Experience the next-generation Desktop PC form factor for the digital home or digital office.

Intel® Desktop Boards based on the Balanced Technology Extended (BTX) form factor and the Intel® 915G Express Chipset.

When the ATX form factor was introduced in 1995, it was difficult to imagine the incredible growth in PC performance that would lead to the complexity of today's typical system configurations. Processors have grown from 200 MHz to over 3 GHz. Memory and storage are many times faster and higher capacity. Graphics cards are much more powerful. Chipsets offer many more integrated capabilities. These performance and capability increments all come with additional power and virtually everything in the typical system runs hotter. The evolving digital home and digital office usage models continue to drive the need for incremental performance. At the same time, market interest in smaller form factors has grown significantly. The challenge of keeping all the components within their operating temperature range has unfortunately exposed the limitations of ATX, since the technologies required have become increasingly more expensive and noisy.

The Balanced Technology Extended (BTX) form factor was designed specifically to address these challenges. When compared to ATX, the evolutionary design of BTX is expected to enable a broader range of system sizes, an improved thermal environment, reduced noise, and over time a lower total system cost[1].

Experience the Balanced Technology Extended (BTX) form factor today with the Intel® Desktop Board D915GMH, available in two versions with ideal features for the digital home or the digital office.

Intel® Desktop Board D915GMH

The Intel® Desktop Board D915GMH pairs the innovative technologies and high-bandwidth interfaces of the Intel® 915G Express Chipset with the thermal and acoustic benefits of the new Balanced Technology Extended (BTX) form factor.

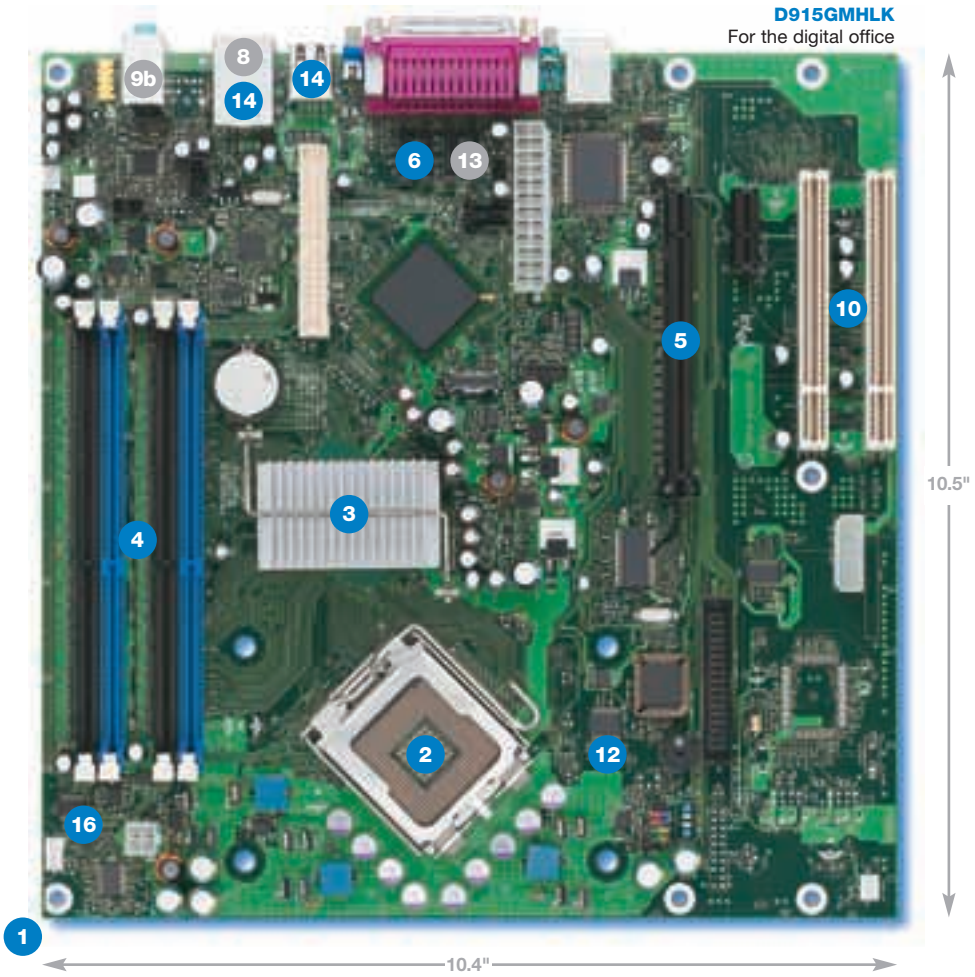
The Intel® Desktop Board D915GMH supports the latest Intel® Pentium® 4 processors supporting Hyper-Threading Technology[2] and is offered in two models with ideal features for the digital home or the digital office. These desktop boards deliver exceptional platform flexibility with both PCI Express* x16 graphics interface and Intel® Graphics Media Accelerator 900, as well as Intel® High Definition Audio and support for dual-channel DDR 400/333 memory. Compared to ATX, PCs based on the new Balanced Technology Extended (BTX) form factor can offer a superior thermal environment, which allows higher performance with lower noise.

