alpha micro **Marketing Bulletin**

AMB2011-01 February 9, 2011

Announcing the AM-9000™ Server System

AMOS™ Performance Takes A Leap Forward With New Technologies
New Archimedes Cache™ Accelerates Disk I/O Beyond Windows'® Abilities

Dear Alpha Micro Dealer:

Alpha Micro is proud to introduce the next generation in our premier line of servers, the AM-9000. The fruit of three years of research and development, the AM-9000 incorporates a number of new technologies which work synergistically to take AMOS application performance to levels never before seen.

As has been the case with all of our post-68000 systems, the AM-9000 is a combination of new Alpha Micro hardware and software developments, coupled with the very best third-party hardware and software. New AMOS enhancements, a new CPU and disk family, a new underlying base operating system, and faster components throughout combine to create a compelling server for demanding AMOS applications.

The Story Begins With The Fastest Available Processor

Alpha Micro has been using AMD microprocessors exclusively since the introduction of the AM-8000™ and Eagle 800™ in 2003. AMD continues to offer excellent CPUs in the lower and middle range. However, for AMOS purposes, at the present time they have lost the lead on ultra-high performance server processors to Intel. Therefore, the AM-9000 incorporates the very fastest Intel server CPU appropriate for AMOS, the four core, eight thread **Xeon® X5677**.

Intended for reliable as well as high-speed applications, Xeons are Intel's high-end server processors. The X5677 in particular provides a number of features that benefit Alpha Micro environments:

First, as with the AMD Opteron®, the memory controller is on the CPU chip. This removes the bottleneck that Northbridge chipsets impose between the CPU and RAM. The faster the RAM operates, the faster virtually everything runs, including disk I/O for cached blocks.

Second, the X5677 provides the highest clock speed of all alternative CPUs. AMOS is primarily a single-threaded environment. All other things being equal, AMOS benefits from the fastest possible clock speed, in order to run that one thread as quickly as possible. The Xeon X5677 runs at an impressive 3.46 Ghz., but even more impressively, if it detects that only a single thread is demanding its time, it partially shuts down its extra cores and boosts the primary core's clock speed to 3.73 Ghz. Now that's fast.

Should a site need extra parallel processing power, the AM-9000 motherboard supports an optional second Xeon CPU.

Double the RAM, Double the RAM Speed

The AM-8000 Series III included 2 GB of DDR2-667 RAM. The AM-9000 kicks it up a notch with **4 GB of DDR3-1333 Registered ECC memory**. The Error Correction function is standard in Alpha Micro's top-end servers and helps them achieve remarkable uptime.

The new class of RAM offers up to ***twice*** the RAM throughput of its immediate predecessor, and ***five*** times the speed of the DDR-266 memory used in the AM-8000 Series I. RAM speed is actually improving at a faster rate than raw CPU clock speed nowadays and is one of the main reasons modern systems perform so much faster than their predecessors. Perhaps most notably, because cached disk I/O is actually performed to and from RAM, the faster the RAM, the faster the disk performance.

Disk Cache benefits from additional RAM on the system, thus we provide 4 GB of RAM standard, the maximum supported by 32-bit Windows.

A Faster, More Capable Multi-Function I/O Board

Integrated circuit technology continues to evolve at an amazing pace. The AM-9000 incorporates a new generation I/O and SSD card for AMOS, which is built around a new, fast programmable I/O controller chip.

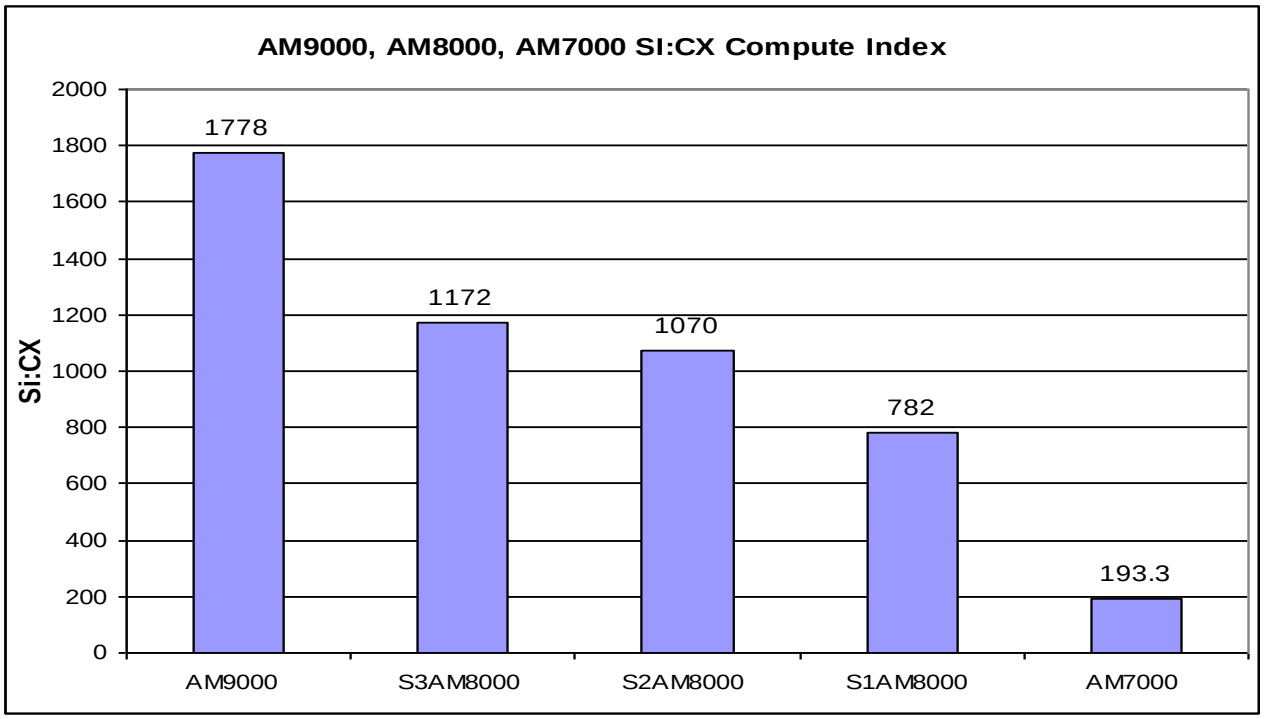
SSD chip performance has been dramatically improved: Applications which call the SSD frequently, such as BASCPP compiles in Metropolis™, will run substantially faster as a result.

