is achieved by looking at the Load Share bus voltage and comparing it to a programmed voltage level through a PMBus command.

Whenever there is no active power supply on the cold redundancy bus driving a HIGH level on the bus all power supplies are ON no matter their defined cold redundant roll (active or cold standby). This guarantees that incorrect programming of the cold redundancy states of the power supply will never cause the power subsystem to shut down or become over loaded. The default state of the power subsystem is all power supplies ON. There needs to be at least one power supply in cold redundant active state or standard redundant state to allow the cold standby state power supplies to go into cold standby state.

CAUTION: Installing two power supply units with different wattage ratings on a system is not supported. This will not provide Power Supply Redundancy and causes the system to log multiple errors.

3.4.1 2130W CRPS Cold Redundancy

If the output power is less than 852 W (40%), the cold redundant function is enabled meaning one PSU is working normally while the second PSU is in CR mode. The power supply LED blinks green.

Table 25. 2130 W CRPS cold redundancy threshold

	Enable (V)	Percent	Power (W)	Disable (V)	Percent	Power (W)
Cold Standby 1 (02h)	2.839 V [1]	40.00%	852 (±5%)	1.115 V [1]	30.00%	639 (±5%)

[1] 1 A before trigger.

3.5 Control and Indicator Functions

The following sections define the input and output signals from the power supply.

Signals that can be defined as low true use the following convention: *Signal#* = low true.

3.5.1 PSON# Input Signal

The PSON# signal is required to remotely turn on/off the power supply. PSON# is an active low signal that turns on the +12 V power rail. When this signal is not pulled low by the system, or left open, the outputs (except the +12 VSB) turn off. This signal is pulled to a standby voltage by a pull-up resistor internal to the power supply. Refer to the table below for the timing diagram.

Table 26. PSON# signal characteristics

Signal Type	Accepts an open collector/drain input from the system. Pull-up to VSB located in power supply.	
PSON# = Low	ON	
PSON# = High or Open	OFF	
	MIN	**MAX**
Logic level low (power supply ON)	0V	1.0V
Logic level high (power supply OFF)	2.0V	5.25V
Source current, Vpson = low		4mA
Power up delay: Tpson_on_delay	5msec	400msec
PWOK delay: Tpson_pwok		50msec

3.5.2 PWOK (power good) Output Signal

PWOK is a power OK signal and will be pulled HIGH by the power supply to indicate that all the outputs are within the regulation limits of the power supply. When any output voltage falls below regulation limits or when AC power has been removed for a time sufficiently long so that power supply operation is no longer guaranteed, PWOK will be de-asserted to a LOW state. See the table below for a representation of the timing characteristics of PWOK. The start of the PWOK delay time will be inhibited as long as any power supply output is in current limit.

Table 27. PWOK signal characteristics

Signal Type		
PWOK = High	Power OK	
PWOK = Low	Power Not OK	
	MIN	**MAX**
Logic level low voltage, Isink=400uA	0V	0.4V
Logic level high voltage, Isource=200µA	2.4V	3.46V
Sink current, PWOK = low		400uA
Source current, PWOK = high		2mA
PWOK delay: Tpwok_on	100ms	1000ms
PWOK rise and fall time		100µsec
Power down delay: T pwok_off	1ms	200msec

3.5.3 SMBAlert# Signal

This signal indicates that the power supply is experiencing a problem that the user should investigate. This is asserted due to Critical events or Warning events. The signal will activate in the case of critical component temperature reached a warning threshold, general failure, over-current, over-voltage, under-voltage, failed fan. This signal may also indicate the power supply is reaching its end of life or is operating in an environment exceeding the specified limits.

This signal is to be asserted in parallel with LED turning solid amber or blinking amber.

Table 28. SMBAlert# Signal Characteristics

Signal Type (Active Low)	Open collector/drain output from power supply. Pull-up to VSB located in system.	
Alert# = High	OK	
Alert# = Low	Power Alert to system	
	MIN	MAX
Logic level low voltage, Isink=4 mA	0 V	0.4 V
Logic level high voltage, Isink=50 µA		3.46 V
Sink current, Alert# = low		4 mA
Sink current, Alert# = high		50 µA
Alert# rise and fall time		100 µs

3.6 Protection Circuits

Protection circuits inside the power supply cause only the power supply's main outputs to shut down. If the power supply latches off due to a protection circuit tripping, an AC cycle OFF for 15 sec and a PSON# cycle HIGH for 1 sec will be able to reset the power supply.

3.6.1 Current Limit (OCP)

The power supply has current limit to prevent the outputs from exceeding the values shown in table below. If the current limits are exceeded, the power supply will shut down and latch off. The latch will be cleared by toggling the PSON# signal or by an AC power interruption. The power supply will not be damaged from repeated power cycling in this condition. 12VSB will be auto-recovered after removing OCP limit.

Table 29. Over current protection

Output Voltage	Input Voltage Range	2130 W Over Current Limits
+12 V	90 – 264 VAC	210 A min; 230 A max
+12 V_{STB}	90 – 264 VAC	4.5 A min; 5.5 A max

3.6.2 Over Voltage Protection (OVP)

The power supply over voltage protection is locally sensed. The power supply will shut down and latch off after an over voltage condition occurs. This latch will be cleared by toggling the PSON# signal or by an AC power interruption. The values are measured at the output of the power supply's connectors. The voltage will never exceed the maximum levels when measured at the power connectors of the power supply connector during any single point of fail. The voltage will never trip any lower than the minimum levels when measured at the power connector. 12 VSB will be auto-recovered after removing OVP limit.

Table 30. Over voltage protection (OVP) limits

Output Voltage	Min (V)	Max (V)
+12V	13.3	14.5
+12VSB	13.3	14.5

3.6.3 Over Thermal Protection

The power supply will be protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the PSU will shut down. When the power supply temperature drops to within specified limits, the power supply will restore power automatically, while the 12 VSB remains always on. The OTP circuit has built in margin so that the power supply will not oscillate on and off due to temperature recovering condition. The OTP trip level has a minimum of 4 °C of ambient temperature margin.

3.7 PMBus*

The PMBus* features are requirements for power supply unit for use in server systems. This specification is based on the *PMBus* specifications part I and II, revision 1.1*. The power supply device address locations are shown below.

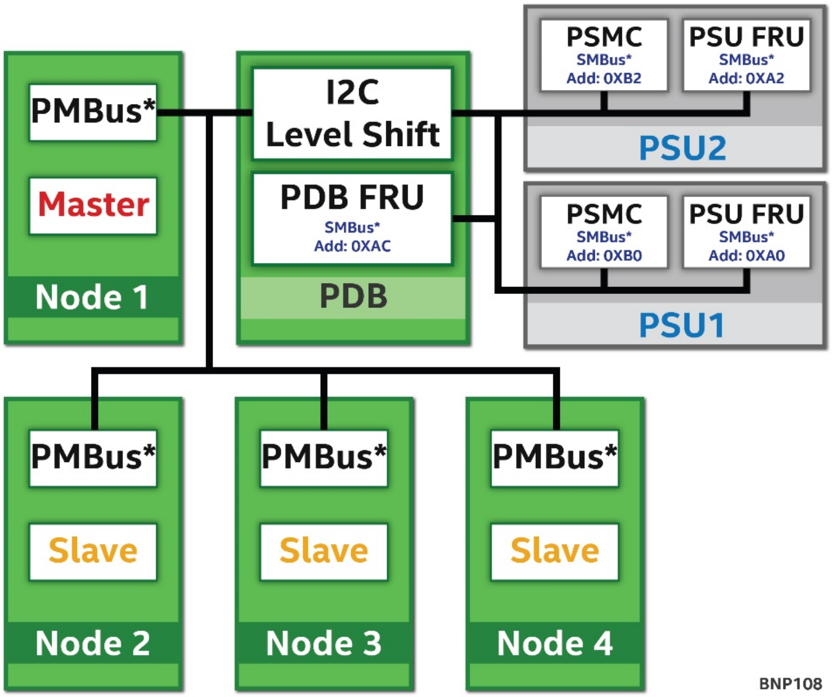


Figure 19. Power supply device address

The PMBus* from PDB is connected to the BMC of all four compute modules. Only one board BMC is assigned to be the master BMC and communicate with PSU as single point. Other board BMCs receive PSU data from the master BMC. In case the master BMC is down, one of the slave board BMC will be promoted automatically as master BMC and maintain the communication.

3.7.1 PSU Address Lines A0

Address pin A0 is used by end use system to allocate unit address to a power supply in particular slot position.

For redundant systems there are two signals to set the address location of the power supply once it is installed in the system: Address0 and Address1. For non-redundant systems the power supply device address locations align with the Address0/Address1 location of 0/0.

Table 31. PSU addressing

PDB addressing	Address0	Address1
Power supply PMBus* device	B0h	B2h

3.7.2 Accuracy

The sensor commands meet the following accuracy requirements. The accuracies are met over the specified ambient temperature and the full range of rated input voltage.

Table 32. PMBus* accuracy

Output Loading	10% - 20%	> 20% - 50%	> 50% - 100%
READ_PIN and READ_EIN	See graphs below		
READ_FAN	+/-500 RPM		
READ_IOUT	+/-5%	+/-2%	+/-2%
READ_TEMPERATURE	+/- 3ºC		

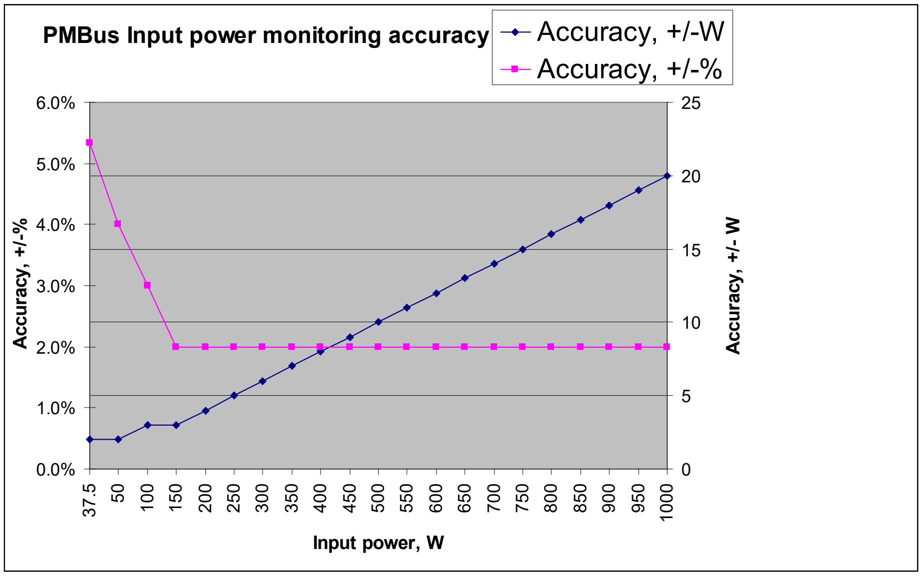


Figure 20. PMBus* monitoring accuracy

3.8 Power Management Policy

When working with the Intel® Server Board, the BMC on each compute module monitors its fans and temperature for critical failures. When there is a fan failure and a critical temperature event at the same time, the compute module will be powered down. When this occurs, the compute module will need to be manually powered back on.

