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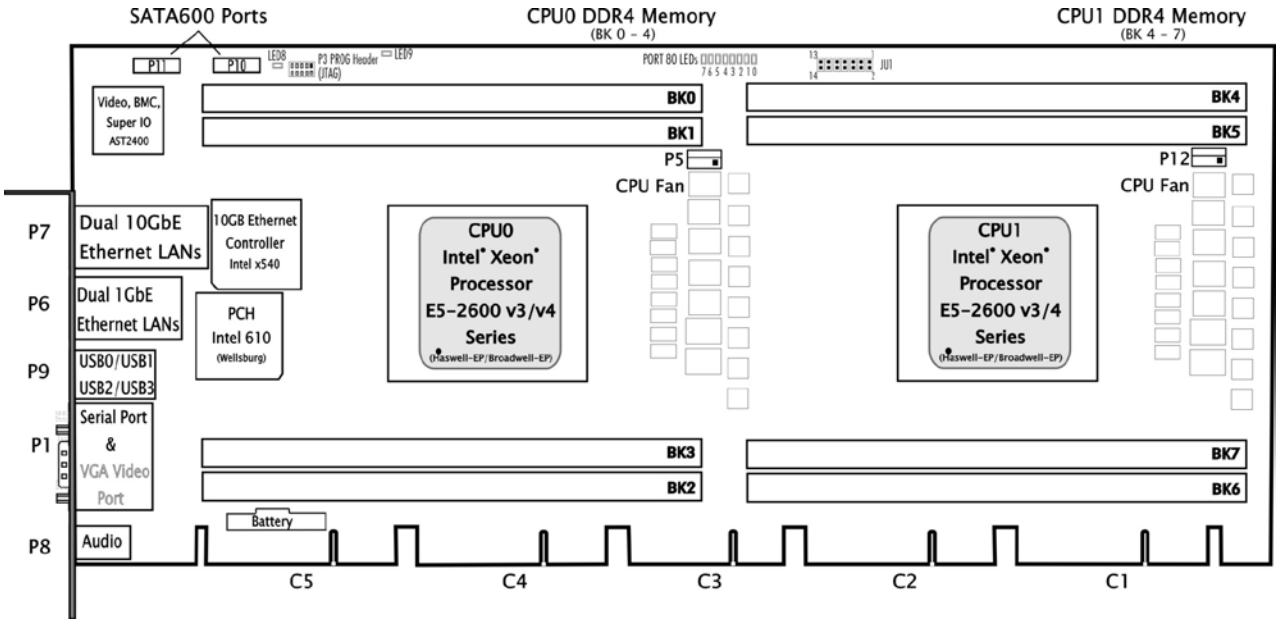
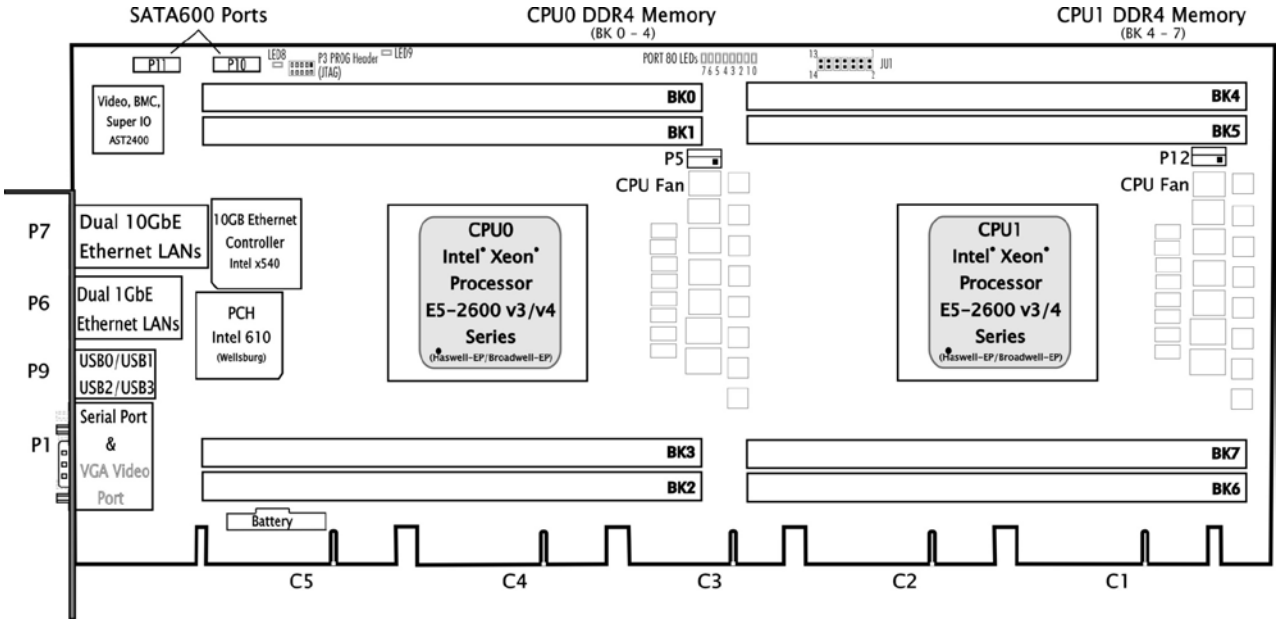
Technical Information – Jumpers, Connectors, Memory Population Rules and Processor Memory Interface Support Details for the HEP8225 (8225-xxx) Dual-Processor, HDEC Series System Host Board