Four "Alpha Micro style" serial ports are built onto the AM-113-24, with a new twist: *Each serial port is accessible by Windows as well as by AMOS!* You can also convert your serial printers to "COM Port Printers" and save yourself the cost of AMOS port licenses for those printers, as Alpha Micro does not currently count serial ports TRMDEF'd using PCLPT towards the AMOS port count.

The sophisticated programmability of the new I/O controller chip on the AM-113-24 eliminates the need for the card to run E-AMOS™ to manage its serial ports, eliminating two sources of overhead.

Two forms of PCI slots have evolved: a 5-volt and a 3.3-volt variant. Motherboard manufacturers don't always tell you which version they use. Unlike the AM-8000's AM-113-50 5-volt card, the AM-9000's AM-113-24 will work in either type of PCI slot, providing more flexibility as motherboards debut and are discontinued.

To get an idea of the accumulated AMOS processing power improvement that the new CPU, RAM, and AM-113-24 board bring to the table, take a look at how the AM-9000's SI Compute Index compares to previous Alpha Micro servers. *The AM-9000's processing speed is two and a quarter times faster than the AM-8000 Series I!*



The AM-113-24 does <u>not</u> support AM-359 serial port cards. Demand for AM-359 boards has dwindled in recent years as TCP/IP has become the preferred way of connecting workstations and printers to systems. PCI and USB serial port boards can meet most serial connectivity needs. *If you have a particular requirement for AM-359 connectivity, contact Alpha Micro and we can accommodate your need with a special AM-9000 build using an AM-113-50 board. We have a limited number of AM-113-50 boards available.*

SAS 2.0 / SATA 3.0 Disk Interface

The disk interface channel is another key controlling factor of system performance. The AM-8000 Series III was Alpha Micro's first server supporting Serial Attached SCSI, or SAS. Because it supports Disconnect/Reconnect and a number of other high-end SCSI commands pertinent to hard disk drives, SAS has become the preferred interface for high-end hard disk drives. The initial implementation, SAS 1.0, like SATA 2.0, had a maximum throughput of 3 Gbits/sec. The AM-9000

incorporates the next generation of this technology, SAS 2.0, which doubles the maximum disk throughput to **6 Gbits/sec**.

The SAS and SATA standards are closely allied. The AM-9000's SAS 2.0 interface also supports **SATA 3.0**, the 6 Gbits/sec. version of the SATA interface.

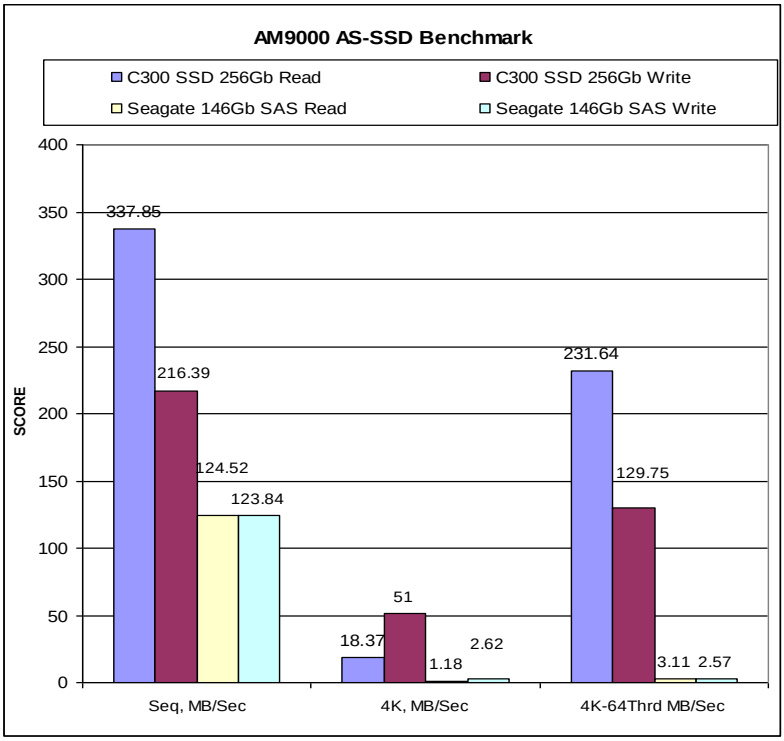
Like previous iterations of the SAS and SATA standards, SAS 2.0 and SATA 3.0 are point-to-point cable configurations. You will no longer need to think about termination, termination power, or sensitive cable length issues that concerned you with SCSI.

The Best of the Fast (Solid State Disk) or the Familiar (Hard Disk)

The past year has witnessed an explosion in Solid State Disk technology. (It will be unavoidable for us occasionally to use the abbreviation "SSD", which is of course also the acronym for Alpha Micro's Software Security Device.) Flash memory technology has vastly improved from its humble thumb drive origins to the point where fast flash memory can now surpass the fastest hard disk drives by impressive margins.

Alpha Micro engineers decided that if we are going to offer a Solid State Disk, we have to do it right. Many of the most highly hyped Solid State Disks suffer from one or more Achilles' Heels. For instance, some models cannot be used as a boot device. Others have impressive reads, but slow writes, or vice versa. Some employ technologies that cause us to question how durable they will be in the 24/7 environment common to AMOS sites. Some are bottlenecked by their choice of interface; even SATA 2.0 can be too slow for some. Some are ridiculously expensive in comparison to peers of comparable performance.

We were able to identify one Solid State Disk that meets all of our criteria: The 256 GB version of the Crucial® C300. With **sequential read throughput of up to 355 MB/sec., sequential write throughput of up to 215 MB/sec.**, and **essentially zero seek time**, no hard drive can touch this device. Our own testing with the AS SSD Benchmark program showed sequential read speeds of 338 MB/sec., sequential write speed of 216 MB/sec., average read access time of 0.1 ms., and average write access time of 0.7 ms. The reviews on numerous web sites confirm our internal testing that the 256 GB version of the C300 (and not the smaller capacity versions) is one of the, if not the, fastest Solid State Disks currently in production.