Additionally, the BMC on compute module 3 and compute module 4 will monitor for a power supply over current condition or power supply over temperature condition. If either of these occurs and the shutdown policy has been enabled, the compute module will be powered down. When this occurs, the compute module will need to be manually powered back on but if the over current or over temperature event is detected again the compute module will be powered back off.

The following table shows the scheme of system power redundancy mode with compute module behavior.

Table 33. Power management policy

Server Chassis Load	System Power Redundancy Mode	System behavior with one PSU AC lost or failed
<Rating	Unconstrained Redundant Mode	No system throttling. All 4 compute modules work normally.
Rating < current load < OC CLST	Optimal Redundant Mode	With BIOS setting “server management - shutdown policy” set to “disable” all compute modules in the chassis may be throttled to maintain power. This may cause lower performance. With BIOS “ server management--shutdown policy” set to “enable”, compute module 3 and 4 will shut down while compute module 1 and 2 keep running without throttling. Compute module 1 and compute module 2 will have no performance loss.
>OC CLST	Non Redundant Mode	All compute modules in the chassis may shut down.

The shutdown policy setting is only shown on compute module 3 and compute module 4, and is disabled by default but can be enabled or disabled in the BIOS setup Server Management page or by using the Intel® command line interface (Intel® CLI) command Set Shutdown Policy.

4. Cooling Subsystem

The cooling subsystem refers to the chassis installed with compute modules. The cooling subsystem contains the fans of each compute module and fans in the power supply units. Both compute module fans and PSU fans work together as a thermal solution to the system.

For each compute module, several components and configuration requirements make up the cooling subsystem. These include processors, chipsets, VR heatsinks, fans, CPU air-duct, and drive bay population. All are necessary to provide and regulate the airflow and air pressure needed to maintain the system thermals when operating at or below the maximum specified thermal limits.

In order to maintain the necessary airflow within the system, you must properly install the air duct, drive carrier, PSU dummy filler and the power distribution module cover.

Each compute module uses a variable fan speed control algorithm to provide adequate cooling for the compute module and whole system at various ambient temperature conditions, under various server workloads, and with the least amount of acoustic noise possible. The fans operate at the lowest speed for any given condition to minimize acoustics.

The following table provides airflow data associated with the different product models within this product family, and is provided for reference purposes only. The data was derived from actual wind tunnel test and measurements using fully configured system. Lesser system configurations may result in totally different results. As such, the CFM data that users get from software may vary from the data listed in the table.

Table 34. Airflow

Chassis	With Compute Module	Airflow (CFM)
H2312XXLR3	HNS2600BP	34~200
H2224XXLR3	HNS2600BP24	38~211
H2204XXLRE	HNS2600BP	39-224

4.1 Power Supply Fan

Each power supply module has one non-redundant dual rotor 40x56 mm fan. The fans control the cooling of the power supply and some drive bays. These fans are not replaceable. Therefore, if a power supply fan fails, you must replace the power supply module.

4.2 Drive Bay Population Requirement

In order to maintain chassis thermal requirements, you must fully populate all drive bays. Drive carriers used for hot-swap drives must either have a drive installed or not have a drive installed.

If only one power supply unit is used, a PSU dummy filler must be used to prevent recirculation.

IMPORTANT: If the drive bay is missing or not fully populated, the system will not meet the thermal cooling requirements, which will most likely result in degraded performance as a result of throttling or thermal shutdown of the compute module. It is recommended to keep/apply the dummy plastic blocker (as shipped with drive carrier) on any blank drive carrier.

5. Drive Support

The Intel® Server Chassis H2000P product family provides different SKUs to support different types of drives as listed in Table 35.

Table 35. Chassis drive support

Chassis	Drive Support
H2312XXLR3	12x 3.5" drives
H2204XXLRE	4 x 3.5" drives [1]
H2224XXLR3	24x 2.5" drives

[1] The H2204XXLRE Chassis includes 4x3.5" drive carriers. However, to maintain the thermal requirements to support higher TDP processors, only 2.5" SSDs are supported.

5.1 Drive Bays Scheme

The Intel Server Chassis H2000P product family can support up to 12 carrier-mounted SATA/SAS 3.5" drives, 4 carrier mounted SAS 2.5" SSDs, or 24 carrier-mounted SAS 2.5" drives. The drives may be "electrically" hot-swapped while the chassis power is applied, but take caution before hot-swapping while the compute module is functioning under operating system/application control or data may be lost.

The following figures show the standard drive configurations for different SKUs of the product family.

Note: Drives routed to the same compute module through the backplane are grouped and numbered only in the figure, not on the actual hardware.

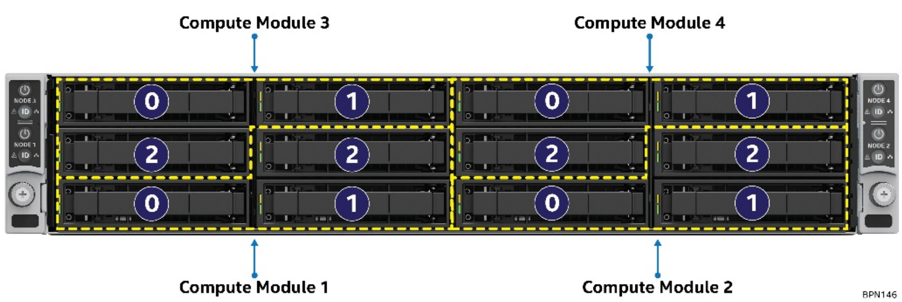


Figure 21. 12 x 3.5" drive configuration

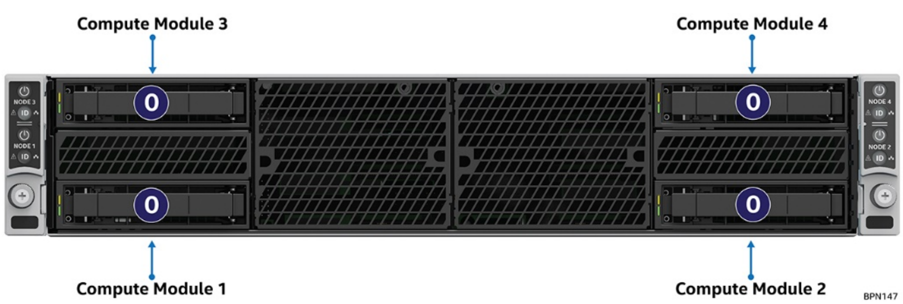


Figure 22. 4 x 3.5" drive configuration

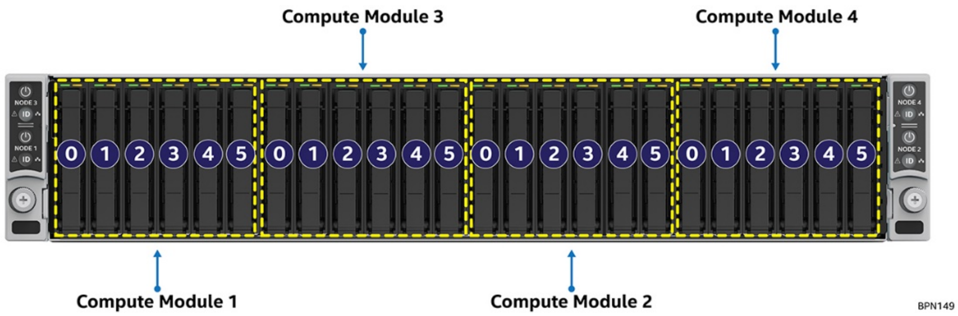


Figure 23. 24 x 2.5" drive configuration

Note: Replace the faulty drive only with one from the same manufacturer with the same model and capacity.

- For 24 x 2.5" drive configuration, the drive bay is capable of supporting 12 Gb SAS or 6 Gb SAS drives. The SAS drives are hot-swappable. The front side of the backplane includes 24 drive interface connectors. All the 24 connectors can support SAS drives, but only the connector #4 and #5 of each compute module are capable of supporting PCIe* SFF devices.
- PCIe SFF (NVMe*) SSDs are hot swap/hot plug capable. Support and usage models are OS dependent.
- For a given compute module, any combination of PCIe SFF devices and SAS devices can be supported, as long as the number of PCIe SFF devices does not exceed two and they are installed into any of the last two drive connectors on the backplane (drive slots 4, 5) and the remaining drives are SAS drive.

Note: Mixing of PCIe SFF and SAS devices in an alternating manner is not a recommended configuration.

5.2 Hot Swap Drive Carriers

Hot swap tool-less drive carriers are shipped standard on LR3/LRE chassis versions. Each SAS/SATA/NVMe* drive that interfaces with a backplane is mounted to a tool-less hot swap drive carrier.

Figure 24. 2.5" Tool-less drive carrier

Drive carriers include a latching mechanism used to assist with drive extraction and drive insertion.

Figure 25. Drive carrier extraction and insertion

Note: To ensure proper system airflow requirements, all front drive bays must be populated with a drive carrier. Drive carriers must be installed with either a drive or supplied drive blank.

There are drive carriers to support 2.5" drives and 3.5" drives. Drive blanks used with the 3.5" drive carrier can also be used to mount a 2.5" SSD.

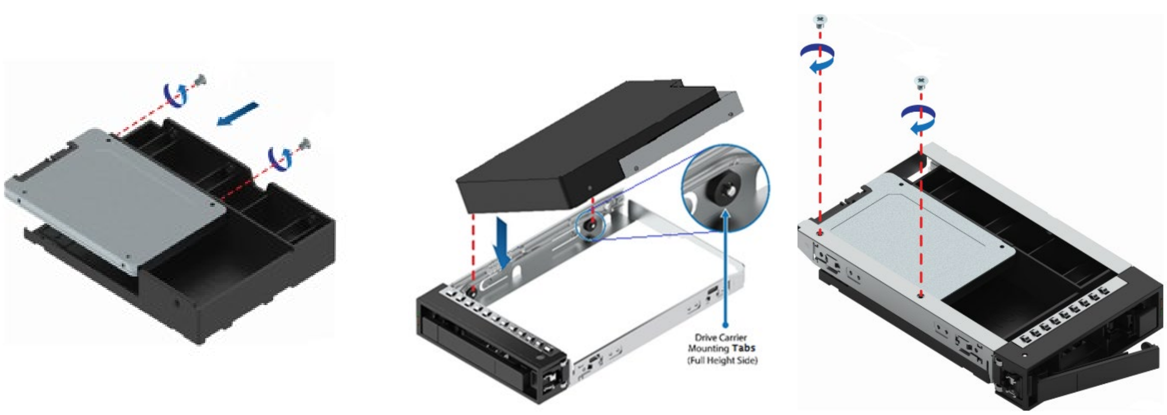


Figure 26. 2.5" SSD mounted to 3.5" drive carrier

Note: Due to degraded performance and reliability concerns, the use of the 3.5" drive blank as a 2.5" drive bracket is intended to support SSD type storage devices only. Installing a 2.5" Hard disk drive into the 3.5" drive blank cannot be supported.

