# Consolidated Buy-15 User's Guide

This is the ninth version the Consolidated Buy (CB) User's Guide which is intended to highlight key computer characteristics that may be used as part of the process to determine best value. Although the focus of this document is computer characteristics each user should also consider all factors that contribute to the usefulness of a platform over the product's entire life cycle as well as the total life cycle cost of a platform. The initial cost of a computer reflects only a small part the total life cycle cost of a platform.
Other cost considerations should include projected cost to procure, maintain, and dispose of equipment and packing material, the energy efficiency of an item; both power and heating/cooling as well its ability to perform over the Federal Electronics Challenge (FEC) goal for a 4-year lifespan.

The CB computer characteristics are identified under to headings "Desktops" and "Notebooks". Both groups start with a functional description of each platform's target mission; followed by desktop performance characteristics (general processor, memory, video and storage). The information provided is general. It is not specific to the make/model of the CB platforms. The information is to assist users in making side-by-side comparisons of platforms and ultimately the establishment of a best value determination.

CB-15 will only offer MS Windows based platforms. An Apple OS X based Army Golden Master (AGM) is not available. Currently Apple OS X does not have an approved Authority to Operate (ATO). For details on applications and versions included in the current Windows AGM see the AGM page on AKO.

## DESKTOPS

### Desktops Functional Descriptions

Standard Desktop – A platform targeted for typical office automation tasks requiring word processing, spreadsheet manipulation, or presentation slide development. Platform intended for well defined missions with a low risk of expansion throughout the platform's life cycle.

Performance Desktop – A platform targeted for office automation with higher performance requirements such as database operations, analytical analysis, programming, basic engineering functions, etc. Platform intended to provide expansion capabilities (more memory, storage, or expansion cards) to address changing mission needs over the platform's life cycle.

All-In-One – A platform targeted for typical office automation skills such as word processing, spreadsheet manipulation, or presentation slide development. Platform intended for well defined missions with no expansion requirements with limited available platform footprint.

Workstation – A platform targeted for power users performing functions such as multi-media editing, computer-aided design, engineering functions, modeling & simulation and/or other applications requiring use of multiple concurrent threads. This platform

should not be considered for mainstream office automation since current Microsoft Office applications cannot take full advantage of the quad core structure.

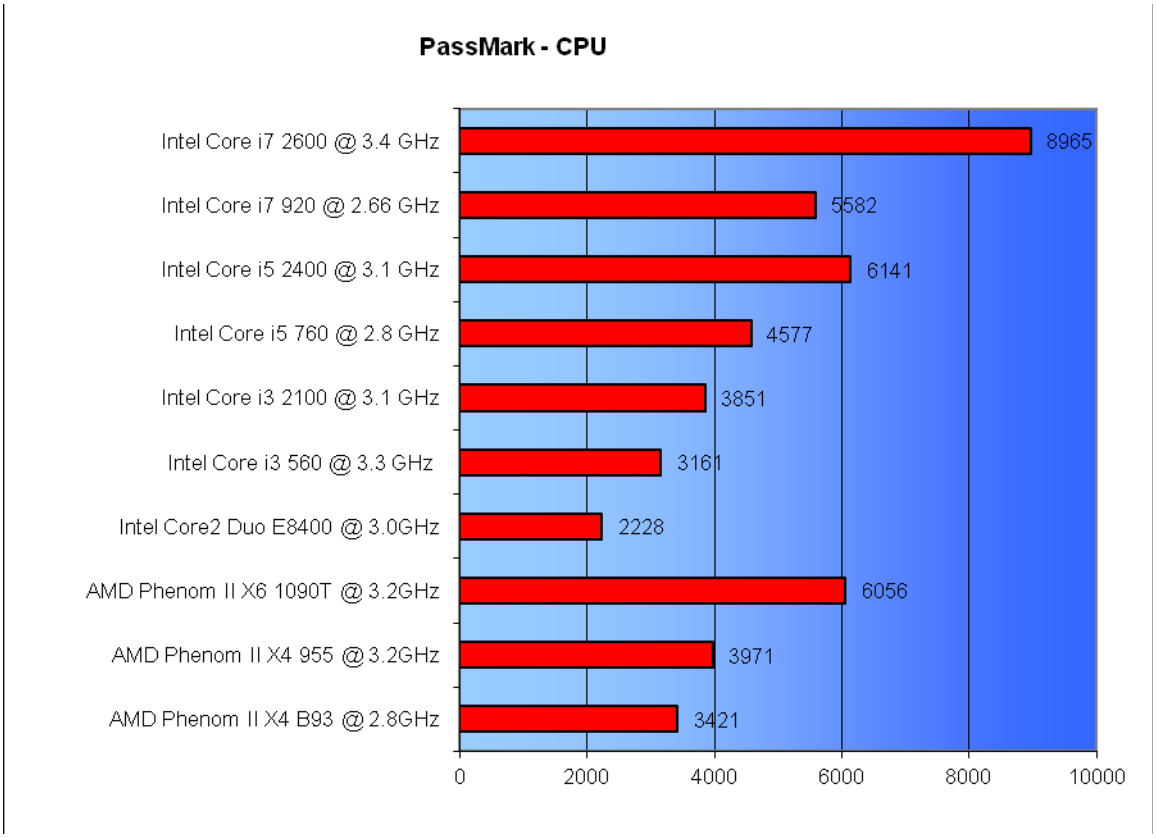
## Desktop Performance Characteristics

### Processor Benchmarks

Benchmarks are designed to emulate a particular type of workload on specific components or on the whole system in order to measure its performance. Two types of benchmarks specific to processors; two synthetic and two applications based are provided to assist in platform selection. Synthetic benchmarks are specially created programs that measure response time by imposing an artificial workload on the components. Application benchmarks execute a set script using real-world programs to measure execution time. While application benchmarks give a much better measure of real-world performance on a given platform, synthetic benchmarks are useful in gauging the raw performance of the system. The three benchmarks discussed are PassMark CPU, 3D Mark 06-CPU, and SYSMark 2007 which provide measurements for comparing processor performance. Although other platform components (memory, video, and hard drive) can affect overall system performance, the stated benchmark results share a comparable system configuration so that users may accurately compare processor performance.