The C300 is physically the same size as a 2.5" hard disk drive. In order to deliver data to its host quickly enough, the C300 has a SATA 3.0 interface. A Solid State Disk has much faster read times than a hard disk, as all memory locations are accessible at equal speed. Issues of mechanical efficiency and their associated SCSI commands do not apply. Therefore SATA is an appropriate interface technology to be used.

For those who prefer a traditional hard disk drive, Alpha Micro also offers the 145 GB Seagate Savvio 15K.2®, the next generation of the drive that was used in the AM-8000 Series III. The 15K.2 improves upon its predecessor by sporting an SAS 2.0 interface. The Savvio continues to be the fastest hard disk drive tested in real-world conditions by StorageReview.com, in spite of specsmanship practiced by other disk drive vendors. The Savvio's specs are impressive enough: Its read and write performance specs out at **up to 160 MB/sec.** with a **2.9 ms. average seek time**. Our own testing with the AS SSD Benchmark program revealed sequential read speed of 122 MB/sec., sequential write speed of 116 MB/sec., average read access time of 11.9 ms., and average write access time of 3.5 ms.

Microsoft Windows Embedded Standard 7®

Solid State Disks have different characteristics than hard disk drives. Some functions that are good for hard drives can slow down a Solid State Disk. Write and delete operations in particular behave differently. Some functions such as defragmentation are unnecessary and can even shorten the life of a Solid State Disk via unneeded writing.

The International Committee for Information Technology Standards created a specification for a command called TRIM, which allows an operating system to offset certain write operations to the judgment of the Solid State Disk's controller. An OS that supports TRIM will enjoy faster performance and longer life from Solid State Disk drives. TRIM is available in Windows 7®, but not in Windows XP®. This fact, plus the general evolution of technology, provides an impetus for Alpha Micro to upgrade the underlying OS used on our servers.

In keeping with Alpha Micro's tradition of providing virus and malware-resistant server computers, Alpha Micro is building the AM-9000 on top of the latest version of Microsoft's Embedded Operating System: Windows Embedded Standard 7®. For convenience, we will abbreviate this product's name to WES7. Like XP Embedded before it, WES7 allows Alpha Micro to build a base OS with just enough functionality to meet the needs of AMOS, but not enough to invite corruption from external sources.

Improved Cohabitation in Windows Environments

Alpha Micro's build of Windows Embedded Standard 7 provides some improvements that have been requested over the years:

A) <u>Ability to join a Domain:</u> Now it will be easier to share files and printers on a Windows network. This will also permit you to access files on network drives directly from your AMOS programs.

B) <u>Improved Windows multi-tasking:</u> The combination of the Xeon CPU's four cores and Windows 7's improved scheduler means that your AM-9000 can host specialized

applications in addition to AMOS, without fear that those apps will slow down AMOS. Example: The Delegate TCP/IP proxy software is gaining popularity among AMOS users, but it has until now been a resource hog. Now it will be feasible to host Delegate on an AM-9000.

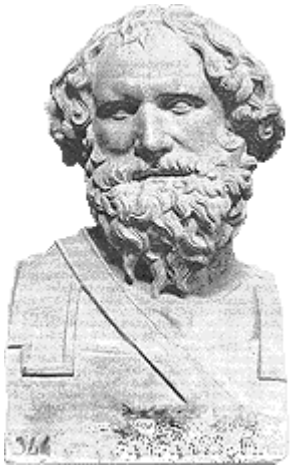
C) Anti-Virus / Anti-Spyware software included: While AMOS itself remains immune to viruses and worms, ever more clever ways of bringing down systems are making their way onto networks. Microsoft Security Essentials® is included in our WES7 builds as a security precaution. The extra cores on the Xeon CPU provide the horsepower to drive this software without affecting AMOS performance.

An Entirely New Disk Caching Approach: The Archimedes Cache

And now something really exciting: By now you've surely noted that many of the above enhancements relate to improving disk performance. Faster hardware and the improved Embedded OS can only take you so far, however.

When the AM-8000 was introduced in 2003, one of its most noteworthy features was dramatically faster disk throughput. The Windows disk cache was a large part of the reason for this jump in performance. Running in native x86 code on a fast CPU with ample memory, the Windows disk cache provides read-ahead and write-behind improvements well beyond what was and is possible with AMOS' 68000-side DCACHE disk cache.

Over the past three years, Alpha Micro has been investigating new ways to improve system performance. Assuming nothing, our engineers analyzed numerous aspects of system throughput. When it came time to look at the disk cache, we discovered that despite our initially favorable perceptions, Microsoft's cache was far from perfect. Scholarly research has been done on disk caching techniques; our staff located and poured over some of the third-party and university-level studies that have been conducted.



After extensive development and testing, we have been able to create a brand-new approach to disk read caching. Deficiencies in the Windows disk cache were identified, and the missing functions were created on the x86 side of AMOS for maximal efficiency. Reflecting its extensive use of mathematical logic, we have named our new system the **Archimedes Cache**. Archimedes was arguably the most accomplished mathematician in history, known among other things for approximating the value of pi, devising formulae that explained volume, describing the mechanics of a lever, and inventing a form of water pump. It also doesn't hurt that he has an "A" and an "M" in his name.

No matter whether your environment is sequential or random file-intensive, we are confident that the Archimedes Cache will significantly improve your throughput. You can enable and disable the Archimedes Cache on the AM9000 Configuration Window, select one of three modes to optimize its performance in your environment, and allocate varying amounts of RAM to it, to determine where it will provide the maximal benefit to your application.

The Archimedes Cache works with both Solid State Disks and conventional hard drives. Of course, the significantly faster underlying performance of Solid State Disks complement Archimedes technology, which is why Alpha Micro recommends that you use them.