Layout Diagram – Audio Ports Populated



Layout Diagram – Audio Ports Not Populated



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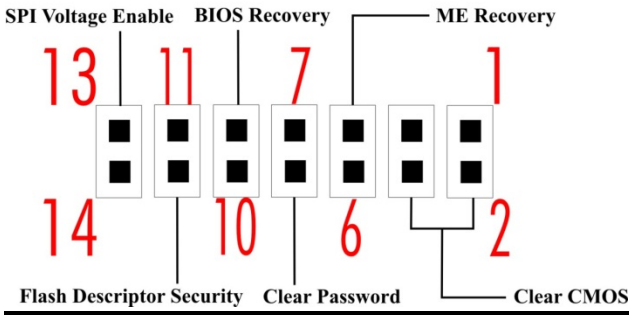
Jumpers & LEDs



JU1 Jumper Layout Detail

The setup of the configuration jumpers on the SHB is described below. An asterisk (*) indicates the default value of each jumper. Jumper JU1 is a dual-row, 14-pin jumper. Each position controls the operation of a specific SHB implementation.

JU1 Pins 1 – 2 and 3 – 4	**CMOS Clear** Install on pins 1 and 2 to operate.* Install on pins 3 and 4 to clear. **NOTE:** To clear the CMOS, power down the system and install the JU1 jumper on pins 3 and 4. Wait for at least two seconds, move the jumper back to pins 1 and 2 and turn the power on. Clearing CMOS on the HEP8225 will not result in a checksum error on the following boot. If you want to change a BIOS setting, you must press DEL or the F2 key during POST to enter BIOS setup after clearing CMOS.
JU1 Pins 5 – 6	**Management Engine (ME) Recovery** No jumper installed on pins 5 and 6 is the normal SHB operating mode.* Install jumper on pins 5 and 6 for one power-up cycle to force a management engine update
JU1 Pins 7 – 8	**Clear Password** No jumper installed on pins 7 and 8 is the normal SHB operating mode.* Install jumper on pins 7 and 8 for one power-up cycle to reset the password to the default (null password).
JU1 Pins 9 – 10	**BIOS Recovery** No jumper installed on pins 9 and 10 is the normal SHB operating mode.* Install jumper on pins 9 and 10 to force a Top Block Swap (Alternate Boot Block).
JU1 Pins 11 – 12	**Flash Descriptor Security** No jumper installed on pins 11 and 12 enables the Flash Descriptor Security.* Install jumper on pins 11 and 12 to disable Flash Descriptor Security.
JU1 Pins 13 – 14	**SPI Voltage Enable (Factory Use Only)** No jumper installed on pins 13 and 14 is the normal SHB operating mode.* Installing a jumper on pins 13 and 14 to allows SPI factory programming via a clip on programmer.