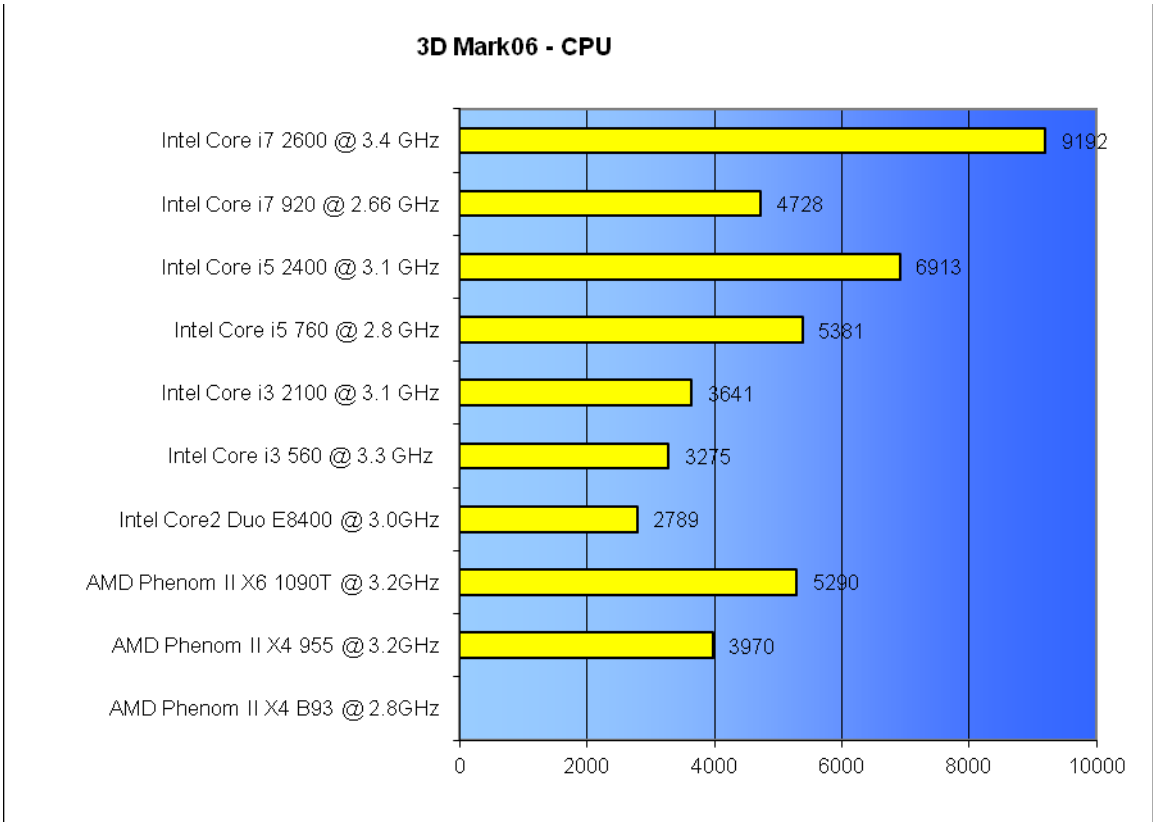
Industry is increasing reluctant to openly publish benchmark results and therefore we are pursuing the evaluation of each proposed baseline platform. Tabulation of those results will not be available until early February. The following is stop gap information for your consideration.

PassMark CPU is a synthetic benchmark that conducts eight different tests and then averages the results together to determine the CPU Mark for a system. The tests are: Integer Math Test, Compression Test, Prime Number Test, Encryption Test, Floating Point Math Test, SSE/3D Now Test, Image Rotation Test and String Sorting Test. Details of this test can be found at http://www.cpubenchmark.net/cpu_test_info.html. A view of other PassMark results can be found at http://www.cpubenchmark.net/ . Other factors you may want to take into consideration when viewing results can be found at http://www.cpubenchmark.net/graph_notes.html



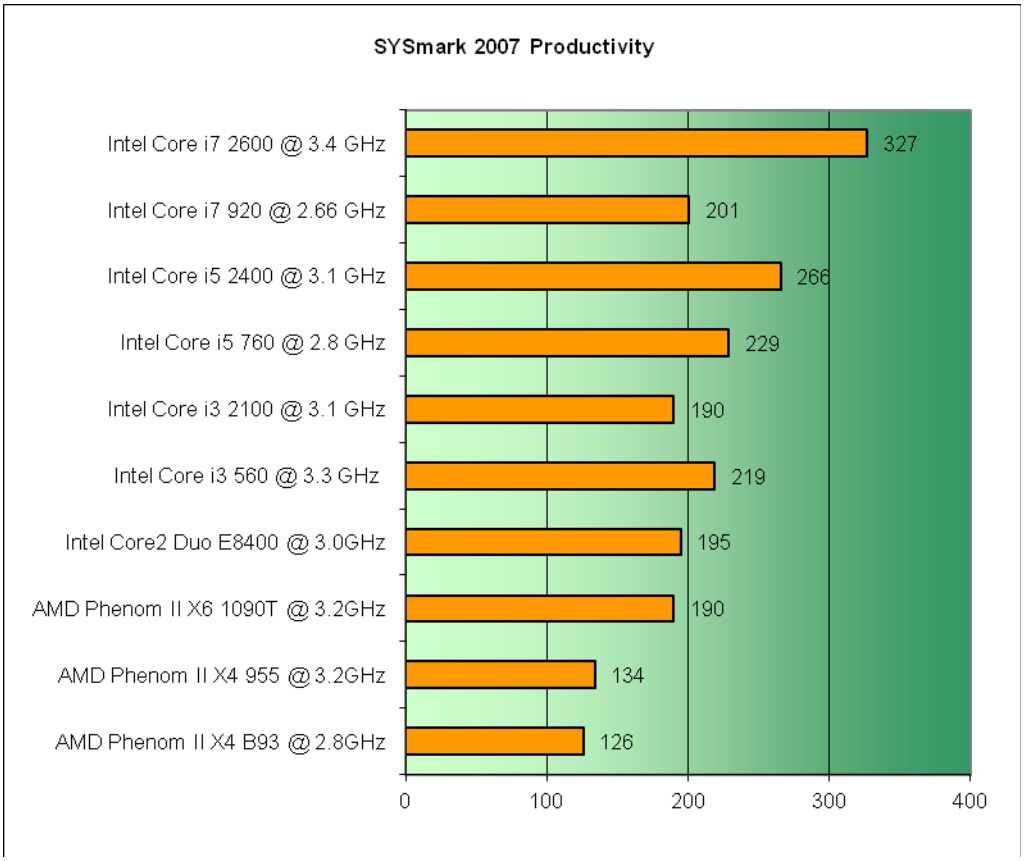

The higher the score the faster the processor is able to perform calculations.