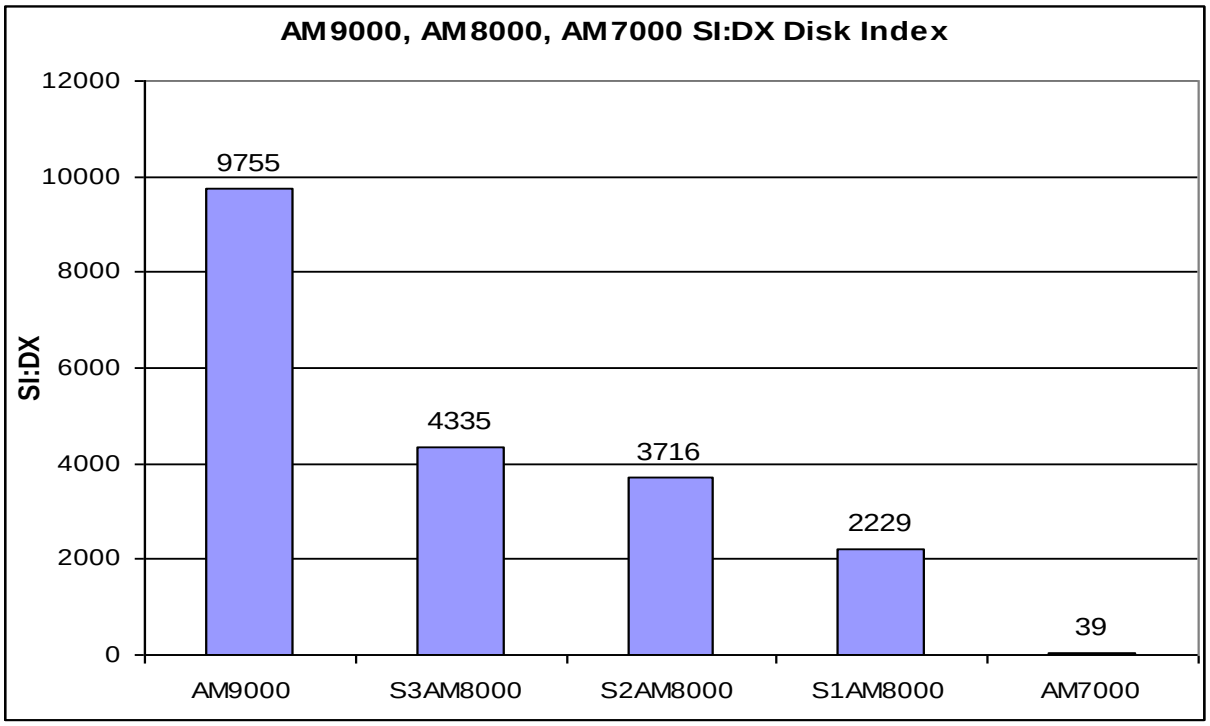
The Numbers Tell the Story

The AM-9000 trounces it predecessors in CPU Speed, Floating Point, and especially in cached Disk I/O. And take a look at this: The Disk SI test yields 39 on an AM-7000, 2229 on the AM-8000 Series I, and 3716 on the Series II, and 4335 on the Series III. **On the AM-9000 with a Solid State Disk, the Disk SI is 9755. *That's over four times the Disk SI of the AM-8000 Series I!***

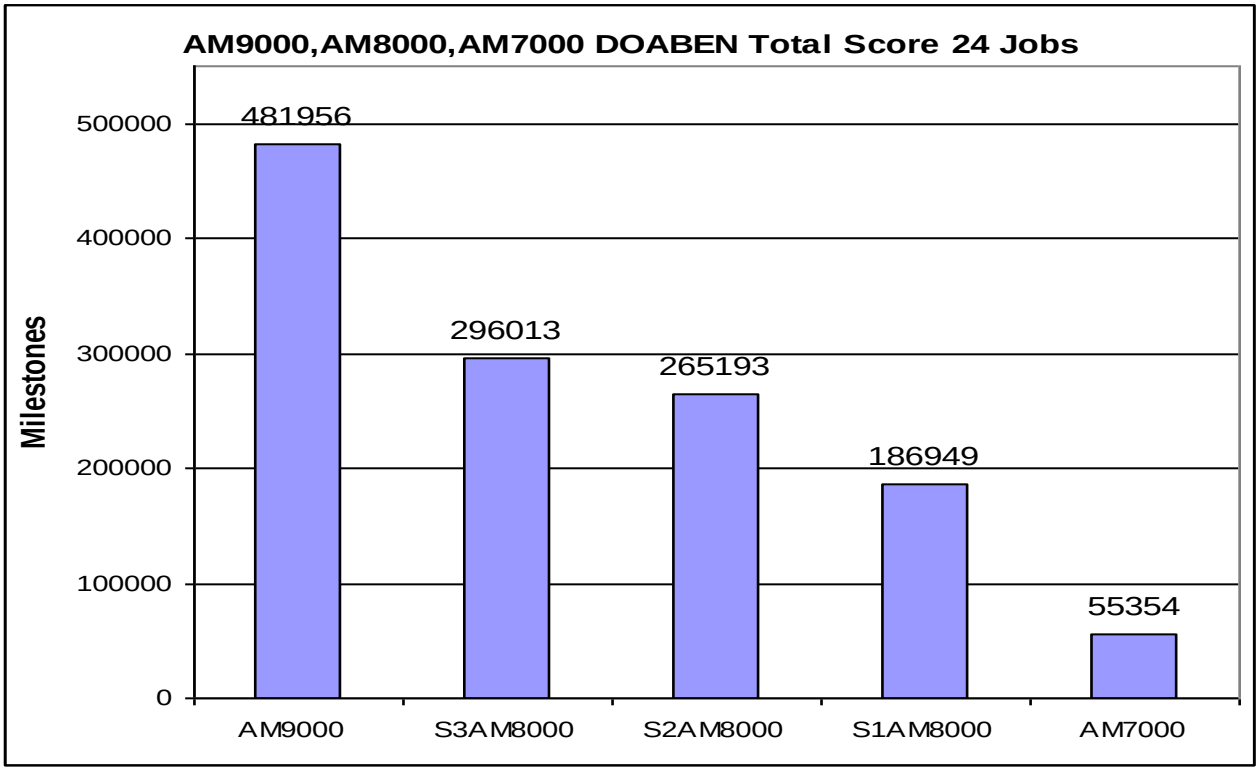
The familiar System Information benchmarking program, SI.LIT, provides a first glimpse into the performance of the AM-9000. The tests using SI display raw compute power and raw disk throughput. All numbers have been updated using the latest Version 1.1(949) of AM8000.EXE

