intel®

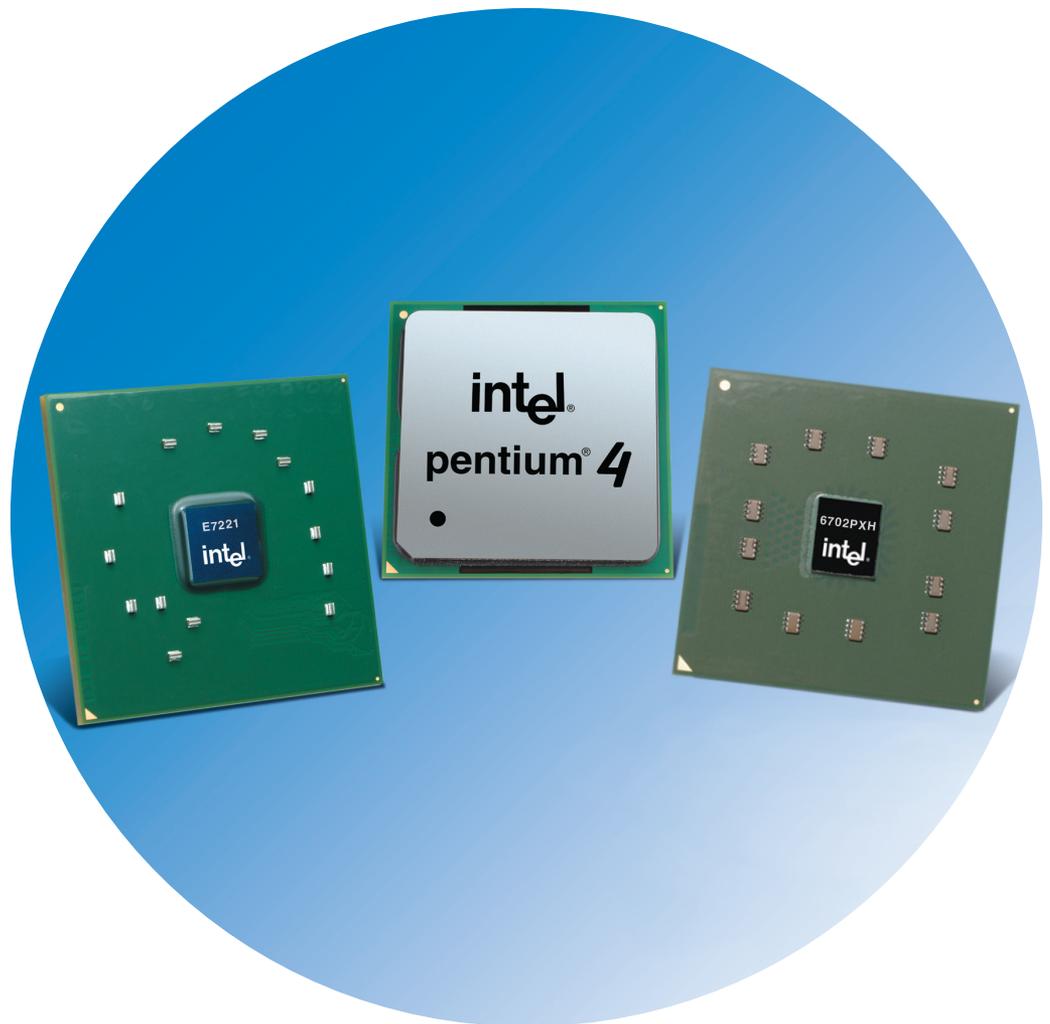# Intel® Pentium® 4 processor and Intel® E7221 chipset-based entry servers:

For affordable & dependable entry-level servers

intel inside

pentium 4

The Intel® E7221 Chipset for Affordable and Dependable, Entry-level Server Platforms

In small companies when a server goes down, work stops. You lose worker productivity and revenue. Your business requires servers that are not only powerful enough to handle their computing workloads, but also provide reliable and trouble-free operation. Intel offers an affordable and highly dependable server platform targeted for the small business market segment. This entry-level platform incorporates the Intel® Pentium® processor supporting HT (Hyper-Threading) Technology[1] with the Intel® E7221 Chipset.