3D Mark 06- CPU is also a synthetic benchmark. The benchmark is used primarily by gamers. The CPU portion of the benchmark is an additional data source for comparing processor performance. The benchmark generates a multi-threaded workload that can be distributed on multiple processors, cores or even on a single processor. This assures that the full raw performance of the processor is measured. Details of this test can be found at http://www.futuremark.com/products/3dmark06/tests/ .

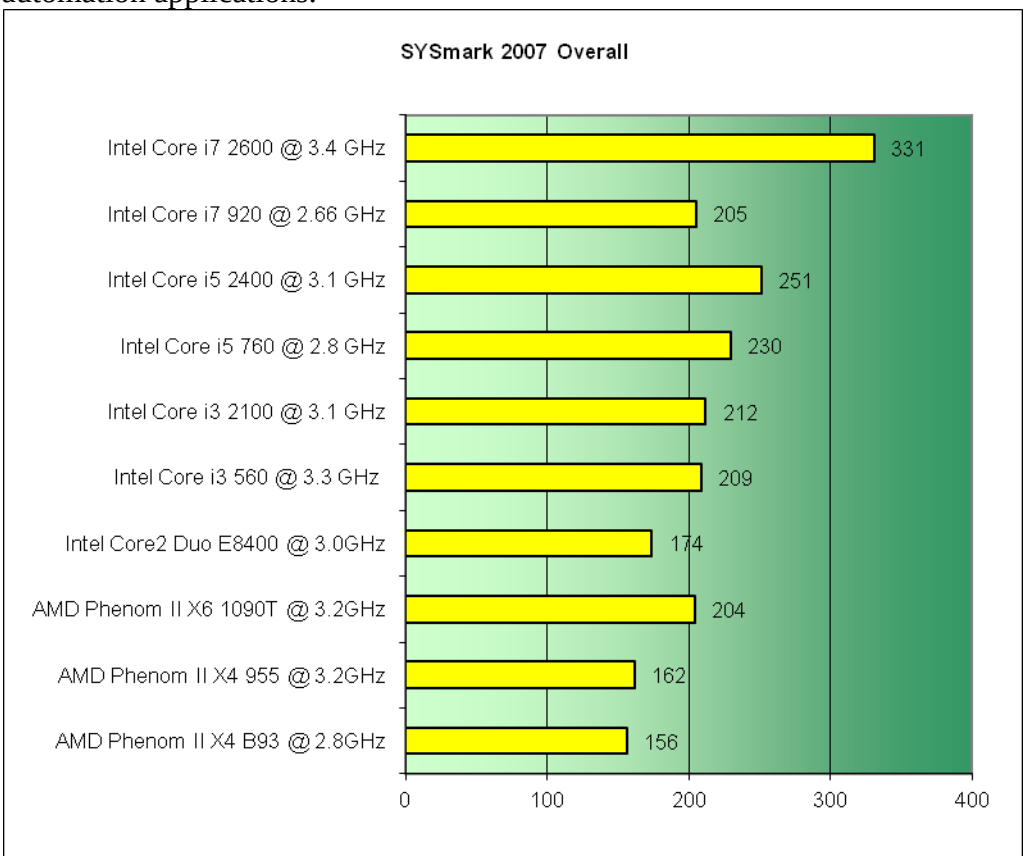



The higher the score the faster the processor is able to perform calculations.

SYSMark 2007 is an application based benchmark. The SYSMark 2007 Productivity benchmark measures the performance of general office automation applications such as MS Word, Excel, PowerPoint, Project, Outlook, and WinZip. The SYSMark 2007 Overall benchmark includes not only of the Productivity benchmark results but also E-Learning, Video Creation, and 3D Modeling benchmark. A complete description of the SYSMark 2007 benchmarks can be obtained at http://www.bapco.com/support/technical_documents/SYSmark2007Preview_WhitePaper.pdf.




The higher the Productivity score the better the processor is at executing general office automation applications.



Results shown on the application based benchmarks illustrate that triple and quad core processors do not provide proportional performance increase over dual core processor systems when performing basic office automation applications. Most of the benefit for office automation users comes from higher processor clock rate and improved "turbo-boost" implementation. Microsoft Office 2003 and Office 2007 code is not able to take advantage of multiple concurrent threads, therefore the third and forth processor is idle during execution. It should be noted that triple and quad platforms provide no benefit to Army users executing the standard suite of applications included with the Army Golden Master.

Memory Access Rates

Computer memory comes in various forms; CB vendors are required to provide a minimum of 2 Giga-Bytes (GB) of Dynamic Random Access Memory (DRAM) with the option for upgrades to 4 GB. Today's processors are significantly faster than memory therefore CPUs have to wait a relatively long time for a memory access to be completed before it can process the data. This delay is referred to as memory latency. The following table identifies the access capabilities of various Synchronous Dynamic Random Access Memory (SDRAM) used by PC manufacturers. The faster the data transfer rate the better the platform will perform.