Each drive carrier includes separate LED indicators for drive activity and drive status. Light pipes integrated into the drive carrier assembly direct light emitted from LEDs mounted next to each drive connector on the backplane to the drive carrier faceplate, making them visible from the front of the system.

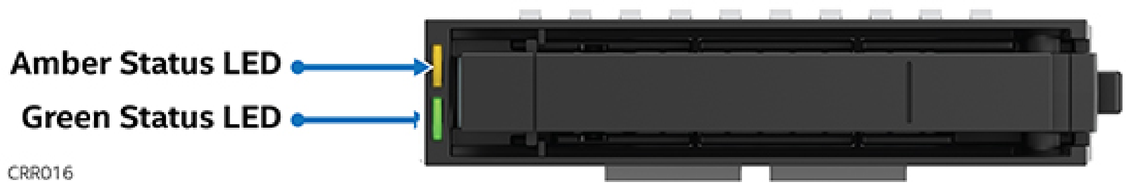


Figure 27. 2.5" drive tray LED identification

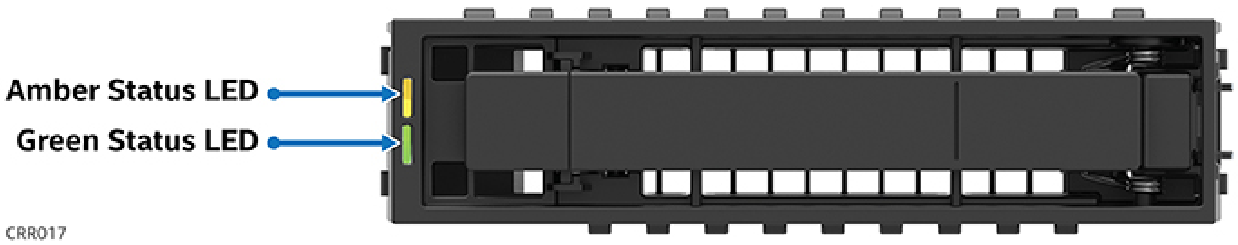


Figure 28. 3.5"/2.5" drive tray LED identification

Each drive tray includes separate LED indicators for drive activity and drive status. Light pipes integrated into the drive tray assembly direct light emitted from LEDs mounted next to each drive connector on the backplane to the drive tray faceplate, making them visible from the front of the system.

Table 36. Drive status LED states

	LED State	Description
Amber	Off	No access and no fault
	Solid On	Hard drive fault has occurred
	Blinking 1 Hz	RAID rebuild in progress
	Blinking 2 Hz	Identify

Table 37. Drive activity LED states

	Condition	Drive Type	Behavior
Green	Power on with no drive activity	SAS/PCIe SFF	LED stays on
		SATA	LED stays off
	Power on with drive activity	SAS/PCIe SFF	LED blinks off when processing a command
		SATA	LED blinks on when processing a command
	Power on and drive spun down	SAS/PCIe SFF	LED stays off
		SATA	LED stays off
	Power on and drive spinning up	SAS	LED blinks
		SATA/PCIe SFF	LED stays off

Note: The drive activity LED is driven by signals coming from the drive itself. Drive vendors may choose to operate the activity LED different from what is described in the table above. Should the activity LED on a given drive type behave differently than what is described, customers should reference the drive vendor specifications for the specific drive model to determine the expected drive activity LED operation.

5.3 Hot-Swap Drive Support

The Intel Server Chassis H2000P product family supports hot-swap SATA/SAS drives. Drives interface with the passive backplane through a blind mate connection when drives are installed into a drive bay using hot-swap drive carriers.

Each compute module has dedicated hot-swap controller (HSC) to manage three or four drives. There are totally four sets of independent Programmable System On Chip (PSoC*) on the backplane, to function as HSC respectively to four compute modules.

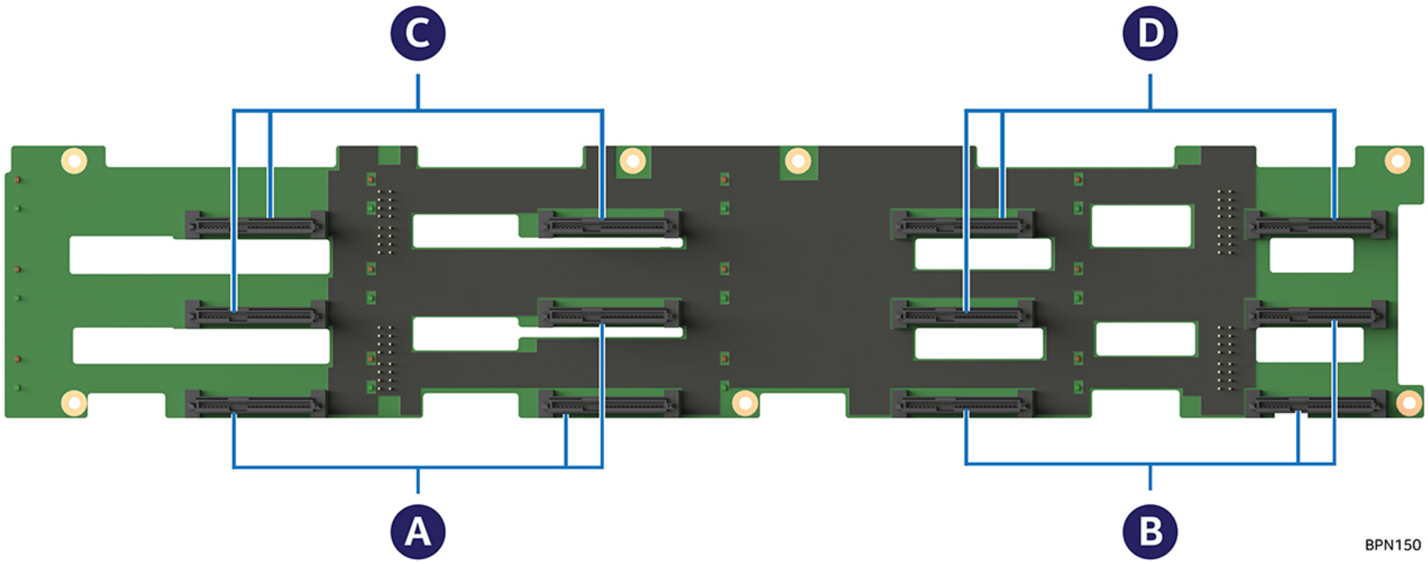
The following sections describe the feature and connections between the backplane and server board.

5.3.1 Backplane Feature Set

- **H2312XXLR3** – 12x SAS/SATA 3.5" drives at 12Gb SAS and 6Gb SATA or slower speeds, divided into four groups of three hot-swap drives. Each drive group is associated with one of the four compute modules respectively in the 2U chassis.
- **H2204XXLRE** – 4 x SAS/SATA 3.5" drives at 12Gb SAS and 6Gb SATA or slower speeds, divided into four groups of one hot-swap drive. Each drive is associated with one of the four compute modules respectively in the 2U chassis. Note that in order to maintain the thermal requirements of higher TDP processors, only 2.5" SSD will be supported.
- **H2224XXLR3** – 24 x SAS 2.5" drives at 12Gb SAS or slower speeds, divided into four groups of six hot-swap drives. Each drive group is associated with one of the four compute modules respectively in the 2U chassis.
- One SGPIO SFF-8485 interface per each of the compute module total of four SGPIO on the backplane.
- Three SMBus interfaces supported on this HSBP:
  - SMBus R1: For chassis Temp Sensor and Chassis FRU EEPROM device
  - SMBus R5: Connectivity up to two HSBP controllers
  - SMBus R7: Connectivity up to two common redundant power supply (CRPS) module PMBus
- Two front panel connectors; each front panel connector provides signals for two compute modules.
- FRU EEPROM support through external device.
- In-application microcontroller firmware updateable over I2C interface. No special hardware needed for field firmware upgrade when used with EPSD baseboard with BMC support.
- Drive status LED and activity LED; four of each per compute module.
- Drive presence detect inputs to the microcontroller; four of each per compute module.
- 5V_MAIN VR (switcher regulator) from P12V_MAIN and 5V_AUX VR (switcher regulator) from P12V_STBY for drive power and for the compute modules. This HSBP is intended to be used with 12 V only main power subsystems.

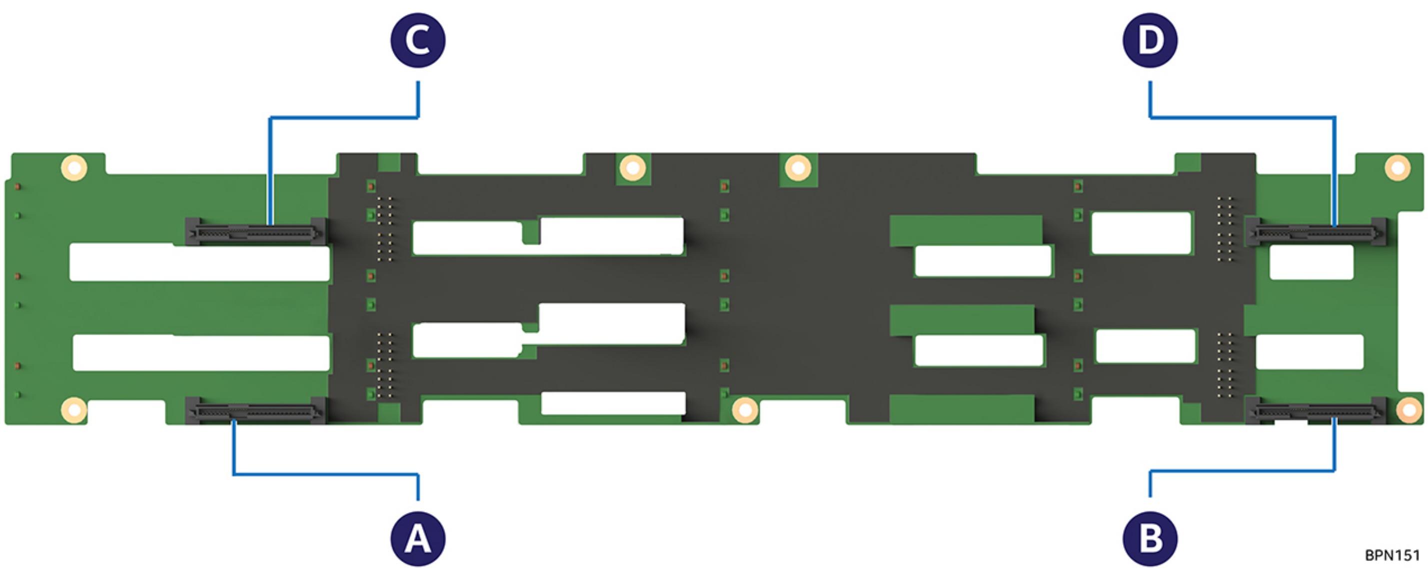
5.3.2 3.5" Hot Swap Backplane Connector Scheme

The following diagrams show the layout of major components and connectors for 3.5" hot swap backplane.