The Intel® E7221 chipset is ideal for running server applications for file and print sharing, web serving, load sharing and firewalls. For value-conscious business users, this entry-level server delivers impressive computing performance without compromising speed, affordability or system reliability — a substantial improvement over desktop PCs or workstations used as "servers."
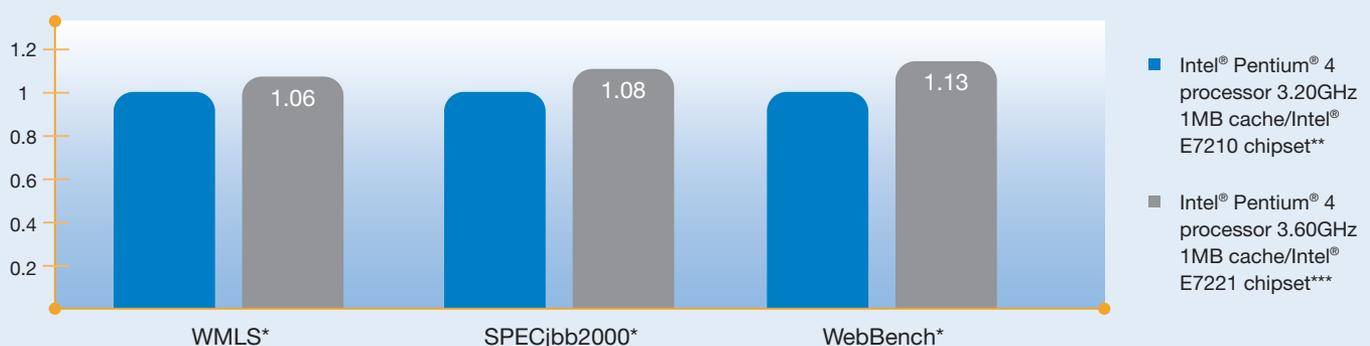
Introducing the Intel chipset optimized for value-conscious markets

The highly integrated Intel E7221 chipset consists of the Intel® E7221 Memory Controller Hub, the Intel® 6702PXH 64-bit PCI Hub and the Intel® 82801FR (ICH6R). It is designed to operate with the latest Intel Pentium 4 processor supporting HT Technology and 800 MHz system bus. The Intel E7221 chipset supplies the intelligence to manage and prioritize heavy workloads. HT Technology is an Intel innovation allowing the processor to execute instruction threads in parallel freeing the processor to complete more tasks in the same amount of time and return your results faster. This technology maximizes the efficiency of the processor, improves system performance and quickens response time.