| Module Name / Standard Name | Data Transfers per second | Peak Transfer rate |
|---|---|---|
| PC2-3200 DDR2-400 SDRAM (single channel) | 400 Million | 3200 MB/s |
| PC2-4200 DDR2-533 SDRAM (single channel) PC2-4300[1] | 533 Million | 4266 MB/s |
| PC2-5300 DDR2-667 SDRAM (single channel) PC2-5400[1] | 667 Million | 5333 MB/s |
| PC2-6400 DDR2-800 SDRAM (single channel) | 800 Million | 6400 MB/s |
| PC2-8500 DDR2-1066 SDRAM (single channel) PC2-8600[1] | 1066 Million | 8533 MB/s |
| PC3-8500 DDR3-1066 SDRAM (single channel) | 1066 Million | 8533 MB/s |
| PC3-10600 DDR3-1333 SDRAM (single channel) | 1333 Million | 10667 MB/s |
| PC3-12800 DDR3-1600 SDRAM (single channel) | 1600 Million | 12800 MB/s |
| PC3-14900 DDR3-1866 SDRAM (single channel) PC3-15000[1] | 1866 Million | 14933 MB/s |
| PC3-16000 DDR3-2000 SDRAM (single channel) | 2000 Million | 16000 MB/s |
| PC3-17000 DDR3-2133 SDRAM (single channel) PC3-17066[1] | 2133 Million | 17067 MB/s |
| PC3-20000 DDR3-2500 SDRAM (single channel) | 2500 Million | 20000 MB/s |

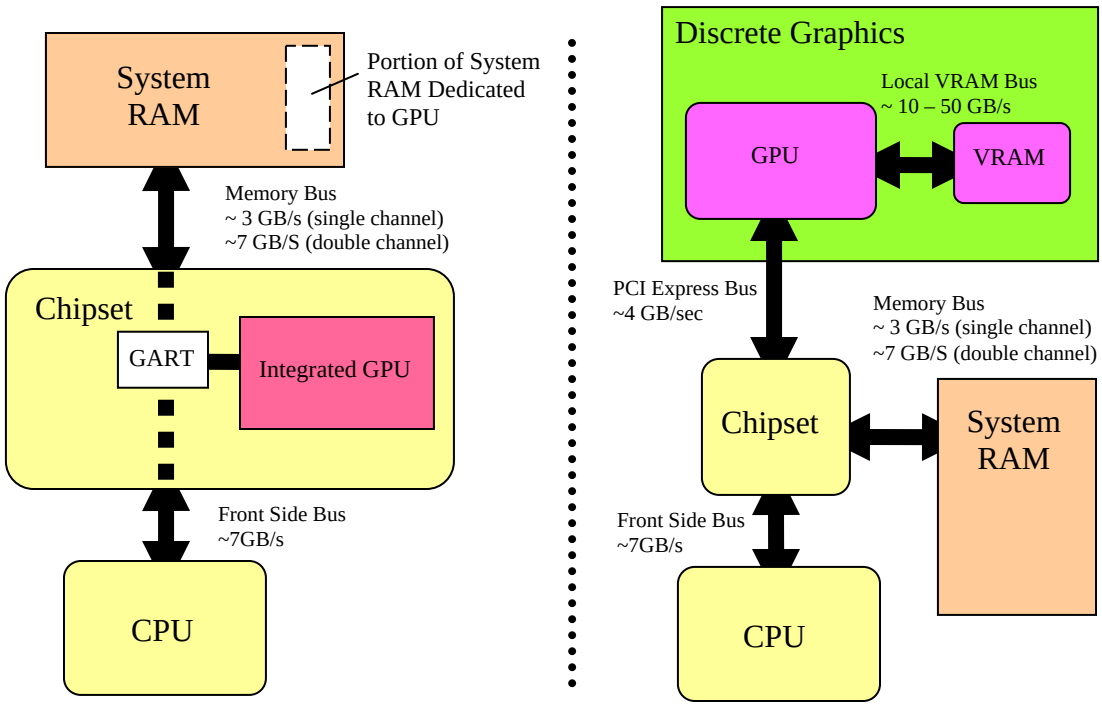
[1] *Some manufacturers label their DDR2 sticks as PC2-4300 instead of PC2-4200, PC2-5400 instead of PC2-5300, etc. At least one manufacturer has reported this reflects successful testing at a faster-than standard speed, while others simply use the alternate rounding as the name.*

In addition to chip access times memory architecture also plays a role in memory latency. Dual-channel technology was created to reduce overall memory latency by regulating the data flow between the CPU and system memory. In order to achieve this, a pair of memory modules must be installed into matching banks, which are usually color coded on the

motherboard. These separate channels allow each memory module access to the memory controller, increasing throughput bandwidth. Instead of a single memory channel, a second parallel channel is added. With two channels working simultaneously, the bottleneck is reduced. Rather than wait for memory technology to improve, dual-channel architecture simply takes the existing RAM technology and improves the method in which it is handled. While the actual implementation differs between Intel and AMD motherboards, the basic theory stands.
NOTE: Dual channel performance is a theoretical maximum and does not always reflect real world performance. In many cases, performance may be closer to single channel operation because of software jumps, subroutine calls, and redirections.

Video Interface

The Graphics Processing Unit (GPU) is a graphics microprocessor optimized to conduct calculations fundamental to the generation of computer graphics. Current Army graphical requirements are for a DirectX 10 compatible graphics processor with a Windows Display Driver Model (WDDM) driver, Pixel Shader 2.0, and a minimum of 128 MB of RAM. The graphical interface used will directly affect the user's visual experience, especially with graphic intensive applications. The illustration below shows the two typical configurations available to users; integrated graphics (left figure) and discrete graphic (right figure).




Integrated graphic configurations use a portion of the system's memory for GPU operation. During system initiation a minimum amount of system memory is dedicated to the GPU; however access to the memory is shared with the system CPU through the memory bus. The sharing of the memory bus combined with the speed of the system memory makes integrated graphics a poor solution for graphic intensive applications. Graphic intensive applications typically also require a lot of CPU resources. With an integrated graphic

configuration the sharing of the memory bus will result in screen freezes and jumps as the GPU starts and stops operations.

Discrete graphic configurations overcome the memory bus bottleneck by having a dedicated bus between the GPU and its memory. The memory for discrete graphic configurations comes in a wide range of speeds, typically faster than system memory. This table shows the various VRAM options available to users.

| Type | Memory clock rate (MHz) | Bandwidth (GB/s) |
|---|---|---|
| DDR2 | 533 - 667 | 4.2 – 5.3 |
| GDDR3 | 700 - 1800 | 5.6 - 54.4 |
| GDDR4 | 1600 - 2400 | 64 - 156.6 |

Performance is also affected by the graphic Application Programming Interfaces (APIs) used. The Army minimum requirement is DirectX 10. DirectX 10 provides the benefit of redirecting graphic operations to the GPU; not found with Direct X 9. This added feature frees up CPU workload and makes overall system operation more efficient.