System	*CPU SI:Cx*	*Floating Point SI:4x*	*Dhrystones*	*Disk SI:Dx*
AM-4000	66.1	30	11293	14.8
AM-6000	146	39.7	15531	21
AM-7000	193.3	53.3	21316	39
AM-8000 Series I	782	1264	93567	2229
AM-8000 Series II	937	1511	113882	3716
AM-8000 Series III	1172	1900	142982	4335
AM-9000	**1778**	**3505**	**156259**	**9755**

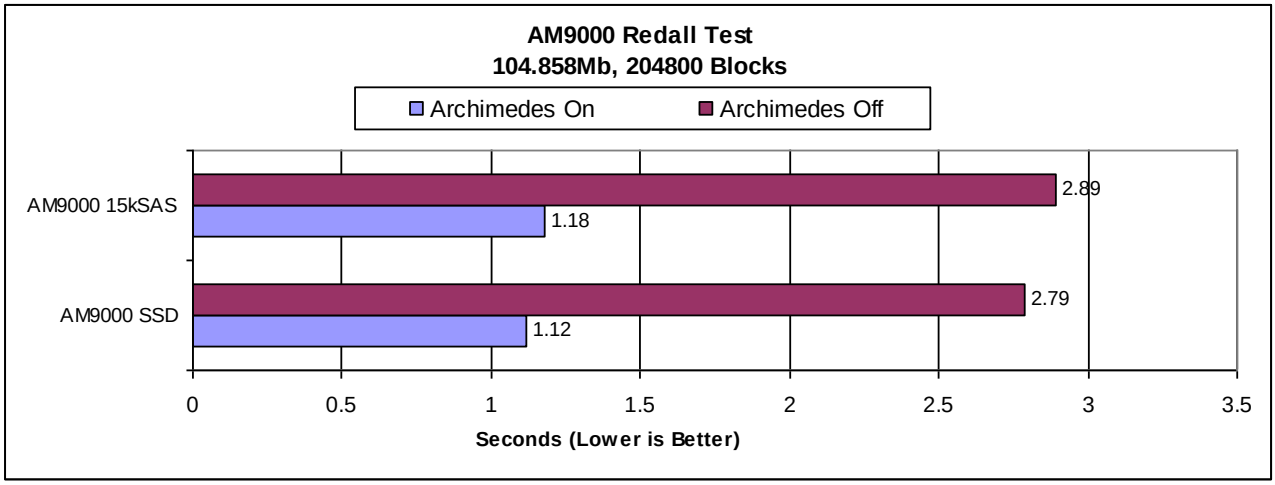
Here you can see the affect that Archimedes Cache Technology has on disk throughput:

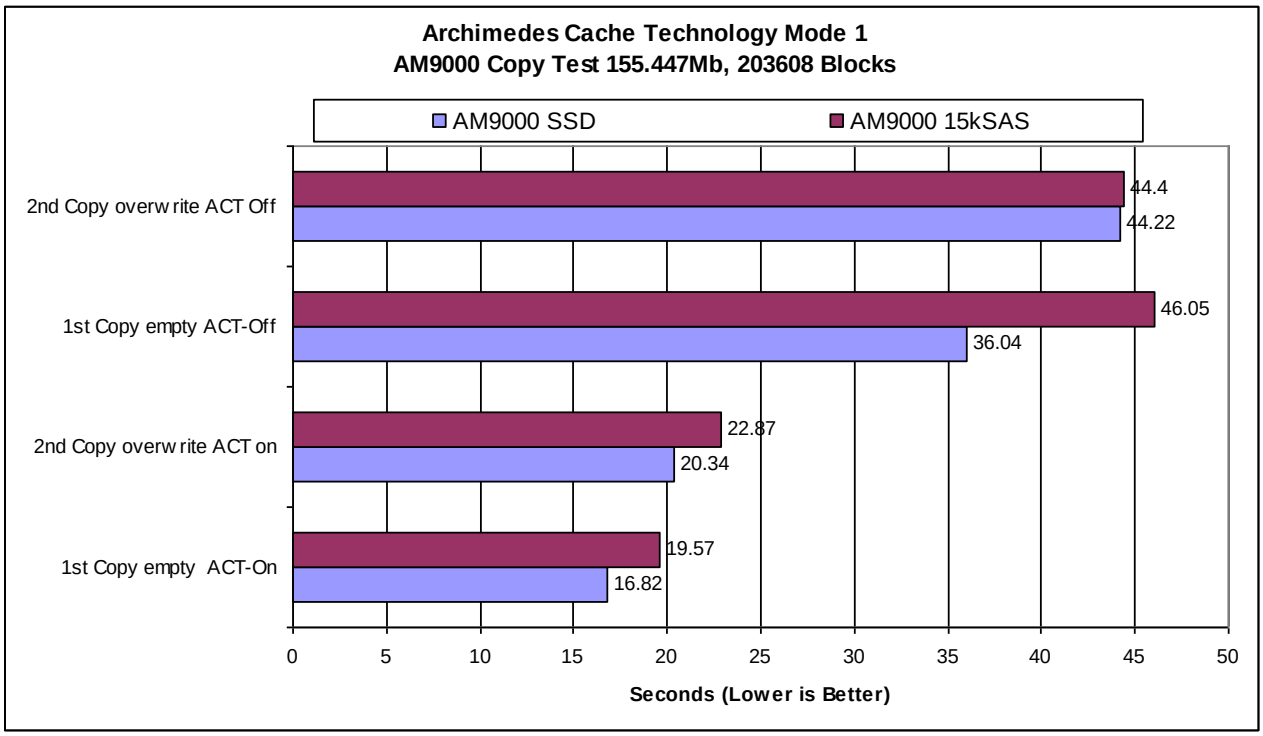


The DOABEN Benchmark is a multi-job benchmark that performs compute tasks, disk I/O tasks, and serial I/O tasks on 24 jobs.



REDALL and logical-to-logical COPY Benchmarks are easy-to-understand disk throughput tests. Note that COPY yields different results when writing to a blank logical versus overwriting existing files. Results are shown with Archimedes Cache Technology ("ACT") on and off.