Whether you are building a PC for the digital home, or the digital office, Intel Desktop Board D915GMH offers the performance and ideal features for each:

BOXED INTEL® DESKTOP BOARD D915GMH INCLUDES:

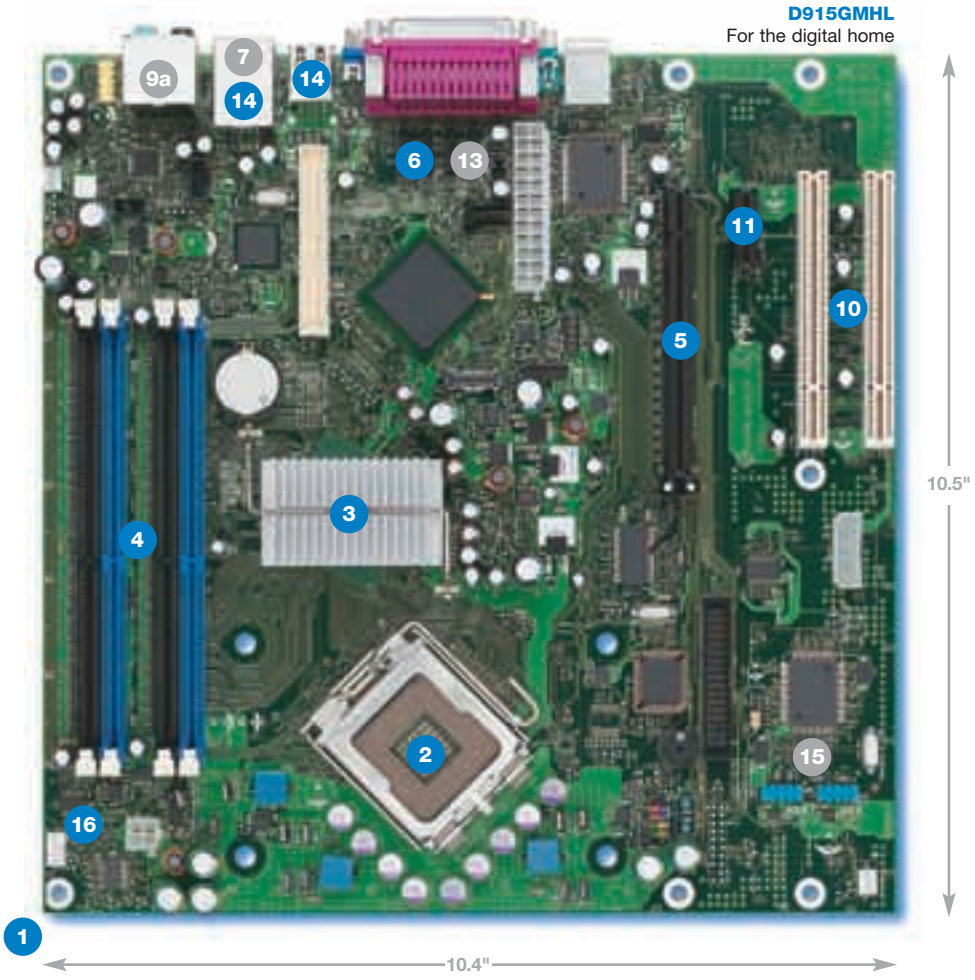
- Desktop Board D915GMH
- BTX 1.0-compliant I/O shield
- Floppy, SATA and ATA 100/66 cables
- Board and back-panel I/O layout stickers
- Intel® Desktop Board D915GMH Quick Reference Guide
- Intel® Desktop Board D915GMH Integration Guide Poster
- Desktop board three-year limited warranty
- Intel® Express Installer CD, including:
  - Intel® Audio Studio
  - Intel® Desktop Utilities**
  - Norton Internet Security*
  - NTI CD-Maker*
  - Musicmatch* Jukebox
  - InterVideo* Home Theater Silver
  - InterVideo* WinDVD Creator Silver
  - Farstone* RestoreIT! Lite
  - LANDesk* System Manager†
  - WebEx* Personal Edition†
  - Software Drivers
  - Desktop Board Product Guide