With the Army migration to the Vista operating system most users will want to take advantage of the windows Aero interface. The Aero interface provides several advanced effects such as “Window Glass” which is a translucent effect allowing the user to see through multiple windows, “Live Thumbnails” which display the actual window contents when minimized in the taskbar, and “Flip3D” which dynamically displays all the open windows on your desktop in a 3D stacked view. All these advanced effects add to the system graphics workload. Although the Aero interface does not have to be activated to run Vista (a version similar to XP windows interface is available), it is recommended that all users planning to use the Aero interface select systems with discrete graphics. These systems are identified by the video characteristic of “*xxx* MB of dedicated VRAM” (*xxx* indicates the amount of VRAM). For systems with integrated graphics (denoted by “Dedicated System Memory”) users can typically update to a discrete graphics interface by adding the optional graphics cards for that platform.

Hard Drive Access Rate

An argument could be made that a hard disk's performance level is not as important as that of the CPU, or memory, or other core system components, however performance of a system is only equal to that of its poorest-performing component. Compared to the solid state components in a PC, hard disks have, by far, the worst performance. Thus, hard disks continue to constrain the overall performance of many systems.

The factors specified in the current CB are Interface/rate, cache size, and drive RPM. The Interface/rate specification identifies the transfer rate between the hard drive and system chipset. The faster the transfer rate of the hard drive the better the desktop’s performance.

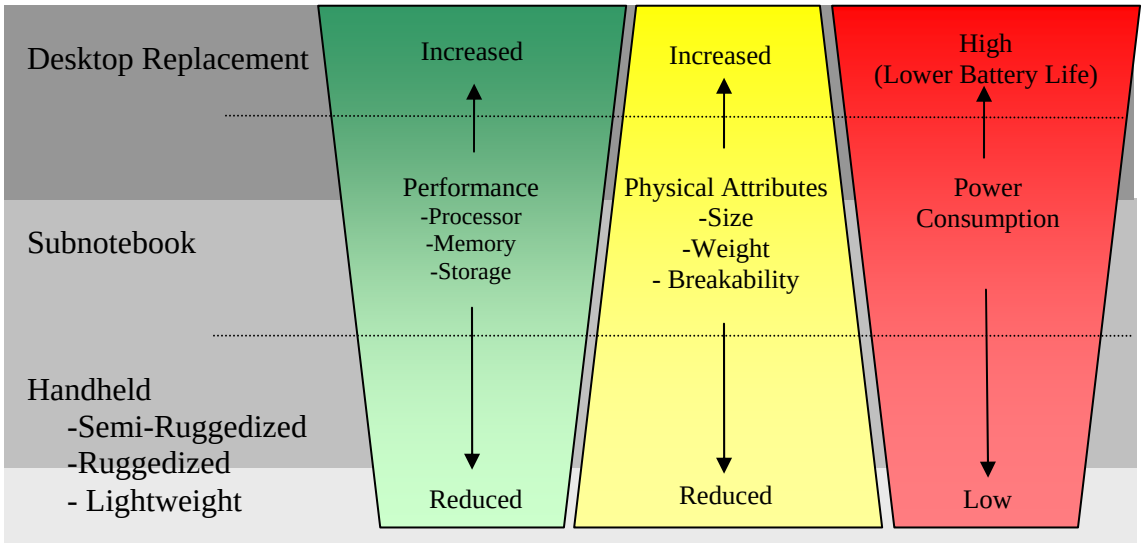
| Interface | Transfer Rate |
|---|---|
| SATA-150 or SATA 1.5 | 150 MB/sec |
| SATA-300 or SATA 3.0 | 300 MB/sec |
| SATA-600 or SATA 6.0 | 600 MB/sec |

The term cache is misleading since the memory on the hard drive is actually a disk buffer used for write sequencing and read prefetching. The larger the memory the more efficient the platform will perform.

All CB hard drives are self-monitoring, analysis and reporting technology (S.M.A.R.T.), which attempts to alert users to impending failures.

## NOTEBOOKS

A notebook is a platform whose selection requires the user to balance between three factors: performance, physical attributes, and power consumption. Notebook performance always lags behind mainstream desktop computers because high performance requires faster and more complex circuitry which generates more heat and needs more space. This also results in additional components to dissipate the heat, all of which increase power consumption and reduces battery life. It is only when advances occur, such as chip size reduction and component integration, that notebooks approach a balance between performance levels, physical attributes and power consumption. Because of ever increasing software demands and lower initial processor performance, notebooks have a shorter life cycle than desktop units. Mobility is the key reason for opting for a notebook. The level of mobility underlines a user's selection between a mainstream notebook for occasional travel, lightweight notebook for the frequent traveler and a fully ruggedized notebook for use in harsh environments.




Mainstream Notebook
Specialty Notebook
Lightweight, Semi-ruggedized/Ruggedized Notebook

**<u>Notebook Functional Descriptions</u>**

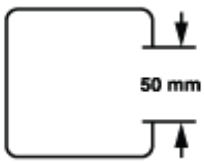
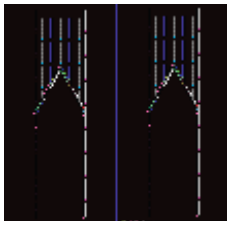
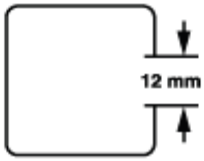
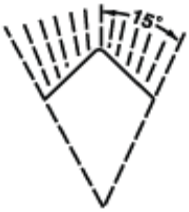
Mainstream Notebook – A desktop replacement platform targeted to provide office automation functions such as word processing, spreadsheet manipulation, or presentation slide development. Processor provides adequate performance for office automation, incorporates docking station or port replicator to facilitate mobility but general size and weight may not be desirable for frequent travel use.