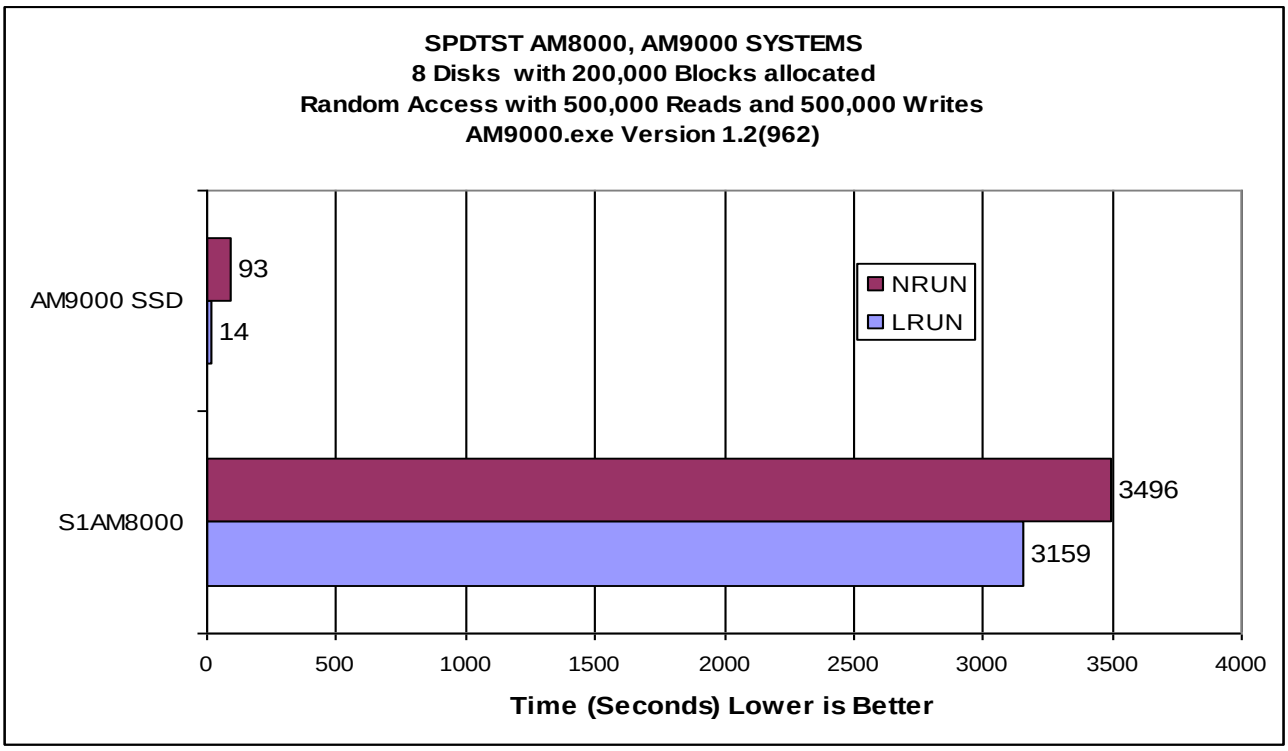


The popular Hoffmeister Benchmark, which consists of a payroll processing application representative of the typical use of an AMOS server, is no longer a useful test. It runs so quickly now that it has become statistically meaningless. To supersede the venerable Hoffmeister test, we have created:

The SPDTST Benchmark: SPDTST is an AlphaBASIC program (source code is available on the Alpha Micro FTP site) which creates PPNs and allocates random files on every logical disk on which there is sufficient room. It then randomly chooses a logical, randomly chooses a record within the random file on that logical, randomly chooses read or write mode, and then reads or writes a 512 byte record. It does this for a specified number of iterations, then deletes all of the random files and PPNs it created. It is a pure test of random AlphaBASIC™ I/O, exercising all of the underlying advancements in hardware and software.

And what a test it is: As the next chart shows, the AM-9000 is ***37 times faster than the AM-8000 Series I*** when both execute SPDTST using NRUN.

Even better...the AM-9000 is ***225 times faster*** than the AM-8000 Series I if LRUN (LightningRUN) is used on the AM-9000 instead of NRUN. That's a greater performance improvement than the AM-8000 Series I offered over the AM-7000, and we all remember how impressive that was. It's so much faster that were we to include an AM-7000 on this chart, the 9000's performance bars would be so short, they would be invisible!



Faster RAID Available

The AM-453 internal SAS RAID is the unit of choice for environments requiring failsafe disk drive functionality. This RAID unit mounts inside the AM-9000 and has been updated to incorporate either Solid State Disks or the new SAS hard drives. Updated pricing on the AM-453 RAID is included in the Reseller Supplement.

The existing AM-452S SATA RAID 1 subsystem is also still available and is also shown in the Reseller Supplement.

Failsafe Redundant Power Supply Available

An optional Redundant Power Supply provides continuous uptime in the event of a failure of one of the two power supply modules. This unit is an ideal complement to the above RAID products to ensure maximum system uptime. And of course Alpha Micro's Automatic Reboot Box will work fine with the AM-9000.

Multiple Backup Alternatives and Improved Windows Backup Software

The AM-9000 sports two interesting backup alternatives: Blu-ray and removable hard drive. Both of these technologies are accessible through AMOS commands and are detailed below. We continue to offer ¼" Streaming Tape Drives as an alternative and familiar form of backup. Please note that tape cartridge pricing has been on the rise, to the point where a tape costs approximately the same as a SATA hard drive/tray combination.

Acronis® True Image™ Backup is included standard with each AM-9000, replacing the venerable Norton Ghost® used in earlier systems. Like Ghost, Acronis provides drive imaging and

bootable backups for disaster recovery. In addition, Acronis offers a variety of options for native Windows backups. You can have your AMD files or even your entire Windows filesystem backed up onto the hard drive or Blu-ray, manually or on a scheduled basis.

The Fastest Blu-ray Backup and Double the Backup Capacity

A new generation Blu-ray drive in the AM-9000 offers faster performance with multiple kinds of optical media including DVD-RAM. Most significantly, it supports the new BD-RE DL double layer rewritable discs. These discs offer ***50 GB of rewritable capacity***, twice what previous Blu-ray drives could support.