	For the digital home	For the digital office
Product Code/UPC	BOXD915GMHL / 00735858167130	BOXD915GMHLK / 00735858167154
10 Pack Product Code/UPC	BLKD915GMHL / 00735858167147 / KD915GMHLPAK10	BLKD915GMHLK / 00735858167161 / KD915GMHLKPAK10
Integrated Graphics	Intel® Graphics Media Accelerator 900	Intel® Graphics Media Accelerator 900
Storage	SATA 150 ports and ATA 100/66 up to two devices	SATA 150 ports and ATA 100/66 up to two devices
LAN	Intel® PRO 10/100	Gigabit LAN Solution
Audio	Intel® Audio Studio Intel® High Definition Audio 8-channel audio (7.1)	Intel® Audio Studio Intel® High Definition Audio 6-channel (5.1)
1394	Two internal headers	—
Security	—	Trusted Platform Module (TPM)
RAID	—	Intel® Matrix Storage Technology (RAID 0/1)



Features and Benefits

1. **Micro Balanced Technology Extended (microBTX) form factor:** Capability for improved thermal and acoustic performance compared to microATX.
2. **Support for the Intel® Pentium® 4 processor featuring Hyper-Threading Technology[2]:** Supports today's highest Intel® processor frequencies with 800- or 533-MHz system bus via the LGA775 socket. Supports boxed Intel® desktop processors with packaging designated by 04B or 04A Platform Compatibility Guide.
3. **Intel® 915G Express Chipset featuring Intel® Graphics Media Accelerator 900:** Low-cost, high-performance graphics solution.
4. **Dual-Channel DDR 400/333 SDRAM support:** Four DIMM sockets designed to support up to 4 GB[3] of DDR 400/333 SDRAM memory. Flexible support for either single- or dual-channel operation.
5. **PCI Express* x16 graphics connector:** Add an Advanced Digital Display 2 (ADD2) card for low-cost DVI and/or TV-out, or dual-independent display capability. Alternatively, add a high-performance PCI Express x16 graphics card for up to 8-GB/s graphics bandwidth (up to four times faster than previous AGP solutions).
6. **Four Serial ATA 150 ports:** Facilitates high-speed storage transfers at up to 1.5 Gb/s per port, allows easier hard drive upgrades and expansion for new SATA optical drives. Additionally, compared to IDE ribbon cables, the thinner SATA cables allow for better airflow in a BTX-based system.
7. **Integrated Intel® PRO 10/100 LAN (optional):** Onboard 10/100-Mbps Ethernet LAN connectivity.
8. **Integrated Gigabit LAN (optional):** 10/100/1000-Mbps LAN connectivity.



9 **Intel® High Definition Audio and Intel® Audio Studio:** High-quality integrated audio that rivals the performance of high-end discrete solutions.

9a Flexible 8-channel (7.1) audio with jack sensing.

9b Flexible 6-channel (5.1) audio with jack sensing.

10 **Two PCI connectors:** Expansion slots for custom system configurations and future add-in card upgrades.

11 **One PCI Express* x1 connector:** With a 500-MB/s concurrent data transfer bandwidth, easily doubles the I/O bandwidth of traditional PCI architecture.

12 **Trusted Platform Module [TPM] (optional):** Helps enhance platform security above-and-beyond the capabilities of today's software.

13 **Intel® Matrix Storage Technology (optional):** SATA RAID 0, 1, and Intel® Matrix RAID capabilities.

14 **Eight Hi-Speed USB 2.0 ports:** Four back-panel ports and an additional four front-panel USB ports via two internal headers.

15 **1394 Headers (optional):** Two front-panel 1394 ports via two internal headers.

16 **Intel® Precision Cooling Technology:** Advanced management ASIC supports temperature-based fan control. Automatically adjusts the processor fan speed based on the processor temperature and adjusts the chassis fan speeds depending on the system temperature. System fan noise may be reduced by operating controlled chassis and processor fans at the minimum necessary speeds.

17 **Instantly-Available PC (suspend-to-RAM):** Enables advanced power savings (not pictured).

Balanced Technology Extended (BTX): The Next-Generation Desktop PC Form Factor

Why BTX?