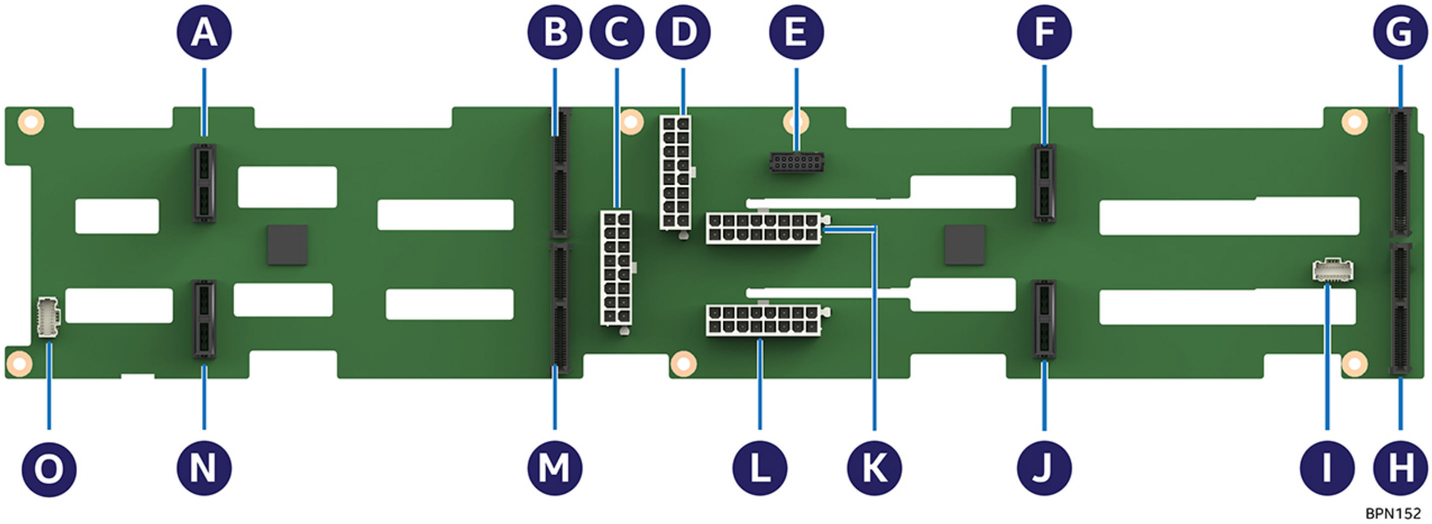
A	SATA/SAS connectors for Compute Module 1
B	SATA/SAS connectors for Compute Module 2
C	SATA/SAS connectors for Compute Module 3
D	SATA/SAS connectors for Compute Module 4

Figure 29. 12 x 3.5" backplane component and connectors (front view)



A	SATA/SAS connectors for Compute Module 1
B	SATA/SAS connectors for Compute Module 2
C	SATA/SAS connectors for Compute Module 3
D	SATA/SAS connectors for Compute Module 4

Figure 30. 4 x 3.5" backplane component and connectors (front view)

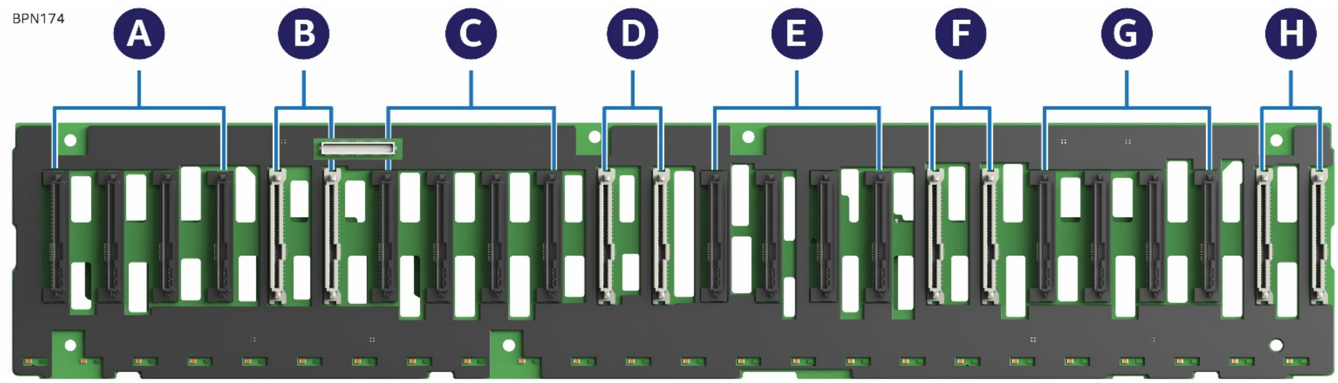


A	2-blade compute module power connector for compute module 4
B	2x40 pin bridge board connector for compute module 4
C	2x8 pin power supply input connector
D	2x8 pin power supply input connector
E	2x7 pin power control cable connector
F	2-blade compute module power connector for compute module 3
G	2x40 pin bridge board connector for compute module 3
H	2x40 pin bridge board connector for compute module 1
I	20-pin front panel cable connector for compute module 1, 3
J	2-blade compute module power connector for compute module 1
K	2x8 pin power supply input connector
L	2x8 pin power supply input connector
M	2x40 pin bridge board connector for compute module 2
N	2-blade compute module power connector for compute module 2
O	20-pin front panel cable connector for compute module 2, 4

Figure 31. 3.5" backplane component and connectors (back view)

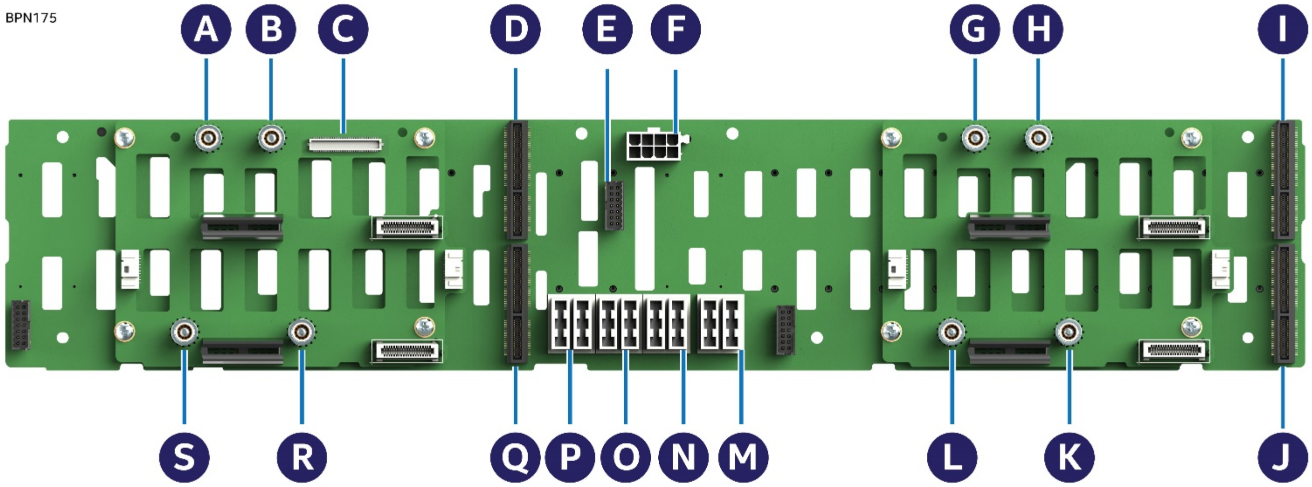
5.3.3 SAS/PCIe* SFF Combo 24 x 2.5" Hot Swap Backplane

The SAS/PCIe* SFF combo 24 x 2.5" hot swap backplane is capable of supporting a combination of both SAS hard drives, SAS SSDs, and up to eight PCIe small form factor (SFF) (NVMe*) devices. The following diagrams show the layout of major components and connectors for 2.5" hot swap backplane.



A	SAS 0-3 SFF-8680 connectors (Compute Module 1)
B	SAS 4-5 / PCIe* SFF 0-1 SFF-8639 connectors (Compute Module 1)
C	SAS 6-9 SFF-8680 connectors (Compute Module 3)
D	SAS 10-11 / PCIe* SFF 2-3 SFF-8639 connectors (Compute Module 3)
E	SAS 12-15 SFF-8680 connectors (Compute Module 2)
F	SAS 16-17 / PCIe* SFF 4-5 SFF-8639 connectors (Compute Module 2)
G	SAS 18-21 SFF-8680 connectors (Compute Module 4)
H	SAS 22-23 / PCIe* SFF 6-7 SFF-8639 connectors (Compute Module 4)

Figure 32. 24 x 2.5" backplane component and connectors (front view)



A	Power Mate Pin (to BIB)
B	Power Mate Pin (to BIB)
C	80 pin Misc Signal Connector (to BIB)
D	100 pin bridge board connector
E	2x7 pin power control cable connector (to PDB)
F	2x4 pin P5V power cable connector (to PIB)
G	Power Mate Pin (to BIB)
H	Power Mate Pin (to BIB)
I	100 pin bridge board connector
J	100 pin bridge board connector
K	Power Mate Pin (to BIB)
L	Power Mate Pin (to BIB)
M	12V power connector (to PIB)
N	12V power connector (to PIB)
O	12V power connector (to PIB)
P	12V power connector (to PIB)
Q	100 pin bridge board connector
R	Power Mate Pin (to BIB)
S	Power Mate Pin (to BIB)

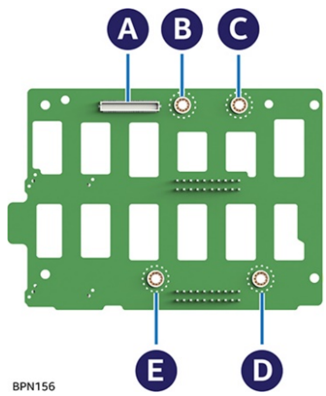
Figure 33. 24 x 2.5" backplane component and connectors (back view)

5.3.4 Backplane Interposer Board

The backplane interposer board (BIB) is only used in 24 x 2.5" drive chassis as the interposer between the backplane and the power docking board to connect the power and miscellaneous (misc.) signals from the backplane to the compute modules. Two backplane interposer boards are pre-assembled with the 24 x 2.5" drive backplane in the server chassis to support four compute modules.