CAUTION: Installing this jumper is required for certain factory operations. Field installation of a jumper in JU1 pin locations 13 and 14 may result in unintended system operation.

Jumpers & LEDs (continued)

P6 **1Gb Ethernet LEDs**

The I/O bracket houses the two RJ-45 network connectors for Ethernet LAN3 and LAN4. Each LAN interface connector has two LEDs that indicate activity status and Ethernet connection speed. Listed below are the possible LED conditions and status indications for each LAN connector:

LED/Connector	Description
Activity LED	Green LED indicates network activity. This is the upper LED on the LAN connector (i.e., toward the upper memory sockets).
Off	No current network transmit or receive activity
On (solid)	Indicates a valid link established, but no network activity.
On (flashing)	Indicates network transmit or receive activity.
Speed LED	Green/Yellow bi-color LED identifies the connection speed. This is the lower LED on the LAN connector (i.e., toward the edge connectors).
Off	Indicates a valid link at 10-Mb/s.
On (green)	Indicates a valid link at 100-Mb/s.
On (yellow)	Indicates a valid link at 1000-Mb/s or 1-Gb/s.
RJ-45 Network Connectors	The RJ-45 network connector requires a Connectors category 5 (CAT5) unshielded twisted-pair (UTP) 2-pair cable for a 100-Mb/s network connection or a category 3 (CAT3) or higher UTP 2-pair cable for a 10-Mb/s network connection. A category 5e (CAT5e) or higher UTP 2-pair cable is recommended for a 1000-Mb/s (Gigabit) network connection.

LEDs (continued)

P7 10Gb or 1Gb Ethernet LEDs

The I/O bracket also contains two upper RJ-45 network connectors that indicate either a maximum Ethernet connection speed of 10Gb or 1Gb on LAN1 and LAN2. With the HEP8225 configured with an Intel® Ethernet Controller X540 Ethernet controller the P7 ports are capable of 10GbE operations. An alternate HEP8225 configuration is available that enables a maximum LAN speed of 1GbE on the P7 LAN connectors when the HEP8225 SHB is configured with an Intel® Ethernet Controller I350-AM2.

Each LAN interface connector has two LEDs that indicate activity status and Ethernet connection speed. Listed below are the possible LED conditions and status indications for each LAN connector:

Activity LED	**Yellow LED indicates network activity. This is the upper LED on the LAN connector (i.e., toward the upper memory sockets).**
Off	No current network transmit or receive activity
On (solid)	Indicates a valid link established, but no network activity.
On (flashing)	Indicates network transmit or receive activity.

Speed LED – 10GbE Port Configuration	**Green/Orange bi-color LED identifies the connection speed. This is the lower LED on the LAN connector (i.e., toward the edge connectors).**
Off	Indicates a valid link at 100-Mb/s.
On (orange)	Indicates a valid link at 1000-Mb/s or 1-Gb/s.
On (green)	Indicates a valid link at 10000-Mb/s or 10-Gb/s.

Speed LED – 1GbE Port Configuration	**Green/Orange bi-color LED identifies the connection speed. This is the lower LED on the LAN connector (i.e., toward the edge connectors).**
Off	Indicates a valid link at 10-Mb/s.
On (green)	Indicates a valid link at 100-Mb/s.
On (orange)	Indicates a valid link at 1000-Mb/s or 1-Gb/s.