Innovations balance affordability, speed and reliability

The Intel E7221 chipset, with dual channel DDR2-400/533 and DDR-333/400 memory support, provides speeds up to 533 MHz and an aggregate memory bandwidth of up to 8.5 gigabytes per second (GB/s). Dual channels balance platform design and deliver maximum system performance for memory intensive server applications. The performance of a 3.60 GHz Intel Pentium 4 processor supporting HT Technology and the Intel E7221 chipset based server, as measured using the WebBench* benchmark, shows up to a 13% improvement in transactions per second when compared to a previous generation Intel Pentium 4 processor 3.20 GHz and Intel® E7210 chipset-based system.
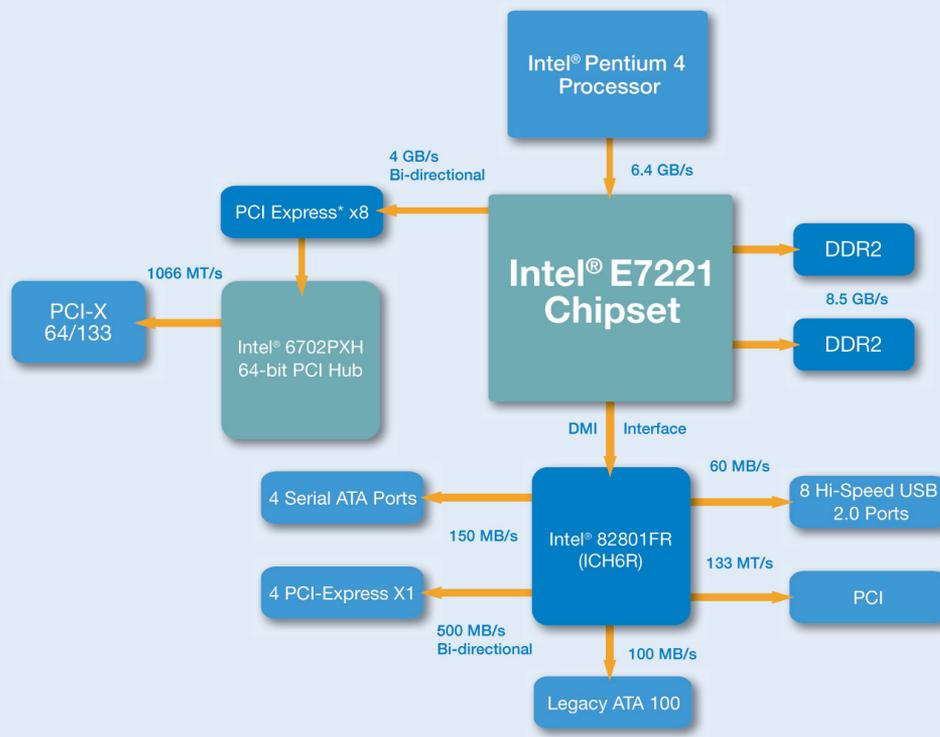
Intel® Pentium® 4 processor Intel® E7221 chipset-based entry server

Legend:
- Intel® Pentium® 4 processor 3.20GHz 1MB cache/Intel® E7210 chipset**
- Intel® Pentium® 4 processor 3.60GHz 1MB cache/Intel® E7221 chipset***

WMLS*: 1.06 — SPECjbb2000*: 1.08 — WebBench*: 1.13

System configurations:
Source: Veritest* Labs (Sept '04)

(**) **WMLS*:** Intel® Pentium® 4 processor 3.20 GHz with 1MB cache, Intel® E7210 chipset-based server board, 4 GB DDR-400 ECC Unbuffered, Microsoft Windows* 2003, 2 Intel® PRO/1000 Gigabit Server adapters, Disk Subsystem: Adaptec AIC-7901, HD Make/Model/Size: Seagate/ST373453LC/70GB.
SPECjbb2000*: Intel® Pentium® 4 processor 3.20 GHz with 1MB cache, Intel® E7210 chipset-based server board, 4 GB DDR-400 ECC Unbuffered, Microsoft® Windows 2000 Advanced Server with Service Pack 4, BEA Jrockit 8.1 JVM, Disk Subsystem: Adaptec AIC-7901, HD Make/Model/Size: Seagate/ST373453LC/70GB.
WebBench*: Intel® Pentium® 4 processor 3.20 GHz with 1MB cache, Intel® E7211 chipset-based server board, 4 GB DDR-400 ECC Unbuffered, Microsoft Windows* 2003, 2 Intel® PRO/1000 Gigabit Server adapters, Disk Subsystem: Adaptec AIC-7901, HD Make/Model/Size: Seagate/ST373453LC/70GB.