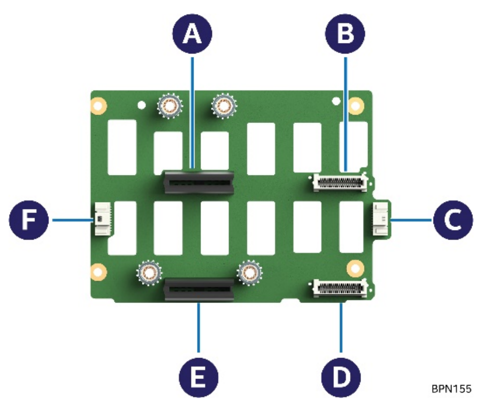
The BIB is a completely passive board, which contains connectors on both sides of the board to connect to the backplane on the front side and the power docking board on the back side.

Two front panel connectors with the same signals routed are placed on the BIB for easy of cabling to the front panel on each side of the chassis.



A	80 pin Misc Signal Connector (to backplane)
B	Power Mate Pin Hole (to backplane)
C	Power Mate Pin Hole (to backplane)
D	Power Mate Pin Hole (to backplane)
E	Power Mate Pin Hole (to backplane)

Figure 34. Backplane interposer board front view



A	Power Edge Connector (to top compute module power docking board)
B	40 pin Misc. Signal Connector (to top compute module power docking board)
C	Front Panel Connector
D	40 pin Misc. Signal Connector (to bottom compute module power docking board)
E	Power Edge Connector (to bottom compute module power docking board)
F	Front Panel Connector

Figure 35. Backplane interposer board back view

5.3.5 Backplane Connector Definition

The backplanes include several different connectors. This section defines the purpose and pin-out associated with each connector.

5.3.5.1 2x8 Pin Power Input Connector

The backplane is powered by +12 V and +12 V_{STB} from PDB of CRPS. The input power is distributed by backplane to all four compute modules.

Table 38. Backplane input power connector pinout

Pin	Signal Description	Pin	Signal Description
2	P12V_NODEx	1	GND
4	P12V_NODEx	3	GND
6	P12V_NODEx	5	GND
8	P12V_NODEx	7	GND
10	P12V_NODEx	9	GND
12	P12V_NODEx	11	GND
14	P12V_NODEx	13	GND
16	P12V_NODEx	15	GND

Note: Each compute module has a separate power plane on backplane (P12V_NODEx).

5.3.5.2 Two-Blade Compute Module Power Connector

The backplane provides main power to compute module through two-blade power connector.

Table 39. Two-blade compute module power connector pinout

Pin	Signal Description	Pin	Signal Description
Lower Blade (Circuit 1)			
1	GND	2	GND
3	GND	4	GND
5	GND	6	GND
7	GND	8	GND
Upper Blade (Circuit 2)			
9	P12V	10	P12V
11	P12V	12	P12V
13	P12V	14	P12V
15	P12V	16	P12V

5.3.5.3 2x40 Pin Bridge Board Connector

The compute module provides four SATA/SAS ports to backplane, together with front panel control signals and SMBus*.

Table 40. 2x40 pin connector pinout for compute module bridge board

Pin	Signal Description	Pin	Signal Description
1	5V_AUX	2	5V_AUX
3	SATA0_TXN	4	USB2_OC
5	SATA0_TXP	6	GND
7	GND	8	SATA0_RXN
9	NODE_Present_N (GND)	10	SATA0_RXP
11	ALL_NODE_OFF	12	GND
13	spare	14	USB2_P0P
15	GND	16	USB2_P0N
17	IPMB-Data	18	GND
19	IPMB-Clk	20	FP HDD_ACT_LED_N
21	GND	22	FP Activity LED_N
23	SMBUS_R1 DATA	24	FP Health LEDA_N
25	SMBUS_R1 CLK	26	FP Health LEDG_N
27	GND	28	FP PWR LED_N
29	SMBUS_R5 DATA	30	FP ID LED_N
31	SMBUS_R5 CLK	32	FP ID BTN_N
33	GND	34	FP RST BTN_N
35	SMBUS_R7 DATA	36	FP PWR BTN_N
37	SMBUS_R7 CLK	38	FP NMI BTN_N
39	GND	40	SPA_SOUT_N
41	PMBUS Alert_N	42	SPA_SIN_N
43	NODEx_ON_N	44	ID3
45	SGPIO DATA IN	46	ID2
47	SGPIO Data Out	48	ID1
49	SGPIO LD	50	ID0
51	SPKR	52	SGPIO CLK
53	GND	54	GND
55	SAS3_RX	56	SAS3_TX
57	SAS3_RX	58	SAS3_TX
59	GND	60	GND
61	SAS2_TX	62	SAS2_RX
63	SAS2_TX	64	SAS2_RX
65	GND	66	GND
67	SAS1_RX	68	SAS1_TX
69	SAS1_RX	70	SAS1_TX
71	GND	72	GND
73	SAS0_TX	74	SAS0_RX
75	SAS0_TX	76	SAS0_RX

Pin	Signal Description	Pin	Signal Description
77	GND	78	GND
79	3.3V	80	3.3V

5.3.5.4 20-Pin Front Panel Connector

The backplanes provide connectors for front panel control signals. Each connector integrates the control signals of two compute modules.

Table 41. Front panel connector pinout

Pin	Signal Description
1	GND
2	FP1_PWR_BTN_N
3	FP1_RST_BTN_N
4	FP1_ID_BTN_N
5	P5VSB
6	FP1_PWR_LED_N
7	FP1_HEALTH_LEDG_N
8	FP1_HEALTH_LEDA_N
9	FP1_ACTIVITY_LED_N
10	FP1_ID_LED_N
11	GND
12	FP2_PWR_BTN_N
13	FP2_RST_BTN_N
14	FP2_ID_BTN_N
15	P3V3SB
16	FP2_PWR_LED_N
17	FP2_HEALTH_LEDG_N
18	FP2_HEALTH_LEDA_N
19	FP2_ACTIVITY_LED_N
20	FP2_ID_LED_N

5.3.5.5 2x7 Pin Power Supply Control Signal Connector

The backplanes provide power supply control signals, together with PMBus functionality integrated.

Table 42. Power supply control connector pinout

Pin	Signal Description	Pin	Signal Description
1	SMBUS_R7_DATA	2	A0
3	SMBUS_R7_CLK	4	PSON_N
5	PMBUS_ALERT_N	6	12V RS_RTN
7	PWROK	8	12V RS
9	Reserved	10	PDU1-12VSB
11	PDU1-12VSB	12	PDU2-12VSB
13	PDU2-12VSB	14	Reserved

5.3.6 Backplane Interposer Board Connectors

Table 43. 80-pin misc. signal connector

Pin	Signal Description	Pin	Signal Description
1	N1_PE_SMB_CLK	2	N1_PE_SMB_DATA
3	GND	4	N1_FM_ALL_NODE_OFF
5	P5V_STBY	6	GND
7	GND	8	N1_SMB_IPMB_5VSTBY_BP_DATA
9	P3V3_STBY	10	N1_SMB_IPMB_5VSTBY_BP_CLK
11	Reserve	12	GND
13	Reserve	14	N1_SMB_SENSOR_3V3STBY_BP_DATA
15	Reserve	16	N1_SMB_SENSOR_3V3STBY_BP_CLK
17	Reserve	18	GND
19	Reserve	20	N1_SMB_HSBP_3V3_BP_DATA
21	Reserve	22	N1_SMB_HSBP_3V3_BP_CLK
23	N1_FM_IBMC_NODEID_1	24	GND
25	N1_FM_IBMC_NODEID_0	26	N1_SMB_PMBUS_BP_DATA
27	GND	28	N1_SMB_PMBUS_BP_CLK
29	N1_SGPIO_SAS12G_1_CLOCK_R1	30	GND
31	GND	32	N1_IRQ_SML1_PMBUS_ALERT_N
33	N1_SGPIO_SAS12G_0_CLK	34	N1_FM_NODE_ON_N
35	N1_SGPIO_SAS12G_0_LD	36	N1_SGPIO_SAS12G_1_DATAIN1_R1
37	N1_SGPIO_SAS12G_0_Data_Out	38	N1_SGPIO_SAS12G_1_DATAOUT0_R1
39	N1_PWROK	40	N1_SGPIO_SAS12G_1_LOAD_R1
41	PE_SMB_CLK	42	PE_SMB_DATA
43	GND	44	FM_ALL_NODE_OFF
45	Reserve	46	GND
47	Reserve	48	SMB_IPMB_5VSTBY_BP_DATA
49	Reserve	50	SMB_IPMB_5VSTBY_BP_CLK
51	Reserve	52	GND
53	Reserve	54	SMB_SENSOR_3V3STBY_BP_DATA
55	Reserve	56	SMB_SENSOR_3V3STBY_BP_CLK
57	Reserve	58	GND
59	Reserve	60	SMB_HSBP_3V3_BP_DATA
61	Reserve	62	SMB_HSBP_3V3_BP_CLK
63	FM_IBMC_NODEID_1	64	GND
65	FM_IBMC_NODEID_0	66	SMB_PMBUS_BP_DATA
67	GND	68	SMB_PMBUS_BP_CLK
69	SGPIO_SAS12G_1_CLOCK_R1	70	GND
71	GND	72	IRQ_SML1_PMBUS_ALERT_N
73	SGPIO_SAS12G_0_CLK	74	FM_NODE_ON_N
75	SGPIO_SAS12G_0_LD	76	SGPIO_SAS12G_1_DATAIN1_R1
77	SGPIO_SAS12G_0_Data_Out	78	SGPIO_SAS12G_1_DATAOUT0_R1
79	PWROK	80	SGPIO_SAS12G_1_LOAD_R1