RJ-45 Network Connectors	The RJ-45 network connector requires a Connectors category 5 (CAT5) unshielded twisted-pair (UTP) 2-pair cable for a 100-Mb/s network connection or a category 3 (CAT3) or higher UTP 2-pair cable for a 10-Mb/s network connection. A category 5e (CAT5e) or higher UTP 2-pair cable is recommended for a 1000-Mb/s (Gigabit) network connection.

LED8 ERROR LED

The error LED indicates several different error conditions.

LED Status	**Description**
Off	Indicates the normal board operation.

At the present time an LED8 on condition indicates one of the following error conditions:

Two (2) Blinks/sec	=	CATERR issue
One (1) Blink/sec	=	Machine Check issue
ON Solid	=	CPU Thermal Trip
One (1) Blink/Two (2) sec	=	DDR Memory Thermal Event

Additional LED conditions may be available to narrow down the specific fault condition. Contact Trenton for additional details.

LEDs (continued)

LED9 P0_PhaseFault LED

LED ON condition indicates and issue with the CPU or DDR memory voltage regulators.

LED Status	Description
Off	Indicates the normal board operation.
On (solid)	CPU or DDR voltage regulator fault condition. Additional LED conditions may be available to narrow down the specific fault condition. Contact Trenton for additional details.

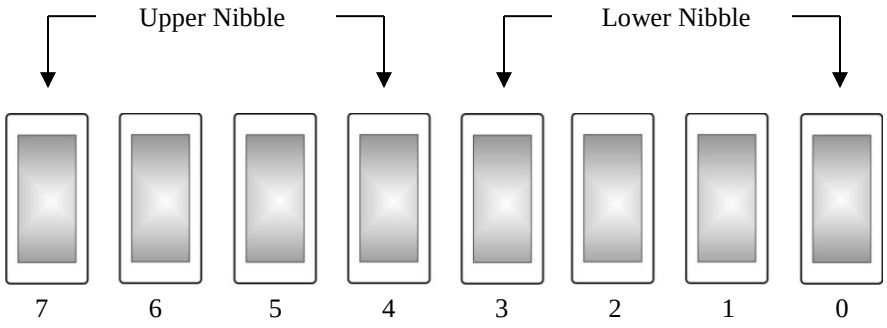
POST Code LEDs 0 - 7

As the POST (Power On Self-Test) routines are performed during boot-up, test codes are displayed on Port 80 POST Code LEDs 0, 1, 2, 3, 4, 5, 6 and 7. These LED are located on the top of the SHB, just above the board's battery socket. The POST Code LEDs and are numbered from right (position 1 = LED0) to left (position 8 – LED7). Refer to the board layout diagram for the exact location of the POST code LEDs.

These POST codes may be helpful as a diagnostic tool. Specific test codes are listed in Appendix A - BIOS Messages section of the HEP8225 Technical Reference Manual. After a normal POST sequence, the LEDs are off (00h) indicating that the SHB's BIOS has passed control over to the operating system loader typically at interrupt INT19h. The chart is from Appendix A and can be used to interpret the LEDs into hexadecimal format during POST.

Upper Nibble (UN)				
Hex. Value	LED7	LED6	LED5	LED4
0	Off	Off	Off	Off
1	Off	Off	Off	On
2	Off	Off	On	Off
3	Off	Off	On	On
4	Off	On	Off	Off
5	Off	On	Off	On
6	Off	On	On	Off
7	Off	On	On	On
8	On	Off	Off	Off
9	On	Off	Off	On
A	On	Off	On	Off
B	On	Off	On	On
C	On	On	Off	Off
D	On	On	Off	On
E	On	On	On	Off
F	On	On	On	On

Lower Nibble (LN)				
Hex. Value	LED3	LED2	LED1	LED0
0	Off	Off	Off	Off
1	Off	Off	Off	On
2	Off	Off	On	Off
3	Off	Off	On	On
4	Off	On	Off	Off
5	Off	On	Off	On
6	Off	On	On	Off
7	Off	On	On	On
8	On	Off	Off	Off
9	On	Off	Off	On
A	On	Off	On	Off
B	On	Off	On	On
C	On	On	Off	Off
D	On	On	Off	On
E	On	On	On	Off
F	On	On	On	On



HEP8225 POST Code LEDs

Connectors

NOTE:
A connectors' square solder pad located on the bottom side of the PCB indicates pin 1.