(***) **WMLS*:** Intel® Pentium® 4 processor 3.60 GHz with 1MB cache, Intel® E7221 chipset-based server board, 4 GB DDR2-533 ECC Unbuffered, Microsoft Windows* 2003, 2 Intel® PRO/1000 Gigabit Server adapters, Disk Subsystem: Intel 82801EB Ultra ATA, HD Make/Model/Size: Maxtor/6Y060L0/60GB.
SPECjbb2000*: Intel® Pentium® 4 processor 3.60 GHz with 1MB cache, Intel® E7210 chipset-based server board, 4 GB DDR2-533 ECC Unbuffered, Microsoft® Windows 2000 Advanced Server with Service Pack 4, BEA Jrockit 8.1 JVM, Disk Subsystem: Intel 82801EB Ultra ATA, HD Make/Model/Size: Maxtor/6Y060L0/60GB.
WebBench*: Intel® Pentium® 4 processor 3.60 GHz with 1MB cache, Intel® E7221 chipset-based server board, 4 GB DDR2-533 ECC Unbuffered, Microsoft Windows* 2003, 2 Intel® PRO/1000 Gigabit Server adapters, Disk Subsystem: Intel 82801EB Ultra ATA, HD Make/Model/Size: Maxtor/6Y060L0/60GB.

Performance tests and ratings are measured using specific computer systems and/or components and reflect the apporximate performance of Intel products as measuerd by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit http://www.intel.com/performance/resources/limits.htm or call (U.S.) 1-800-628-8686 or 1-916-356-3104.

Intel® Pentium 4 Processor

4 GB/s Bi-directional

6.4 GB/s

PCI Express* x8

1066 MT/s

Intel® E7221 Chipset

DDR2

8.5 GB/s

DDR2

PCI-X 64/133

Intel® 6702PXH 64-bit PCI Hub

DMI Interface

4 Serial ATA Ports

150 MB/s

4 PCI-Express X1

500 MB/s Bi-directional

Intel® 82801FR (ICH6R)

60 MB/s

8 Hi-Speed USB 2.0 Ports

133 MT/s

PCI

100 MB/s

Legacy ATA 100

To support demanding disk I/O, the Intel E7221 chipset integrates two Serial ATA controllers with optional RAID 0 and 1, as well as AHCI capability for improving disk operation and data integrity. RAID 0 striping increases storage performance and speeds up data transfer rates for disk-intensive applications. RAID 1 mirroring protects sensitive data that might be lost during a hard drive failure.

Fast I/O process is critical for quick server response. But PCI throughput often reduces I/O performance. Unlike chipsets designed solely for the desktop market segment, the Intel 6702PXH 64-bit PCI Hub contains a PCI-X bridge that allows higher I/O performance by supporting new PCI-X server cards that conform to the PCI-X 1.0 specification. The server provides high bandwidth connectivity across a variety of peripherals using eight integrated Hi-Speed USB 2.0 ports.

Reliability and manageability
A server must provide reliable operation and ensure data security. The Intel E7221 chipset incorporates outstanding system reliability features. The E7221 chipset supports single memory channel operation allowing the system to continue operating should a single channel memory fail. In addition, the error correction on the memory interface (ECC) protects your vital data.

The Intel Controller Hub enhances server manageability by integrating a programmable watchdog timer (WDT). The WDT increases system availability by monitoring the server for hardware and/or software lock-ups. Upon a lock-up, the WDT either notifies the operating system or performs a system reboot. The WDT can be accessed by operating system services or applications directly.
In addition to such built-in reliability features, the E7221

chipset is backed by more than 20 years of chipset expertise, significant investment in research and development, and thousands of man-hours committed to chipset and software validation. As a result, an entry-level server based on the Intel Pentium 4 processor supporting HT technology and the Intel E7221 chipset delivers exactly the key features that small and value-conscious organizations want for running their business, while providing the rigorous quality and reliability standards enterprise users have come to expect.

