

Getting the Most Out of Your Dual-channel Intel-based HP Desktop

Today's business desktop user needs the power to run multiple applications and access large media files simultaneously. While memory performance is improving as standards evolve from PC2100 to PC2700 to PC3200, it still lags behind the 533MHz or 800MHz offered by current front-side buses. So although processor speeds are getting faster and faster, memory performance has become a system bottleneck.

Minimizing this bottleneck and maximizing system performance is simple with HP desktops that feature motherboards designed with two memory channels instead of a single channel. These dual-channel systems handle memory-processing more efficiently by utilizing the theoretical bandwidth of two memory modules instead of one, thus reducing system latencies, the timing delays that inherently occur with memory. Through the introduction of these dual-channel chipsets, memory bandwidth has effectively doubled, leading to significant performance improvements.

Memory type	Memory speed	Bandwidth (GBps)	
		Single-channel	Dual-channel
PC2100	266MHz	2.1	4.2
PC2700	333MHz	2.7	5.4
PC3200	400MHz	3.2	6.4



Deploying dual-channel memory

New HP Compaq Business Desktop models support single- and dual-channel memory configurations.

- Single channel - With single-channel memory, the memory bus is 64-bits wide. Memory bandwidth is significantly less than that of the processor's front-side bus; the processor often wastes valuable CPU cycles waiting for access to memory.
- Dual channel - With dual-channel memory, the memory bus becomes 128 bits wide, doubling memory bandwidth. Memory performance improves significantly over a single-channel deployment.

IMPORTANT: HP recommends using a dual-channel memory configuration to optimize system performance (if supported on the particular platform).

Selecting and configuring DDR memory for use in dual-channel systems

To maximize performance in a dual-channel configuration, matched pairs of DIMMs are required. All DIMM characteristics should match: sizes, DRAM technologies, bus widths, external banks, organizations, and speeds should be the same.

Characteristic	Comments
SIZE	DIMMs must be the same size, for example: 128MB or 256MB.
DRAM TECHNOLOGY	DRAM chips on each DIMM must be the same density, for example: 128Mb or 256Mb.
BUS WIDTH	The DRAM bus width on each DIMM must be the same, for example: 8-bit or 16-bit.
EXTERNAL DRAM BANKS	DIMMs must have the same number of external DRAM banks, either one or two. (Both DIMMs must be either single-sided or double-sided.)
ORGANIZATION	DIMMs must be organized the same way: for example, 16M x 64 or 32M x 64.
SPEED	DIMM speeds should be matched because the speed of the entire memory configuration slows to that of the slowest DIMM. For example, if memory is configured with one PC2100 DIMM and one PC2700 DIMM, the maximum possible memory speed is 266MHz.
IMPORTANT: Mismatched memory defaults to single-channel operation.	

Conclusions

The results of performance tests carried out by HP indicated that dual-channel memory installed in Intel-based HP business desktops outperforms single-channel memory:

- Up to 10% improvement for regular business applications
- Up to 70% improvement for memory-intensive applications

Benchmark	Dual channel (2 DIMMs) over Single channel (1 DIMM)
SYSMARK	7.0%
Winstone (Content Creation)	6.9%
Winstone (Business)	9.2%
Mad Onion 3D	22.0%
Stream	33.0% - 70.0%
Sandra (Integer and Floating Point)	61%
ViewPerf	9%