Hot-Swappable, Removable SATA Disk Drive for Backup

With the descending cost of high-capacity hard disk drives, it has become possible to offer a high speed backup alternative in the form of removable trays holding SATA disk drives. Backup and restore operations run faster on SATA hard drives than on tape, optical disc, or USB drives. As a result, ***every AM-9000 includes one SATA tray*** with a removable 640 GB backup disk drive.

Hot Swap software is included to permit you to install and remove drives safely while the system is up and running. A Hot Swap operation (drive installation or removal) can be invoked from the AMOS command prompt as well as from an icon on the Windows Embedded boot console screen.

Costs on streaming tape cartridges have increased substantially in recent years. A hard drive backup solution that costs roughly the same as a tape cartridge and offers comparable portability, yet provides much faster backup and random-access file restoral, is simply compelling.

Optional Parallel SCSI

Since 1982, Parallel SCSI has been a popular means of connecting peripherals in the AMOS world. Older RAID units, tape drives, and external hard drives from existing systems typically use some variant of Parallel SCSI. The AM-9000 supports SCSI devices by means of an optional PCI Express add-in card.

Six Serial Ports Standard

There are 2 COM ports on the AM-9000 motherboard, and 4 “Alpha Micro style” serial ports on the AM-113-24 card. There is no onboard parallel port.

Additional serial ports are available by add-in PCI Express cards and via the AM-131-16 16 port USB-to-COM port adapter.

The AM-9000 Serial configuration window has been updated to support up to 36 COM ports to be assigned to AMOS.

Dual Gigabit Ethernet Interfaces

As high-end networks now consider Gigabit Ethernet standard fare, the AM-9000 sports two Gigabit Ethernet ports for maximum throughput. One port is used by AMOS and Windows. A second port can also be used by Windows. Heavy FTP, e-mail, or web serving duties will benefit from this technology.

PCI Expansion

Two PCI Express 2.0 x8 slots, one PCI Express 1.0 x8 slot, and one 32-bit PCI slot support the addition of SCSI and COM port expansion cards. One additional 32-bit PCI slot is occupied by the AM-113-24 card, one PCI Express 2.0 x16 slot is used by a video card, and one additional PCI Express x8 slot is blocked by the video card.

Dual-Purpose Chassis

The AM-9000 is delivered in a universal chassis that may be used for tower or rack mounting. A rack mount kit is optionally available to assist in proper installation in a rack.

Full AMOS License Carryover

AMOS licenses from all 68000 and later systems may be carried over to the AM-9000 at no charge.

LightningBASIC™ Standard

All AM-9000 systems, both upgrades and systems with new AMOS licenses, include a PIC Code for LightningBASIC, our native x86 AlphaBASIC runtime environment.

*True*GUI™ Standard with New Systems

New AM-9000 system orders, that is those that are <u>not</u> upgrades from older Alpha Micro systems, include *True*GUI licenses equal in number to the number of AMOS ports being purchased. This offer is only valid at initial system order time; subsequent port increments to AMOS do not qualify for additional free *True*GUI licenses. Start your new clients off with a GUI view of your application!

Upgrades From Existing Alpha Micro Systems

Trade-ins are available from earlier Alpha Micro systems. The attached Reseller Supplement contains the details of our trade-in programs.

Four Week Test Drives Available

Alpha Micro believes that we are somewhat unique in the computer industry in offering to provide a *four week advance loan* of our systems to VARs on Net 30 terms whose accounts are current. There is nothing like showing your customer the actual performance of our new generation

systems. Alpha Micro has had an exceptional track record with the Test Drive program, with no system ever having been returned for performance reasons.

The fine print: A limited number of AM-9000s are available for the Test Drive program, thus Alpha Micro cannot guarantee availability when you want it. A Test Drive is only offered once per prospective end user and SSD number. For example, a particular user cannot test drive a system in August, return it, and ask for another test drive in January. Either payment or return of the system is required at the 30 day mark. Net 30 terms do not entitle you to an additional 30 days to pay after the date of acceptance, as the Test Drive program is not an extension of credit. Shipping and insurance from Alpha Micro is billable; in the case of a return, the return shipping and insurance are your responsibility. Systems not received back at Alpha Micro 45 days from the date of shipment from Alpha Micro are deemed sold and are not returnable.

Improved Technology – Same Price

In spite of rising high-end CPU prices, Alpha Micro has priced the AM-9000 with SSD *at the same price* as its predecessor AM-8000 Series III system. Opting for a hard disk drive in place of the Solid State Disk offers a slightly lower price, though you are trading performance for those dollars.

Availability

AM-9000 systems are available for shipment now. All pending AM-8000 Series III orders will be filled as AM-9000 orders unless you tell Order Administration otherwise. AM-8000 systems will be treated as custom builds for special requirements only.

Tremendously improved speed – better security and Windows cohabitation – more convenient and economical backup – Windows 7 framework - All reasons why the AM-9000 is an exciting platform for new and existing AMOS sites.

FOR FURTHER TECHNICAL DETAILS ON THE AM-9000, SEE THE INFORMATION PACKAGE, ATTACHED TO THE END OF THIS MARKETING BULLETIN

AM-9000

Information Package

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Introducing the AM-9000

Product Overview

The AM-9000 is at the top of the AMOS product family. Compared to other family members, the AM-9000 system family's most distinctive feature is performance. A CPU SI:CX (System Index:Compute Index) rating of 1782 alone positions the AM-9000 ahead of the AM-8000 Series III by 52%, 122% ahead of the AM-8000 Series I, and 9.2 times faster than the AM-7000. Note that overall throughput is application dependent.

Architecture

The AM-9000 is a leap forward in the high end server product family. The hardware is built around the fastest Xeon 64-bit processor currently available, extending the performance of the existing high end of our product line. The system is housed in a versatile pedestal style chassis which can easily be configured into a 5U rack mountable unit, the same size chassis our latest AM-8000 Series III systems are housed in.

The system configuration is expanded via industry standard technologies. Three PCIe slots and two PCI Express slots are included to accommodate special function boards, such as high speed serial I/O controllers and parallel SCSI controllers to allow maximum flexibility in system configuration and expansion.

The standard system configuration also includes a Blu-ray drive, 17" flat screen monitor, keyboard, and mouse.