Table 44. 40-pin misc. signal connector

Pin	Signal Description	Pin	Signal Description
1	PE_SMB_CLK	2	PE_SMB_DATA
3	GND	4	FM_ALL_NODE_OFF
5	FP HDD_ACT_LED_N	6	GND
7	FP Activity LED_N	8	SMB_IPMB_5VSTBY_BP_DATA
9	FP Health LEDA_N	10	SMB_IPMB_5VSTBY_BP_CLK
11	FP Health LEDG_N	12	GND
13	FP_PWR_LED_BUF_R_N	14	SMB_SENSOR_3V3STBY_BP_DATA
15	FP_ID_LED_BUF_R_N	16	SMB_SENSOR_3V3STBY_BP_CLK
17	FP_ID_BTN_R_N	18	GND
19	FP_RST_BTN_R_N	20	SMB_HSBP_3V3_BP_DATA
21	FP_PWR_BTN_R_N	22	SMB_HSBP_3V3_BP_CLK
23	FM_IBMC_NODEID_1	24	GND
25	FM_IBMC_NODEID_0	26	SMB_PMBUS_BP_DATA
27	GND	28	SMB_PMBUS_BP_CLK
29	SGPIO_SAS12G_1_CLOCK_R1	30	GND
31	GND	32	IRQ_SML1_PMBUS_ALERT_N
33	SGPIO_SAS12G_0_CLK	34	FM_NODE_ON_N
35	SGPIO_SAS12G_0_LD	36	SGPIO_SAS12G_1_DATAIN1_R1
37	SGPIO_SAS12G_0_Data_Out	38	SGPIO_SAS12G_1_DATAOUT0_R1
39	PWROK	40	SGPIO_SAS12G_1_LOAD_R1

Table 45. BIB power edge connector

Pin	Signal Description	Pin	Signal Description
1	P12V	2	P12V
3	P12V	4	P12V
5	P12V	6	P12V
7	P12V	8	P12V
9	P12V	10	P12V
11	GND	12	GND
13	GND	14	GND
15	GND	16	GND
17	GND	18	GND
19	GND	20	GND

Table 46. Front panel connector

Pin	Signal Description	Pin	Signal Description
1	GND	2	FP_PORTx_PWR_BTN_N
3	FP_PORTx_RST_BTN_N	4	FP_PORTx_ID_BTN_N
5	P5V_AUX	6	FP_PORTx_PWR_LED_N
7	FP_PORTx_HEALTH_LEDG_N	8	FP_PORTx_HEALTH_LEDA_N
9	FP_PORTx_ACT_LED_N	10	FP_PORTx_ID_LED_N
11	GND	12	FP_PORTy_PWR_BTN_N
13	FP_PORTy_RST_BTN_N	14	FP_PORTy_ID_BTN_N
15	P3V3_AUX	16	FP_PORTy_PWR_LED_N
17	FP_PORTy_HEALTH_LEDG_N	18	FP_PORTy_HEALTH_LEDA_N
19	FP_PORTy_ACT_LED_N	20	FP_PORTy_ID_LED_N

6. Front Panel Control and Indicators

The Intel® Server Chassis H2000P product family front control panel is integrated with rack handles at the both sides of the chassis. Each control panel contains two sets of compute module control buttons and status LEDs. The control panel assembly is pre-assembled and fixed with the rack handles.

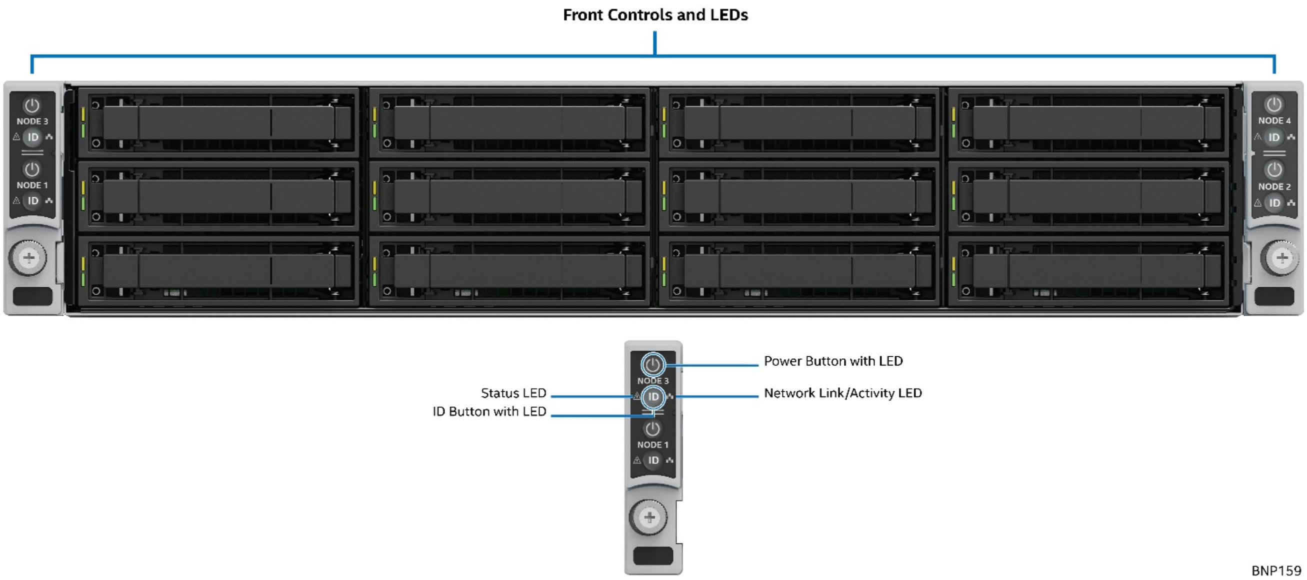


Figure 36. Front control panel

6.1 Control Panel Button

The following table lists the control panel features and functions. The control panel features a compute module power button.

Table 47. Front control button function

Feature	Function
Power Button with Power LED	Toggles the compute module power on/off. This button also integrates the power LED.
Compute Module ID Button with ID LED	Toggles between ID LED on and off.

6.2 Control Panel LED Indicators

The control panel houses independent two LEDs and two button integrated LEDs for each compute module, which are viewable to display the compute module's operating status. The following table identifies each LED and describes their functionality.

Table 48. Front LED indicator functions

LED Indicator	LED State	Description
Power	Solid green	Power On/ACPI S0 state
	Blinking green	Sleep/ACPI S1 state
	Off	Power Off /ACPI S5 state
LAN (i350 Dual NIC)	Solid green	LAN Link no Access
	Blinking green	LAN Activity
	Off	No Link
Compute Module Status	Solid green	Compute Module Ready/No Alarm
	Blinking green	Compute Module ready, but degraded: redundancy lost such as the power supply or fan failure; non-critical temp/voltage threshold; battery failure; or predictive power supply failure.
	Solid amber	Critical Alarm: Critical power modules failure, critical fans failure, voltage (power supply), critical temperature and voltage
	Blinking amber	Non-Critical Alarm: Redundant fan failure, redundant power module failure, non-critical temperature and voltage
	Off	Power off: Compute Module unplugged Power on: Compute Module powered off and in standby, no prior degraded\non-critical\critical state

Notes:

- Blink rate is ~1 Hz at 50% duty cycle.
- It is also off when the compute module is powered off (S5) or in a sleep state (S1).
- The power LED sleep indication is maintained on standby by the chipset. If the compute module is powered down without going through the BIOS, the LED state in effect at the time of power off is restored when the compute module is powered on until the BIOS clear it.
- If the compute module is not powered down normally, it is possible the Power LED will blink at the same time the compute module status LED is off due to a failure or configuration change that prevents the BIOS from running.

6.2.1 Power LED

Table 49. Power LED operation

State	Power Mode	LED	Description
Power Off	Non-ACPI	Off	Compute module power is off and the BIOS has not initialized the chipset.
Power On	Non-ACPI	Solid On	Compute module power is on but the BIOS has not yet initialized the chipset.
S5	ACPI	Off	Mechanical is off and the operating system has not saved any context to the drive.
S1 Sleep	ACPI	Blinking	DC power is still on. The operating system has saved context and gone into a level of low-power state.
S0	ACPI	Solid On	Compute module and the operating system are up and running.

Note: Blink rate is ~ 1 Hz at 50% duty cycle.

6.2.2 Status LED

The control panel includes a bi-color status LED. The status LED on the control panel is tied directly to the status LED on the server board (if present). This LED indicates the current health of the compute module. Possible LED states include solid green, blinking green, blinking amber, and solid amber.

When the compute module is powered down (transitions to the DC-off state or S5), the BMC is still on standby power and retains the sensor and front panel status LED state established before the power-down event.

When AC power is first applied to the compute module, the status LED turns solid amber and then immediately changes to blinking green to indicate that the BMC is booting. If the BMC boot process completes with no errors, the status LED will change to solid green.

When power is first applied to the compute module and 5V-STBY is present, the BMC controller on the server board requires 15-20 seconds to initialize. During this time, the compute module status LED will be solid on, both amber and green. Once BMC initialization has completed, the status LED will stay green solid on. If power button is pressed before BMC initialization completes, the compute module will not boot to POST.

Table 50. Status LED state definitions

State	Criticality	Description
Off	Not ready; system is not operating	• System is powered off (AC and/or DC). • System is in EuP Lot6 Off Mode. • System is in S5 Soft-Off State.
Solid green	Ok	Indicates that the System is running (in S0 State) and its status is 'Healthy'. The system is not exhibiting any errors. AC power is present and BMC has booted and manageability functionality is up and running. After a BMC reset, and in conjunction with the Chassis ID solid ON, the BMC is booting Linux*. Control has been passed from BMC uBoot to BMC Linux* itself. It will be in this state for ~10-~20 seconds.
~1 Hz blinking green	Degraded - system is operating in a degraded state although still functional, or system is operating in a redundant state but with an impending failure warning	System degraded: • Redundancy loss such as power-supply or fan. Applies only if the associated platform sub-system has redundancy capabilities. • Fan warning or failure when the number of fully operational fans is less than minimum number needed to cool the system. • Non-critical threshold crossed – Temperature (including HSBP temp), voltage, input power to power supply, output current for main power rail from power supply and Processor Thermal Control (Therm Ctrl) sensors. • Power supply predictive failure occurred while redundant power supply configuration was present. • Unable to use all of the installed memory (more than 1 DIMM installed). • Correctable Errors over a threshold and migrating to a spare DIMM (memory sparing). This indicates that the system no longer has spared DIMMs (a redundancy lost condition). Corresponding DIMM LED lit. • In mirrored configuration, when memory mirroring takes place and system loses memory redundancy. • Battery failure. • BMC executing in uBoot. (Indicated by Chassis ID blinking at 3Hz). System in degraded state (no manageability). BMC uBoot is running but has not transferred control to BMC Linux*. Server will be in this state 6-8 seconds after BMC reset while it pulls the Linux* image into flash. • BMC Watchdog has reset the BMC. • Power Unit sensor offset for configuration error is asserted. • HDD HSC is off-line or degraded.