The current industry standard, ATX, was introduced in 1995, and as technology has evolved, new challenges have arisen that are increasingly difficult for ATX to handle. The Balanced Technology Extended (BTX) form factor specification was developed as an evolutionary follow-on to the ATX form factor to address these issues, and Intel expects it to eventually replace ATX as the industry standard. Compared to ATX, systems based on BTX can offer:

- **Improved scalability**
  Support for a broader range of system sizes with better scalability into small form factors.
- **Superior thermal environment**
  In-line, high velocity, lower temperature airflow can cool entire system more effectively.
- **Superior acoustic performance**
  Reduced fan count and less airflow impedance allow for lower noise.
- **Improved motherboard design**
  More room for power delivery and localized routing allow simpler, faster, and more cost effective motherboard development.
- **Improved structural integrity**
  Structural support for more efficient, higher-mass heatsink materials.
- **Improved cost structure**[1]
  Low temperature, high velocity airflow can allow simpler, less costly heatsink technologies compared to future ATX solutions. Standard ingredients replace custom ingredients for compact system designs.

BTX Ingredients

BTX Thermal Modules

In order to produce in-line airflow, the key to the many benefits of the new form factor, BTX utilizes a new thermal module design, which combines a fan, heat sink and duct. Two sizes are specified.

- **Type I (Standard height):** Designed to support a broad range of system sizes from full towers to cubes to slim desktops and Entertainment PCs. (Minimum system thickness about 102 mm)
- **Type II (Low Profile):** Designed to support ultra-thin, ultra-small form-factor systems. (Minimum system thickness about 78 mm)

BTX-compatible SKUs of Boxed Intel® Processors

Intel now offers selected boxed processor SKUs with a Type I BTX thermal module. Be sure to select the right boxed processor SKU for your system. Product codes for Type I BTX SKUs will end with the letter "T."

Example: Product Codes for the Boxed Intel® Pentium® 4 processor 560J
For ATX: BX80547PG3600EJ
For BTX: BX80547PG3600ET

BTX-based Motherboards

The BTX-based motherboard layout places the highest power components in-line, allowing cooling with a single airflow path. The design also allows for multiple board sizes utilizing a common core:

- **picoBTX:** maximum width 203.20 mm, up to one add-in card slot.
- **microBTX:** maximum width 264.16 mm, up to four add-in card slots
- **BTX:** maximum width 325.12 mm, up to seven add-in card slots

BTX-based Chassis

With the new motherboard layout and importance of airflow, the new form factor utilizes unique chassis designed specifically for BTX. Look for chassis designated as Type I or Type II compatible to indicate which thermal module size they support. Additionally, look for chassis designated with BTX, microBTX or picoBTX to indicate which board size they support.

Support and Retention Module (SRM)

The SRM is a metal plate that is assembled to the chassis beneath the motherboard to provide structural support for the motherboard and retention for the thermal module. The SRM is expected to be included with BTX-compatible chassis.

BTX-compatible Power Supplies

Choice of power supply depends on the size and style of chassis used. Current ATX-compatible power supplies may be used with BTX, including ATX12V, SFX12V, TFX12V and PS3-12V.

To support smaller systems, two new power supply specifications have been introduced:

- **CFX12V:** For use with small form-factor system designs (10L to 15L in total system volume).
- **LFX12V:** For use with ultra-small form factor system designs (6L to 9L in total system volume).

Ingredients that are not BTX-specific

Many of the ingredients currently used for ATX-based systems are generally compatible with BTX-based systems. These cross-platform ingredients include:

- Memory
- Hard Drives
- Optical Drives
- Floppy (and other 3.5") Drives
- Add-in cards (PCI*, PCI Express*)

Compatibility with these various ingredients may depend on chassis configuration. Check with your chassis supplier for details.

Balanced Technology Extended (BTX) Channel Resource Center

Visit the Balanced Technology Extended (BTX) Channel Resource Center for more information about BTX, including:

- Links to Ingredient Source Lists
- Links to Tested Hardware Lists
- More detail on BTX Value Propositions and Comparisons to ATX

www.intel.com/go/BTX

TECHNICAL SPECIFICATIONS

Processor

Processors Supported

- Intel® Pentium® 4 processors supporting Hyper-Threading Technology[2] with 800-MHz system bus for the LGA775 socket
- Intel® Celeron® D processors with 533-MHz system bus for the LGA775 socket
- Supports boxed Intel processors with packaging designated by 04B or 04A Platform Compatibility Guide

Chipset

Intel® 915G Express Chipset

- Intel® 82915G Memory Controller Hub (MCH)
- Intel® 82801FB I/O Controller Hub (ICH6) (D915GMHL)
- Intel® 82801FR I/O Controller Hub (ICH6-R) (D915GMHLK)

Graphics Memory Controller Hub (GMCH)