P6 – Dual 10/100/1000Base-T Ethernet Connector – LAN3 and LAN4

RJ-45/Dual connector, Pulse #JG0-101NL
Each individual RJ-45 connector is defined as:

PIN	SIGNAL	PIN	SIGNAL
1A	L3_MDI0n	1B	L4_MDI0n
2A	L3_MDI0p	2B	L4_MDI0p
3A	L3_MDI1n	3B	L4_MDI1n
4A	L3_MDI1p	4B	L4_MDI1p
5A	L3_MDI2n	5B	L4_MDI2n
6A	L3_MDI2p	6B	L4_MDI2p
7A	L3_MDI3n	7B	L4_MDI3n
8A	L3_MDI3p	8B	L4_MDI3p
9A	VCC_1.8V	9B	VCC_1.8V
10A	GND_A	10B	GND_b

P1A – Right Angle Stacked Connector - Video

DB15 HD video, Kycon # K42X-E9P/E15S-A4N

PIN	SIGNAL	PIN	SIGNAL
1	Red	9	+5V
2	Green	10	Gnd
3	Blue	11	NC
4	NC	12	EEDI
5	Gnd	13	HSYNC
6	Gnd	14	VSYNC
7	Gnd	15	EECS
8	Gnd		

P1B – Right Angle Stacked Connector - Serial

DB9 serial, Kycon # K42X-E9P/E15S-A4N

PIN	SIGNAL	PIN	SIGNAL
1	Data Carrier Detect	6	Data Set Ready
2	Receive Data	7	Request to send
3	Transmit Data	8	Clear To Send
4	Data Terminal Ready	9	Ring Indicator
5	Signal Grid		

DB15 video connector is to the left and has female sockets
DB9 serial connector is to the right and has male pins

P9 – Quad USB 3.0 Stacked Connector, Type A

Four USB connectors, Foxconn #UEA1112C-QHD6-4F

PIN	P9A USB0 SIGNAL	PIN	P9B USB1 SIGNAL
A1	+5V-USB0	B1	+5V-USB1
A2	USB P0-	B2	USB P1-
A3	USB P0+	B3	USB P1+
A4	Gnd-USB0	B4	Gnd-USB1
A5	USB RXN0	B5	USB RXN1
A6	USB RXP0	B6	USB RXP1
A7	Gnd-USB0	B7	Gnd-USB1
A8	USB TXN0	B8	USB TXN1
A9	USB TXP0	B9	USB TXP1

PIN	P9C USB2 SIGNAL	PIN	P9D USB3 SIGNAL
C1	+5V-USB2	D1	+5V-USB3
C2	USB P2-	D2	USB P3-
C3	USB P2+	D3	USBP3+
C4	Gnd-USB2	D4	Gnd-USB3
C5	USB RXN2	D5	USB RXN3
C6	USB RXP2	D6	USB RXP3
C7	Gnd-USB2	D7	Gnd-USB3
C8	USB TXN2	D8	USB TXN3
C9	USB TXP2	D9	USB TXP3

Note:
1 – P9A is USB0 and located on the left side of the I/O plate directly above the VGA video port. P9B is USB1, P9C is USB2 and P9D is USB3 located on the right side of the I/O bracket farthest from the board and above the serial port.