State	Criticality	Description
~1 Hz blinking amber	Non-critical - System is operating in a degraded state with an impending failure warning, although still functioning	Non-fatal alarm – system is likely to fail: • Critical threshold crossed – Voltage, temperature (including HSBP temp), input power to power supply, output current for main power rail from power supply and PROCHOT (Therm Ctrl) sensors. • VRD Hot asserted. • Minimum number of fans to cool the system not present or failed • Hard drive fault • Power Unit Redundancy sensor – Insufficient resources offset (indicates not enough power supplies present) • In non-sparing and non-mirroring mode if the threshold of correctable errors is crossed within the window
Solid amber	Critical, non-recoverable – System is halted	Fatal alarm – system has failed or shut down: • CPU CATERR signal asserted • MSID mismatch detected (CATERR also asserts for this case). • CPU 1 is missing • CPU Thermal Trip • No power good – power fault • DIMM failure when there is only 1 DIMM present and hence no good memory present. • Runtime memory uncorrectable error in non-redundant mode. • DIMM Thermal Trip or equivalent • SSB Thermal Trip or equivalent • CPU ERR2 signal asserted • BMC/Video memory test failed. (Chassis ID shows blue/solid-on for this condition) • Both uBoot BMC FW images are bad. (Chassis ID shows blue/solid-on for this condition) • 240VA fault • Fatal Error in processor initialization: • Processor family not identical • Processor model not identical • Processor core/thread counts not identical • Processor cache size not identical • Unable to synchronize processor frequency • Unable to synchronize QPI link frequency • Uncorrectable memory error in a non-redundant mode

6.2.3 ID LED

The ID LED provides a visual indication of the server board or compute module being serviced. The state of the ID LED is affected by the following:

- Toggled by the ID button
- Controlled by the Chassis Identify command (IPMI)

Table 51. ID LED

State	LED State
Identify active through button	Solid on
Identify active through command	~1 Hz blinking
Off	Off

There is no precedence or lock-out mechanism for the control sources. When a new request arrives, all previous requests are terminated. For example, if the ID LED is blinking and the chassis ID button is pressed, then the ID LED changes to solid on. If the button is pressed again with no intervening commands, the ID LED turns off.

Appendix A. Integration and Usage Tips

Before attempting to integrate and configure the chassis, refer to the following list of useful information.

- Remove the dummy tray cover before installing the compute module.
- Install the dummy tray cover when respective compute module is plugged out.
- Fans in the compute modules are not hot-swappable.
- It is necessary to use the air duct to maintain compute module thermals.
- To maintain system thermals, populate all drive bays with either a drive or drive blank.
- Remove AC power from the compute module before service.

Download the latest documentation, drivers, and software from the Intel support website at http://www.intel.com/support.

Appendix B. Statement of Volatility

This section describes the volatile and non-volatile components on the HSBP and power supply unit of the server chassis. It is not the intention of this document to include any components not directly included in the server chassis, such as the server board, processors, memory, drives, or add-in cards.

B.1. Chassis Board Components

The server chassis contains several components that can be used to store data. A list of components for the HSBP and power supply unit of the server chassis is included in the table below. The sections below the table provide additional information about the fields in this table.

Table 52. Non-volatile components list

Component Type	Size	Board Location	User Data	Name
Non-Volatile	256 Bytes	UM801	No	PSU Firmware
Non-Volatile	512 Bytes	U6N2	No	12 x 3.5” HSBP FRU
Non-Volatile	512 Bytes	U1A2	No	24 x 2.5” HSBP FRU
Non-Volatile	512 Bytes	U6N2	No	4 x 3.5” HSBP FRU

B.2. Component Type

Non-volatile memory is persistent, and is not cleared when power is removed from the chassis. Non-volatile memory must be erased to clear data. The exact method of clearing these areas varies by the specific component. Some areas are required for normal operation of the server, and clearing these areas may render the server board inoperable.

B.3. Size

The size of each component includes sizes in bits, Kbits, bytes, kilobytes (KB) or megabytes (MB).

B.4. Board Location

The physical location of each component is specified in the board location column. The board location information corresponds to information on the board silkscreen.

B.5. User Data

The flash components on the server boards do not store user data from the operating system. No operating system level data is retained in any listed components after AC power is removed. The persistence of information written to each component is determined by its type as described in the table.

Appendix C. System Configuration Table for Thermal Compatibility

This section provides system configuration compatibility data based on various supported system operating thermal limits. Two tables are provided for each of the server board. The first table identifies supported system configurations while the system is in “normal” operating mode; all systems fans are present, on-line, and operational. The second table identifies supported system configurations while the system is in a “fan fail” mode; one system fan is no longer on-line or operational, fan redundancy is lost.

The following notes communicate support criteria associated with specific configurations identified in the following tables. Each relevant note to a configuration is identified by reference number in the table.

"●" = Full Support without limitation

" " (Blank Cell) = Configuration Not supported

C.1. Thermal Configuration Tables – Intel® Server Board S2600BP Product Family

High Temperature Ambient(HTA) Guidance and Thermal Constrains

The system operating ambient is design for sustained operation up to 35 °C (ASHRAE Class A2) with short-term excursion based operation as follows:

- The system can operate up to 40°C (ASHRAE Class A3) for up to 900 hours per year
- The system can operate up to 45°C (ASHRAE Class A4) for up to 90 hours per year
- System performance may be impacted when operating within the extended operating temperature range
- There is no long term system reliability impact when operating at the extended temperature range within the documented limits.

Thermal Configuration Table Notes:

1. 27 °C is limited to elevations of 900 m or less.
2. CPU throttling with power limitation feature enabled to conditional support 200LFM for PCI Cards.
3. Processors - may have significant performance impact.
4. Processors - There may be some performance impact.
5. Memory - There may be some performance impact. FDHS is required
6. For A3/A4 individual PS selection:
    a. For dual power supply configuration, power budget must fit within single power supply rated load and be installed in dual configuration.
    b. For single power supply configurations, the power budget must be sized with 30% margin to single power supply rated load.
7. When identifying memory in the table, only Rank and Width are required. Capacity is not required. FDHS required for 8Rx4 memory
8. Processor limited to 90W to support 1.5W AOC cable. Processor limited to 85W and memory limited to DRx4 to support 2W AOC cable.
9. Supported with one HDD per node configuration.
10. NVMe SSD IO throughput throttling expected as configuration limitation.

11. M.2 SSD drive is used for OS support only with light workload assuming 70% write, 30% read, 100% Random, 100% access, 8kb transfer rate, IO "delay" of 8. No full stress mode is required.
12. M.2 drives may see performance impact under heavy workload.
13. H2312XXLR3 and H2224XXLR3 include two columns for ASHRAE A2 (35C). For this profile exist some differences regarding memory types and add in cards support depending on the CPU TDP.

Table 53. Thermal configuration table – Intel® Server Board S2600BP Product Family, normal mode

			Base System SKUs: H2204XXLRE				Base System SKUs: H2312XXLR3					Base System SKUs: H2224XXLR3				
ASHRAE (See note 1)		Classifications	27C	A2	A3	A4	27C	A2	A2	A3	A4	27C	A2	A2	A3	A4
		Max Ambient	27C	35C	40C	45C	27C	35C	35C	40C	45C	27C	35C	35C	40C	45C
PS (See note 6)		Power Supplies	See Note 6				See Note 6					See Note 6				
Processors (See notes 3 and 4)	205 W	Intel® Xeon® Platinum 8280L_28C														
		Intel® Xeon® Platinum 8280M_28C														
		Intel® Xeon® Platinum 8280_28C														
		Intel® Xeon® Platinum 8180_28C														
		Intel® Xeon® Platinum 8270_26C														
		Intel® Xeon® Platinum 8268_24C														
		Intel® Xeon® Platinum 8168_24C														
	200 W	Intel® Xeon® Gold 6254_18C														
		Intel® Xeon® Gold 6154_18C														
	165 W	Intel® Xeon® Platinum 8276L_28C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Platinum 8276M_28C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Platinum 8276_28C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Platinum 8176F_28C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Platinum 8176_28C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Platinum 8170_26C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Platinum 8260L_24C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Platinum 8260M_24C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Platinum 8260_24C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Platinum 8260Y_24/20/16C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Gold 6212U_24C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
		Intel® Xeon® Gold 6150_18C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
	157 W	Intel® Xeon® Platinum 8170F_26C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	
	152 W	Intel® Xeon® Platinum 8160F_24C	•	•	3,4	3,4	•		3,4	3,4		•		3,4	3,4	

			Base System SKUs: H2204XXLRE				Base System SKUs: H2312XXLR3					Base System SKUs: H2224XXLR3				
	152 W	Intel® Xeon® Gold 6148F_20C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6142F_16C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
	150 W	Intel® Xeon® Platinum 8164_26C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Platinum 8160_24C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6252_24C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6252N_24/16/8C	●	3,4			3,4					3,4				
		Intel® Xeon® Gold 6248_20C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6148_20C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6210U_20C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6240_18C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6240Y_18/14/8C	●	3,4			3,4					3,4				
		Intel® Xeon® Gold 6242_16C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6142_16C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Platinum 8158_12C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6136_12C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6244_8C	●	3,4			3,4					3,4				
	140 W	Intel® Xeon® Gold 6238_22C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6152_22C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6140_18C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6132_14C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
	135 W	Intel® Xeon® Gold 6262V_24C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
	130 W	Intel® Xeon® Gold 6234_8C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6134_8C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
	127 W	Intel® Xeon® Gold 6138F_20C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6130F_16C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6126F_12C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
	125 W	Intel® Xeon® Gold 6238T_22C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6230_20C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6230N_20/14/6C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6230T_20C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6209U_20C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6138_20C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5220_18C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5220S_18C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4

			Base System SKUs: H2204XXLRE				**Base System SKUs: H2312XXLR3**					**Base System SKUs: H2224XXLR3**				
	125 W	Intel® Xeon® Platinum 8253_16C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Platinum 8153_16C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5218_16C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5218B_16C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6130_16C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6226_12C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 6126_12C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
	115 W	Intel® Xeon® Gold 6222V_20C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5217_8C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 6128_6C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
	105 W	Intel® Xeon® Gold 5220T_18C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5218N_16/12/4C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5218T_16C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Platinum 8256_4C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Platinum 8156_4C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 5120_14C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5117F_14C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5118_12C	●	●	●	3,4	●		●	3,4	3,4	●		●	3,4	3,4
		Intel® Xeon® Gold 5222_4C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
		Intel® Xeon® Gold 5122_4C	●	●	3,4	3,4	●		3,4	3,4		●		3,4	3,4	
	85 W	Intel® Xeon® Silver 4214_12C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Silver 4214Y_12/10/8C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Silver 4116_12C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Gold 5215_10C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Gold 5115_10C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Silver 4210_10C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Silver 4114_10C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Silver 4215_8C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Silver 4110_8C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Silver 4208_8C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Silver 4108 _8C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Bronze 3106 _8C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Bronze 3204_6C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
		Intel® Xeon® Bronze 3104_6C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4