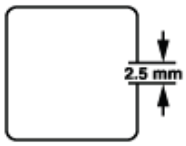
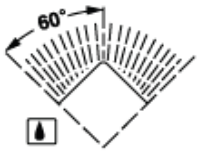
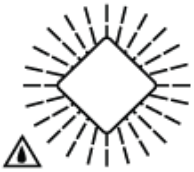
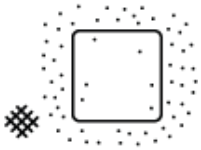
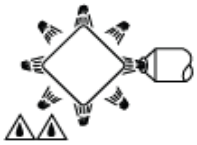
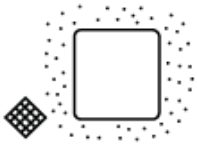
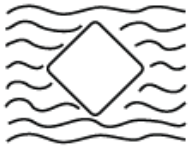
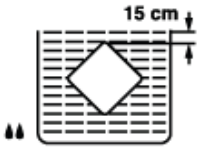
Specialty Notebook – A platform targeted at the wide range of missions between desktop replacement and lightweight road warrior platforms. This wide range of performance requires trade-off analysis between processing power, size/weight, and battery life; any enhanced feature in one area will facilitate a detriment in the other areas.

Lightweight Notebook – A platform with a weight limit of 3.5 pounds or less for users requiring a high level of mobility with the ability to conduct only basic office automation functions. Platform trades-off minimal processing capability and battery life for low weight and compact size.

Ruggedized Notebook – A distinctive platform targeted for missions where users encounter harsh environmental conditions. This category encompasses a wide range of environmental performance thresholds and requires trade-off analysis between processing power, size/weight, environmental characteristics and battery life to determine what best meets the user's needs. The severity of the environmental punishment the notebook can endure is characterized by its International Protection (IP) rating which defines the platform's level of protection against dust and water (table below), whether all electrical components are sealed and all external ports covered as well as MIL-STD 810 results. NOTE: A vendor's statement that the product is MIL-STD 810 compliant tells you nothing!!! The standard only defines how a device is to be tested; it does not define what level of compliance is appropriate for your needs.

## International Protection Rating

| | First Digit | | Second Digit |
|---|---|---|---|
| 0 | No protection against contact or entry of solids | 0 | No protection against liquids |
| 1 | Protection against accidental contact by hand, but not deliberate contact. Protection against large objects. (greater than 50mm)<br>  <br>(Not to scale) | 1 | Protection against drops of condensed water. Condensed water falling on housing shall have no effect.<br>  |
| 2 | Protection against contact by fingers. Protection against medium-size foreign objects. (greater than 12mm)<br>  <br>(Not to scale) | 2 | Protection against drops of liquid. Drops of falling liquid shall have no effect when housing is tilted to 15 degrees from vertical.<br>  <br>(Not to scale) |

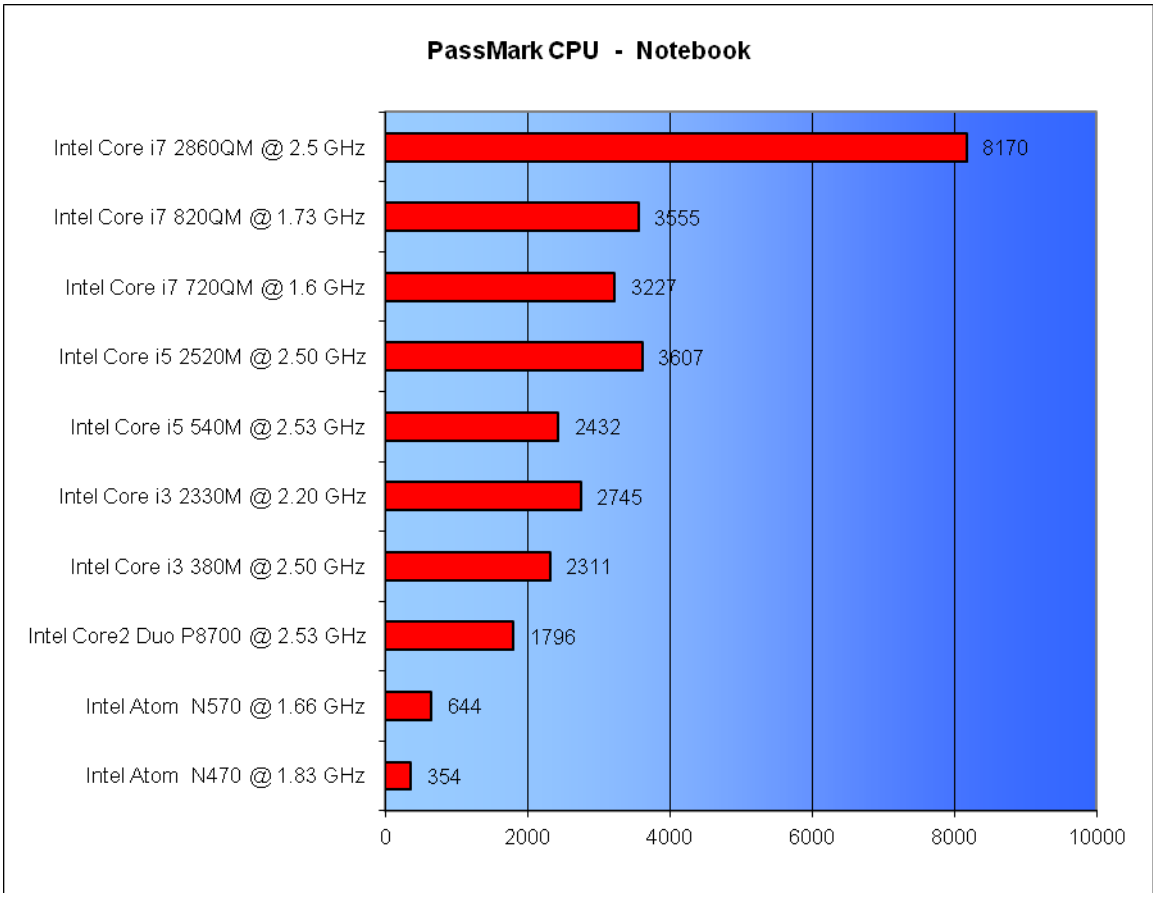
| | | | |
|---|---|---|---|
| 3 | Protection against contact by tools, wire, etc. Protection against small foreign objects.(greater than 2.5mm)<br>  <br>(Not to scale) | 3 | Protection against drops of liquid. Drops of falling liquid shall have no effect when housing is tilted to 60 degrees from vertical.<br>  <br>(Not to scale) |
| 4 | Protection against contact by small tools and wires. Protection against small foreign objects. (greater than 1mm)<br>  <br>(Not to scale) | 4 | Protection against splashing from any direction.<br>  |
| 5 | Complete protection against contact with live or moving parts. Protection against harmful deposits of dust.<br>  | 5 | Protection against low pressure water jets from any direction<br>  |
| 6 | Complete protection of live or moving parts. Protection against penetration of dust.<br>  | 6 | Protection against water projected by powerful jets/heavy seas from any direction.<br>  |
| | Not Defined | 7 | Protection against immersion in water. Water will not enter under stated conditions of pressure and time. (up to meter)<br>  <br>(Not to scale) |
| | Not Defined | 8 | Protection against indefinite immersion in water under a specified pressure. (beyond 1 meter)<br>  |