P10, P11 – SATA III 600 / SATA II 300 Ports

7 pin vertical connector with latch, Molex #67800-8005

PIN	SIGNAL	PIN	SIGNAL
1	Gnd	5	RX-
2	TX+	6	RX+
3	TX-	7	Gnd
4	Gnd		

Notes:
1 – P10 = SATA0 interface, P11 = SATA1 interface

Connectors (continued)

P5 and P12 – CPU Fan Power Connectors

4 pin single row header, Molex # 47053-1000

PIN	SIGNAL
1	Gnd
2	+12V
3	Fan Tach
4	PWM Control Signal

Note:
1 – P5 is the fan connector for CPU0 and P11 is for CPU1

P8 - Audio Port*

3 position audio, Foxconn #JA13331-N20B-4F

SOCKET COLOR	SIGNAL
Light Blue	Line In
Lime	Line Out
Pink	Mic

*Audio port P8 is not populated for board versions that are integrated into 2U rackmount computer chassis

P7 – Dual 10GbBase-T Ethernet Connector – LAN1 and LAN2 - (Optional)

RJ-45/Dual 10GbE connector, MagJack #JG0-101NL
Each individual RJ-45 connector is defined as follows:

Upper/Right PIN	SIGNAL	Lower/Left PIN	SIGNAL
1	L1_MDI_DP0	1	L2_MDI_DP0
2	L1_MDI_DN0	2	L2_MDI_DN0
3	2.5V_X540	3	2.5V_X540
4	L1_MDI_DP1	4	L2_MDI_DP1
5	L1_MDI_DN1	5	L2_MDI_DN1
6	2.5V_X540	6	2.5V_X540
7	L1_MDI_DP2	7	L2_MDI_DP2
8	L1_MDI_DN2	8	L2_MDI_DN2
9	2.5V_X540	9	2.5V_X540
10	L1_MDI_DP3	10	L2_MDI_DP3
11	L1_MDI_DN3	11	L2_MDI_DN3
12	2.5V_X540	12	2.5V_X540
13	L1_MDI_DP4	13	L2_MDI_DP4
14	L1_MDI_DP4	14	L2_MDI_DP4

Note1: The 10GbE LAN ports are the upper two connectors on the board's I/O bracket.
Note2: Some configurations of the HEP8225 system host board may not include the P7, dual LAN 10GbE connector.

Memory

Each processor on the HEP8225 HDEC Series® SHB supports four direct-connect DDR4 memory interfaces. The maximum possible memory interface speed obtained depends on the specific Intel® Xeon® E5-2600 v4 or v3 series (Broadwell-EP or Haswell-EP) processors used on the board and other board configuration options listed in the notes section below. The table below illustrates the maximum DDR4 memory speed supported as a function of each specific Intel® Xeon® processor when using the recommended PC4-19200 compliant standard DIMM module and an SHB with the latest BIOS support.

Max. DDR4 Speed	Processor	Base Clock Speed	Cores / Threads	Cache	Long-Life Availability (5 to 7 years)	Maximum Thermal Design Power (TDP)	Operating Temperature Range*
DDR4-2400	Intel® Xeon® E5-2680 v4	2.4GHz	14 / 28	35MB	Yes	120W	0°C to 45°C
DDR4-2133	Intel® Xeon® E5-2680 v3	2.5GHz	12 / 24	30MB	Yes	120W	0°C to 45°C
DDR4-2400	Intel® Xeon® E5-2658 v4	2.3GHz	14 / 28	35MB	Yes	105W	0°C to 50°C
DDR4-2133	Intel® Xeon® E5-2658 v3	2.2GHz	12 / 24	30MB	Yes	105W	0°C to 50°C
DDR4-2400	Intel® Xeon® E5-2648L v4	1.8GHz	14 / 28	35MB	Yes	75W	0°C to 50°C
DDR4-1866	Intel® Xeon® E5-2648L v3	1.8GHz	12 / 24	30MB	Yes	75W	0°C to 50°C
DDR4-2133	Intel® Xeon® E5-2628L v4	1.9GHz	12 / 24	30MB	Yes	75W	0°C to 50°C
DDR4-1866	Intel® Xeon® E5-2628L v3	2.0GHz	10 / 20	25MB	Yes	75W	0°C to 50°C
DDR4-2133	Intel® Xeon® E5-2618L v4	2.2GHz	10 / 20	25MB	Yes	75W	0°C to 50°C
DDR4-1866	Intel® Xeon® E5-2618L v3	2.3GHz	8 / 16	20MB	Yes	75W	0°C to 50°C
DDR4-1600	Intel® Xeon® E5-2608L v3	2.0GHz	6 / 12	15MB	Yes	50W	0°C to 50°C