			Base System SKUs: H2204XXLRE				Base System SKUs: H2312XXLR3					Base System SKUs: H2224XXLR3				
	85 W	Intel® Xeon® Silver 4112_4C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
	70 W	Intel® Xeon® Gold 4209T_8C	●	●	●	3,4	●	●		3,4	3,4	●	●		3,4	3,4
Memory Type (See note 7)		Intel® Optane™ DC 128 GB PMM	●	●	5	5	●	5	5			●	5	5		
		Intel® Optane™ DC 256 GB PMM	●	5			5					5				
		Intel® Optane™ DC 512 GB PMM	●	5			5					5				
		RDIMM-2Rx8,1Rx4	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		RDIMM-DRx4	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		LRDIMM-QRx4 DDP	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		LRDIMM-8Rx4 DDP	●	●	5	5	●	●	5	5	5	●	●	5	5	5
Add-in Cards		PCI Cards with 100LFM/55C spec	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		PCI Cards With 200LFM/55C spec	●	●	●	●	●	●	9			●	●	9		
		PCI Cards With 300LFM/55C spec	●	●	●	●	9	9				9	9			
Battery Backup (See note 9)		Supercap (rated to 55C)	●	●	●	●	●	●	●	●	●	●	●	●	●	●
2.5" U.2 NVMe SSD	P3700/P 3500	400GB/800GB										●	●	●	●	●
		1.6TB/2TB										●	●	●	●	●
PCIe AIC NVMe SSD	P3700/P 3500	200GB/400GB	●	●	●	●	●	●	●			●	●	●		
		800GB/1.6TB/2TB	●	●	●		●					●				
QSFP Cables (See note 8)		Passive Cable	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		Active Optical Cable (1.5W)	●	●			●	●	8			●	●	8		
		Active Optical Cable (2W)		●				●	8				●	8		
M.2 SSD(See note 11)		PCIe M.2	●	12	12	12	●	12	12	12	12	●	12	12	12	12
		SATA M.2	●	●	12	12	●	12	12	12	12	●	12	12	12	12

Table 54. Thermal configuration table – Intel®® Server Board S2600BP Product Family, fan fail mode

			Base System SKUs: H2204XXLRE				Base System SKUs: H2312XXLR3				Base System SKUs: H2224XXLR3			
ASHRAE (See note 1)		Classifications	27C	A2	A3	A4	27C	A2	A3	A4	27C	A2	A3	A4
		Max Ambient	27C	35C	40C	45C	27C	35C	40C	45C	27C	35C	40C	45C
PS (See note 6)		Power Supplies	See Note 6				See Note 6				See Note 6			
Processors (See notes 3 and 4)	205 W	Intel® Xeon® Platinum 8280L_28C												
		Intel® Xeon® Platinum 8280M_28C												
		Intel® Xeon® Platinum 8280_28C												
		Intel® Xeon® Platinum 8180_28C												
		Intel® Xeon® Platinum 8270_26C												
		Intel® Xeon® Platinum 8268_24C												
		Intel® Xeon® Platinum 8168_24C												
	200 W	Intel® Xeon® Gold 6254_18C												
		Intel® Xeon® Gold 6154_18C												
	165 W	Intel® Xeon® Platinum 8276L_28C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8276M_28C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8276_28C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8176F_28C	●	3,4										
		Intel® Xeon® Platinum 8176 _28C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8170_26C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8260L_24C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8260M_24C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8260_24C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8260Y_24/20/16C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6212U_24C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6150_18C	●	3,4			3,4				3,4			
	157 W	Intel® Xeon® Platinum 8170F_26C	●	3,4										
	152 W	Intel® Xeon® Platinum 8160F_24C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6148F_20C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6142F_16C	●	3,4			3,4				3,4			
	150 W	Intel® Xeon® Platinum 8164_26C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8160_24C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6252_24C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6252N_24/16/8C	3,4											

			Base System SKUs: H2204XXLRE				Base System SKUs: H2312XXLR3				Base System SKUs: H2224XXLR3			
	150 W	Intel® Xeon® Gold 6248_20C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6148_20C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6210U_20C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6240_18C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6240Y_18/14/8C	3,4											
		Intel® Xeon® Gold 6242_16C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6142_16C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8158_12C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6136_12C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6244_8C	3,4											
	140 W	Intel® Xeon® Gold 6238_22C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 6152_22C	●	●			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 6140_18C	●	●			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 6132_14C	●	3,4			3,4				3,4			
	135 W	Intel® Xeon® Gold 6262V_24C	●	3,4			3,4	3,4			3,4	3,4		
	130 W	Intel® Xeon® Gold 6234_8C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6134_8C	●	3,4			3,4				3,4			
	127 W	Intel® Xeon® Gold 6138F_20C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 6130F_16C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 6126F_12C	●	3,4			3,4	3,4			3,4	3,4		
	125 W	Intel® Xeon® Gold 6238T_22C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6230_20C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 6230N_20/14/6C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6230T_20C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6209U_20C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 6138_20C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5220_18C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5220S_18C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Platinum 8253_16C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Platinum 8153_16C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5218_16C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5218B_16C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 6130_16C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 6226_12C	●	3,4			3,4	3,4			3,4	3,4		

			Base System SKUs: H2204XXLRE				Base System SKUs: H2312XXLR3				Base System SKUs: H2224XXLR3			
	125 W	Intel® Xeon® Gold 6126_12C	●	3,4			3,4	3,4			3,4	3,4		
	115 W	Intel® Xeon® Gold 6222V_20C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5217_8C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 6128_6C	●	3,4			3,4				3,4			
	105 W	Intel® Xeon® Gold 5220T_18C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5218N_16/12/4C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5218T_16C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Platinum 8256_4C	●	3,4			3,4				3,4			
		Intel® Xeon® Platinum 8156_4C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 5120_14C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5117F_14C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5118_12C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5222_4C	●	3,4			3,4				3,4			
		Intel® Xeon® Gold 5122_4C	●	3,4			3,4				3,4			
	85 W	Intel® Xeon® Silver 4214_12C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Silver 4214Y_12/10/8C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Silver 4116_12C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5215_10C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Gold 5115_10C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Silver 4210_10C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Silver 4114_10C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Silver 4215_8C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Silver 4110_8C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Silver 4208_8C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Silver 4108 _8C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Bronze 3106 _8C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Bronze 3104_6C	●	3,4			3,4	3,4			3,4	3,4		
		Intel® Xeon® Silver 4112_4C	●	3,4			3,4	3,4			3,4	3,4		
	70 W	Intel® Xeon® Gold 4209T_8C	●	3,4			3,4	3,4			3,4	3,4		
Memory Type (See note 7)		Intel® Optane™ DC 128 GB PMM	●	5			●	5			●	5		
		Intel® Optane™ DC 256 GB PMM	●	5			5				5			
		Intel® Optane™ DC 512 GB PMM	●	5			5				5			
		RDIMM-2Rx8,1Rx4	●	●			●	●			●	●		
		RDIMM-DRx4	●	●			●	●			●	●		

			Base System SKUs: H2204XXLRE				Base System SKUs: H2312XXLR3				Base System SKUs: H2224XXLR3			
		LRDIMM-QRx4 DDP	●	●			●	●			●	●		
		LRDIMM-8Rx4 DDP	●	●			●	5			●	5		
Add-in Cards		PCI Cards with 100LFM/55C spec	●	●			●	●			●	●		
		PCI Cards With 200LFM/55C spec	●	2			2	2			2	2		
		PCI Cards With 300LFM/55C spec												
Battery Backup (See note 9)		Supercap (rated to 55C)	●	●			●	●			●	●		
2.5" U.2 NVMe SSD	P3700/P3500	400GB/800GB									●	●		
		1.6TB/2TB									●	●		
	P4500/P4600	1TB/2TB/4TB									●	●		
		1.6TB/2.0TB/3.2TB									●	●		
PCIe AIC NVMe SSD	P3700/P3500	200GB/400GB	●	●			●	10			●	10		
		800GB/1.6TB/2TB	●	10			10				10			
	P4500/P4600	2TB/	●	●			●	10			●	10		
		2TB/4TB	●	●			●	10			●	10		
QSFP Cables (See note 8)		Passive Cable	●	●			●	●			●	●		
		Active Optical Cable (1.5W)	●	●			●	8			●	8		
		Active Optical Cable (2W)		●				8				8		
M.2 SSD(See note 10)		PCIe M.2	●	12			●	12			●	12		
		SATA M.2	●	12			●	12			●	12		

Appendix D. Glossary

Term	Definition
ACPI	Advanced Configuration and Power Interface
BIOS	Basic Input/Output System
BMC	Baseboard Management Controller
Bridge	Circuitry connecting one computer bus to another, allowing an agent on one to access the other
Byte	8-bit quantity
Intel® CLI	Intel® Command Line Interface
EEPROM	Electrically Erasable Programmable Read-Only Memory
EPS	External Product Specification
FRU	Field Replaceable Unit
GB	1024 MB
GPIO	General Purpose I/O
HSC	Hot-Swap Controller
Hz	Hertz (1 cycle/second)
I2C	Inter-Integrated Circuit Bus
ICH	I/O Controller Hub
IP	Internet Protocol
IPMB	Intelligent Platform Management Bus
IR	Infrared
KB	1024 bytes
LAN	Local Area Network
LED	Light Emitting Diode
MB	1024 KB
ms	milliseconds
NIC	Network Interface Controller
NMI	Non-maskable Interrupt
PMM	Persistent Memory Module
POST	Power-On Self Test
SSI	Server System Infrastructure
VRD	Voltage Regulator Down

Appendix E. Reference Documents

Refer to the following documents for additional information:

- *Intel® Server Chassis H2000P Product Family Service Guide*
- *Intel® Server Board S2600BP Product Family and Intel® Compute Module HNS2600BP Product Family Technical Product Specification*
- *Intel® Server Board S2600BP Product Family and Intel® Compute Module HNS2600BP Product Family Integration and Service Guide*
- *Intel® Server Board S2600BP Product Family and Intel® Compute Module HNS2600BP Product Family Configuration Guide*
- *Intel® Server Board S7200AP Product Family and Intel® Compute Module HNS7200AP Product Family Technical Product Specification*
- *Intel® Server Board S7200AP Product Family and Intel® Compute Module HNS7200AP Product Family Integration and Service Guide*
- *Intel® Server Board S7200AP Product Family and Intel® Compute Module HNS7200AP Product Family Configuration Guide*