- Designed to support up to 4 GB[3] of system memory using DDR 400/333 SDRAM memory

Intel® ICH6 (D915GMHL) or ICH6-R (D915GLMLK) I/O Controller Hub

- Four SATA (1.5 Gb/s) ports
- Up to two ATA 100/66 devices
- Two PCI request-grant pairs for support of two PCI bus masters

Network Connections

- Intel® PRO/100 network connection (D915GMHL)
- Gigabit LAN (D915GMHLK)

USB 2.0

Integrated Intel® ICH6 controllers:

- Four back-panel ports (two dual stack)
- Four front-panel ports (via 2-headers requiring cabling to front panel)

Firmware Hub

System BIOS

- 4-Mb Flash EEPROM with Intel®/AMI* BIOS featuring Plug and Play, IDE drive auto-configure
- Advanced configuration and power interface V1.0b, DMI 2.0, multi-lingual support

Intel® Rapid BIOS Boot

- Optimized POST for faster access to PC from power-on

System Memory

Memory Capacity

- Four 184-pin DIMM connectors supporting up to four-sided DIMMs

Memory Types

- DDR 400/333 SDRAM Memory
- Non-ECC RAM

Memory Modes

- Dual- and single-channel operation support

Memory Voltage

- 2.5V

Hardware Management Features

- Processor fan speed control
- System chassis fan speed control
- Voltage and temperature sensing
- Fan sensor inputs used to monitor fan activity
- Power management support for ACPI 1.0b

Wake-Up From Network

- Wired for Management (WfM) 2.0-compatible
- Support for system wake-up using an add-in network interface card with remote wake-up capability or integrated LAN

Expansion Capabilities

- Two PCI bus add-in card connectors
- One PCI Express* x1 bus add-in card connector
- One PCI Express* x16 graphics connector

Jumpers and Front-Panel Connectors

Jumpers

- Single configuration jumper design
- Jumper access for BIOS configuration mode

Front-Panel Connectors

- Reset, HD LED, Power LEDs, power on/off
- Two front-panel USB headers
- Front-panel audio header
- Two 1394 headers (D915GMHL)

Mechanical

Board Style

- microBTX 1.0a-compliant

Board Size

- 10.5” x 10.4”

Baseboard Power

Requirements

- ATX12V or SFX12V for small to full tower chassis
- CFX12V for small form factor chassis

Environment

Operating Temperature

- 0° C to +55° C

Storage Temperature

- -40° C to +70° C

Regulations

Safety Regulations

U.S. and Canada
UL 1950, Third edition—CAN/CSA C22.2 No. 950-95 with recognized U.S. and Canadian component marks

Europe
Nemko* certified to EN 60950

International
Nemko certified to IEC 60950
(CB report with CB certificate)

EMC regulations (tested in representative chassis)

U.S.
FCC Part 15, Class B

U.S.
FCC Part 15, Class B open-chassis (cover off) testing

Canada
ICES-003, Class B

Europe
EMC directive 89/336/EEC; EN 55022:1998 Class B; EN 55024:1998

Australia/New Zealand
AS/NZS 3548, Class B

Taiwan
CNS 13438, Class B

International
CISPR 22:1997, Class B

Power requirements vary. Complies with US CRF via EN55022 +6 db in system configurations with an open chassis and EU Directive 89/336/EEC and use via EN55022 and EN50082-1 in a representative chassis.

Ordering Information: See Intel’s Web site at www.intel.com
For the most current product information available, visit Intel’s Web site at: developer.intel.com/design/motherbd/

1 As with many technology transitions, any cost advantage will likely only become visible when BTX is broadly adopted and the initial industry conversion premiums disappear.

2 Hyper-Threading Technology requires a computer system with an Intel® Pentium® 4 processor supporting Hyper-Threading Technology and an HT Technology. enabled chipset, BIOS and operating system. Performance will vary depending on the specific hardware and software you use. See http://www.intel.com/info/hyperthreading/ for more information including details on which processors support HT Technology.

3 Desktop Board D915GMH is designed to support up to 4-GB total system memory using DIMMs based on 512-Mbit or 1-Gbit technologies. 1-Gbit technology has not been validated on these Intel® desktop boards. For more information about the latest list of tested memory, refer to the Intel World Wide Web site at: http://support.intel.com/support/motherboards/desktop/.

** Intel® Desktop Utilities includes: hardware monitoring, Diskeeper* Lite defragmentation, NTI Backup Now*, StressTest*, Symantec* Security Check

† Available by Internet download only. Third-party user registration required.

* Other names and brands may be claimed as the property of others.

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