*Requires standard heat sink option and a continuous airflow across the board of 350LFM. Will be 25-30% less with low-profile cooling solution option.

All processors listed above support Intel® Hyper-Threading, Intel® VT-x, Intel® 64, Enhanced Intel® SpeedStep Technology and Execute Disable Bit functionality..

There are four active DDR4 standard DIMM sockets on the board for each processor. Each standard DIMM socket can support a 32GB DIMM for a total possible DDR4 system memory capacity of 256GB. When 64GB DDR4 DIMMs become readily available, the maximum supported SHB memory capacity will increase to 512GB.

In most applications, 8GB or 16 GB DIMM sizes are sufficient providing a maximum memory capacity of 64GB and 128GB respectively. The required DIMM size will depend on the needs of the application. For many workloads, 8GB or 16GB DIMMs should be fine. For applications or benchmarks that benefit from memory capacity more than memory performance, such as TPC-C and TPC-E, there are two options. Option 1 is likely best for TPC-C since it allows a greater memory capacity.

Option 1) Use the largest DIMMs available, currently expected to be 32GB or 64GB quad rank DDR4 LRDIMMs, and populate the maximum DIMMs allowed.
Option 2) Use the largest dual rank registered DIMMs available these currently include 16GB or 32GB dual rank DIMMs.

The processor's four individual direct-connect memory channel interfaces terminate with a single in-line standard DIMM memory module socket BK0 through BK7. The System BIOS automatically detects memory type, size and speed.

Trenton recommends ECC registered DDR4-2400 standard DIMM memory modules for use on the HEP8225, and these ECC registered (72-bit) DDR4 standard DIMMs must be PC4-19200 compliant.

The SHB uses industry standard gold finger standard DIMM memory modules, which must be PC4-19200 compliant and have the following features: 288-pin, gold-plated contacts and ECC registered (72-bit) DDR4-2400 memory.

Populate all four memory channels per processor socket. Sub-optimal memory channel utilization may occur if only 3 memory channels per processor are populated.

The following DIMM sizes are supported:

MT/s	Module Type	Rank	Component Density
2400	PC4-19200 DIMM	Dual	1GB, 2GB, 4GB, 8GB, 12GB
2400	PC4-19200 LRDIMM	Quad	1GB, 2GB, 4GB, 8GB, 12GB

NOTE 1: The HEP8225 does support the more economical and plentiful single rank PC4-19200 standard memory DIMMs. However, to maximize system performance Trenton recommends dual rank DIMMs. Single rank DIMMs may limit the HEP8225 performance of memory-intensive workloads due to the SHB's one DIMM per channel configuration design.

NOTE 2: To maximize memory interface speed, populate each memory channel with identical DIMMs for all DIMM slots populated.

NOTE 3: Low-voltage (DDR4 LRDIMMs) DIMMs are supported, but these are costly and supply may be limited.

NOTE 4: The SHB supports the following memory module memory latency timings: 9-9-9 for 2133MHz DDR4 DIMMs

Memory (continued)

NOTE 5: Populate the memory sockets starting with the DIMM socket closest to the CPU and work your way toward the edges of the SHB as illustrated in the chart below:

DIMM Population Order	CPU0	CPU1
1	BK1	BK5
2	BK3	BK7
3	BK0	BK4
4	BK2	BK6

For additional HEP8225 product and system information, visit the Trenton Systems website at HEP8225 Product Detail.