Example IP26 rating would mean the product protects contact by fingers (2) and against conditions on ships' decks. Water from heavy seas will not enter (6)

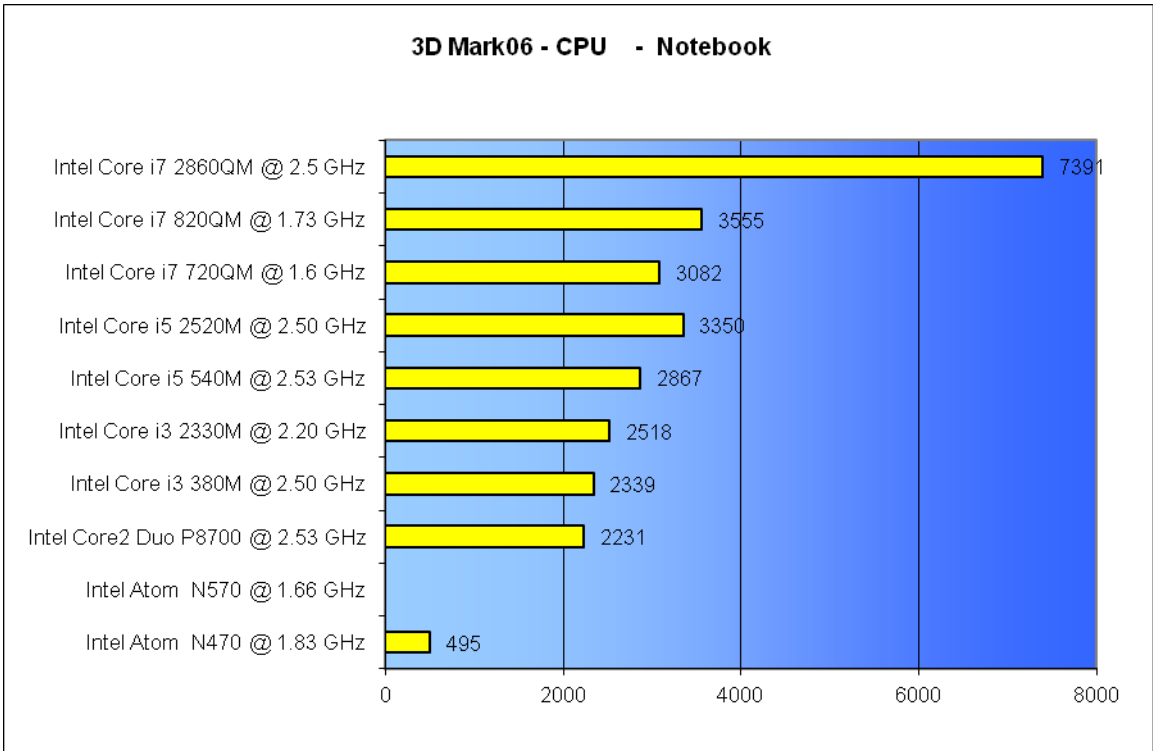
## Notebook Performance Characteristics

Processor Benchmarks

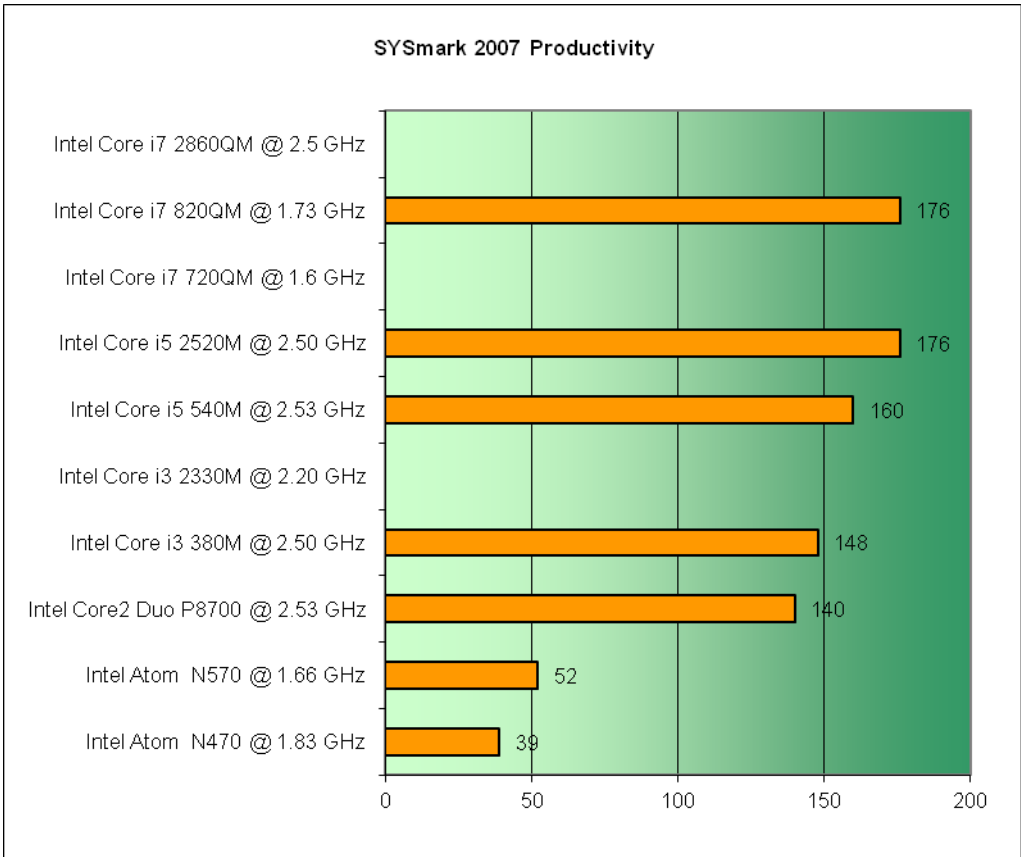
The same type of benchmarks used for the desktop units are used for the notebooks. This allows users to gauge the difference in performance resulting in selecting a mobile solution that meets their automation needs. Please refer to the desktop processor benchmarks for a description of each benchmark.