The Intel E7221 chipset consists of three components:
The E7221 Memory Controller Hub (MCH): supports 800MHz system bus designs using DDR2-533, DDR2-400 and DDR-400 SDRAM memory and 533MHz system bus designs using DDR-333 SDRAM.

The I/O Controller Hub: integrates four independent Serial ATA controllers, each capable of up to 150 MB/s transfer rate, for the most demanding storage data transfers. Eight Hi-Speed USB 2.0 ports allow easy I/O connection and offer better bandwidth compared to USB 1.1 devices. The PCI-X bridge supports up to four PCI-X devices total, and represents a significant increase in bandwidth compared to desktop systems.

The Intel® 6702PXH 64-bit PCI Hub: connects to the MCH through a point-to-point PCI Express x8 interface. The Intel 6702PXH 64-bit PCI Hub can be configured to operate in PCI-X mode 1 (66, 100 or 133 MHz) for either 32-bit or 64-bit PCI-X devices. The Intel 6702PXH 64-bit PCI Hub supports multiple PCI-X slots and frequencies for the high-bandwidth I/O connectivity required in today's server markets.

Feature	Benefit
Platform supports the latest Intel® Pentium® 4 processor supporting HT Technology	• Helps protect investment — supports the latest CPU features
Hyper-Threading Technology	• Increases system response time by extending system performance beyond GHz operation
Intel® Extended Memory 64 Technology	• Allows users 64-bit memory addressability for greater application flexibility • Processors with Intel® EM64T will support 64-bit extended operating systems from Microsoft, Red Hat and SuSE*
PCI Express* I/O (1X8 and 4X1 PCI E* Ports)	• Supports latest PCI I/O technology for improved I/O performance • Provides flexible I/O configuration via X8 and X4 add-in cards or by directly attaching to server
PCI-X/PCI Hot Replacement	• Reduces downtime as PCI cards can be hot swapped without turning the server off
Memory Support for Dual Channel DDR2 533 w/ ECC support memory bus	• Lower power versus DDR1 improves reliability and increases server life • Improves performance • Ensures data reliability and integrity (ECC) • Protects valuable data (ECC RAS)
Integrated graphics in MCH	• Provides graphics for servers at a lower cost
4 Serial ATA (SATA) Ports	• Increases hard drive configuration options • Maximizes disk performance • Improves sensitive data integrity and protection
Direct Media Interface	• Improves performance via a new MCH/ICH interconnect with almost 8 times the concurrent bandwidth over previous generation hub links

Product	Package
Intel® Pentium® 4 Processor	775 Land Grid Array (LGA)
Intel® E7221 MCH	1210 ball Flip Chip-Ball Grid Array (FC-BGA)
Intel® 6702PXH 64-bit PCI Hub	567 ball Flip Chip-Ball Grid Array (FC-BGA)
Intel® 82801FR (ICH6R)	609 ball Micro Ball Grid Array (mBGA)

Intel Access

Intel® Pentium® 4 Processor	*http://developer.intel.com/design/pentium4*
Intel® Chipsets Home Page	*http://developer.intel.com/design/chipsets*
Intel® Server Products	*http://developer.intel.com/design/servers/buildingblocks*
Intel® Reseller Center	*http://program.intel.com*
Other Intel Support	*http://support.intel.com*
Intel Literature Center	(800) 548-4725 7 a.m. to 7 p.m. CST (U.S. and Canada) International locations please contact your local sales office
General Information Hotline	(800) 628-8686 or (916) 356-3104 5 a.m. to 5 p.m. PST

[1] Hyper-Threading Technology requires a computer system with an Intel® Pentium® 4 processor supporting HT Technology, a chipset and BIOS that utilize this technology, and an operating system that includes optimizations for this technology. Look for systems with the Intel® Pentium® 4 Processor with HT Technology logo which your system vendor has verified utilize Hyper-Threading Technology. Performance will vary depending on the specific hardware and software you use. See *www.intel.com/info/hyperthreading* for information.

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