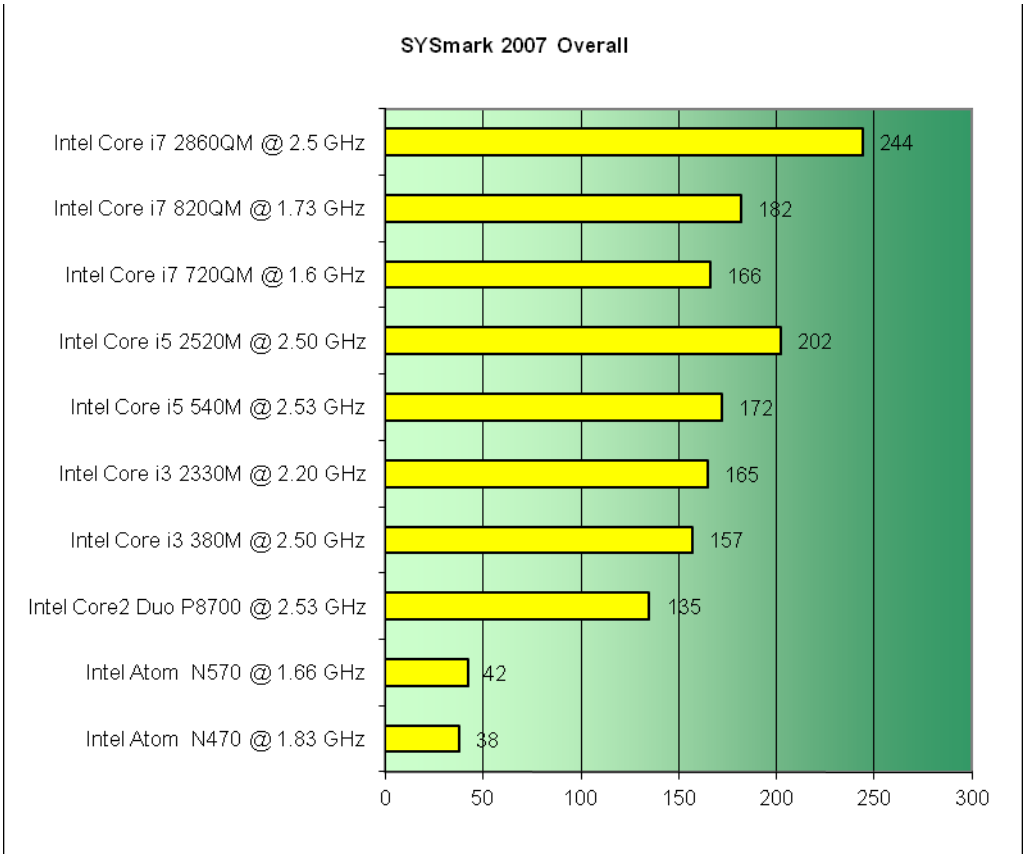



The higher the score the faster the processor is able to perform calculations.




Manufactures tend not to emphasize raw performance which is why this chart does not contain results for all processors. The higher the score the faster the processor is able to perform calculations.






The SYSMark 2007 benchmark can be compared to the desktop results to gauge the difference in office automation performance between two types of platforms. The higher the Productivity score the better the processor is at executing general office automation applications. Please refer to the desktop benchmark description to get details of the each benchmark's performance attribute.

Memory Access Rates

The performance attributes of notebook memory and desktop units are the same; although physical attributes typically prevent substituting memory modules between units. Please refer to the desktop memory access rates for performance attributes. In selecting a notebook users should considered whether the platform has any free memory slots for future expansions since adding additional memory is often the only performance enhancing option available to fielded units.

Video Interface

A notebook comes configured with either integrated graphics or discrete graphic interfaces and typically cannot be upgraded. Therefore when selecting a notebook the user must consider mission requirements of the unit and whether graphical requirements are adequately addressed. If the notebook must take advantage of the full windows Aero interface, it is recommended that a platform with a discrete graphics interface be procured. For a more detailed description of integrated and discrete graphics refer to the desktop video interface paragraph.

Hard Drive Access Rates

The performance attributes of notebook hard drives and desktop units are the same; refer to the desktop hard drive paragraph.

Trusted Hard Drives

As an optional accessory this CB will also provide trusted hard drives. These drives provide full disk encryption of everything that is contained on the drive. Currently no official policy/procedures for managing trusted hard drives have not been completed, users ordering this device will have the product shipped with the full disk encryption disabled, and local users will have to establish their own internal management process (IAW AR 25-2) should they choose to activate the full disk encryption.

Battery

The CB notebooks are typically equipped with Lithium Ion (Li-Ion) batteries with a power rating ranging from 50 to 80 Watt Hours (WHr). Watt hours are not a specific amount of time the battery will run your device, rather a measure of available power over time. With new batteries users can expect a session period of 3 to 5 hours per charge. Each battery can be recharged between 300-500 charge/discharge cycles over its life time. A lithium ion battery doesn't like full discharges and should be avoided whenever possible. Lithium-ion technology is still being enhanced and should continue to be the battery of choice for notebook manufactures in the future. Elevated temperatures seem to have an adverse effect on lithium-ion battery life. Lithium-ion battery manufacturers believe that a typical life span should be somewhere between 2 to 3 years. Most lithium-ion batteries fail because of exposure to excessive heat rather than the charge/discharge habits of the user. A lithium-ion battery begins to age the moment it leaves the factory, whether it is in use or not so don’t order a second battery unless you plan on using it immediately.