The system chassis has plenty of room for future expansion. The AM-9000 houses the standard Blu-ray and initial hard disk drives, and up to 8 additional 5.25"/3.5" peripherals. A total of ten peripheral bays (five 5.25" exposed and five 3.5" hidden), are included in the system, mounted with slide-in rails and secured behind a lockable front door.

Advanced Technology

The AM-9000 leverages leading-edge technology in several areas:

Microprocessor technology — The AM-9000 incorporates an Intel Xeon X5677 quad-core with multi threading microprocessor chip as the top performing processor.

DIMM main memory — The AM-9000 CPU Board has three on-board DIMM (dual inline memory module) expansion slots for each microprocessor, which support DDR3 Registered ECC RAM modules. Memory capacity of 4GB for each processor is supported.

SSD SATA 6 Gbit/sec System Disk —The C300 256GB SSD is used as the system Boot Disk device on one version of AM-9000.

Serial Attached SCSI (SAS) — Eight SAS 2.0 ports are provided in the AM-9000. These ports are used primarily to interface to high capacity SAS 1.0, 2.0, and SATA 3.0 disk drives, one of which is included on each model of the AM-9000.

Serial Advanced Technology Attachment (SATA) — Six SATA 2.0 ports are provided in the AM-9000. These ports are used as the interface to the Blu-ray drive and other high capacity SATA disk drives.

Ultra320 SCSI (Optional) — A PCIe Ultra320 SCSI controller board is available if high speed Parallel SCSI is desired. This optional high speed SCSI bus can be configured to communicate exclusively with high speed wide SCSI disk drives and/or backup devices and other SCSI peripherals (both internal and external).

Gigabit Ethernet — Two Gigabit Ethernet interfaces are provided to maximize both performance and flexibility. These interfaces supports 10 Mbps, 100 Mbps, and 1000 Mbps transfer rates, allowing you to configure your network architecture to meet the needs of your application.

AM-9000 Product Description

Chassis

The AM-9000 is furnished in a versatile deskside and rack mountable chassis, similar to the current AM-8000 Series III, with the following features:

- Sleek styling, with modern black color in standard pedestal configuration.
- Easily reconfigured to 5U rack mountable configuration with low cost optional rack mount kit.
- Ten peripheral bays (five 5.25” exposed and five 3.5” hidden), mounted with slide-in rails and secured behind a lockable front door.
- Black peripherals (monitor, keyboard, mouse, Blu-ray drive, streamer) will be provided to maintain consistent system appearance.
- Dimensions—16.8" high x 8.7" wide x 23.6” deep (42.7 cm x 22 cm x 60 cm)
- Power requirement—5 amp @ 115VAC; 2.5 amp @ 230VAC

Main Memory

Main memory for the AM-9000 is implemented in high-speed Registered ECC DDR3 RAM, packaged in DIMM modules on the AM-9000 main CPU board. 4GB is included as standard with every AM-9000.

The AM-9000 main CPU board is equipped with three DIMM sockets for each Xeon processor. Always install memory in order, starting with DIMM socket 0 (closest to the corresponding processor on the board).

System Disk Drive

The AM-9000 includes either a 256GB Solid State Disk drive or 145GB high speed SAS hard disk drive, depending on the model purchased.

Blu-ray Drive

The new Blu-ray drive is now standard in every AM-9000 for backup. It is backward-compatible with DVD-RAM and CD formats, for compatibility with your existing backups. Disc media is available in 25 GB and 50 GB capacities. See our previous Marketing Bulletin AMB2007-08 for complete details on this new kind of drive.

Alpha Micro’s new MAKBD backup software is included with the AM-9000, assuring the maximum possible utilization of the Blu-ray media’s capacity.

Removable SATA Hard Drive Tray

One removable SATA hard disk drive is included as standard. Used in conjunction with provided Hot Swap software, this drive may be removed and inserted while the system is up, providing a high-speed, random access form of backup.

Serial I/O

The AM-9000 has six serial I/O ports as standard. The ports appear as four RJ-45 jacks and two PC style DB-9M connectors on the rear of the system. Additional serial ports are optional and can be implemented in a variety of ways.

The preferred method is to install 8 port PCIe serial I/O controllers. The second method is to install COM ports with 16 port USB serial I/O controllers external to the chassis. Also, you can connect a terminal server via an Ethernet connection to the AM-9000.

The last method is to externally install AM-359 cards in a Serial I/O chassis like the existing AM-905-31 or AM-3501 chassis, and cable the AM-9000 system to the external I/O chassis. This requires a special build of AM9000.EXE and use of the AM-113-50 SSD Co-processor board to be installed instead of the AM-113-24 board. Up to 15 AM-359 cards (8 serial I/O ports each) can be externally connected to the I/O processor board within the AM-9000 for a total of 120 additional serial I/O ports.

Table 1. AM-9000 Serial I/O Options

Line No.	Configuration Details	I/O Cards	Total Serial Ports
101	***Maximum COM Ports mappable in AM9000.EXE = 36***		
102	Standard serial COM ports in AM-9000 system		2
103	AM-113-24 Serial I/O Controller (4 on-board RJ-45 ports)		4
104	Two additional PCIe Serial I/O Controllers (8 on-board DB-9 COM ports per board)		16
105	**Total serial ports inside AM-9000 system**		**22**
106	***Maximum Ports with external AM-3501 Expansion Subsystem***		
107	Standard serial ports on AM-9000- with AM113-50 + 2 COM		6
108	AM-359 cards in AM-3501	7 AM-359 cards	56
109	**Total serial ports: AM-9000 + AM-3501**		**62**
110	***Maximum Ports with external AM-905-31 I/O Expansion Chassis***		
111	Standard serial ports on AM-9000 with AM113-50 + 2 COM		6
112	AM-359 cards in AM-905-31	15 AM-359 cards	120
113	**Total ports: chassis + AM-905-31**		**126**

Line numbers are for reference during telephone conversations and have no other significance.

The AM-9000 chassis contains either one AM-113-24 or one AM-113-50 as an optional configuration.

The AM-113-50 board includes four on board serial I/O ports (RJ-45) and the ability to externally drive up to 15 AM-359 paddle cards housed in either an AM-3501 or AM-905-31 I/O subsystem chassis. Two standard DB-9 serial I/O ports are also included in the AM-9000, for a total of six serial I/O ports in the base configuration.

Assuming 2 PCIe slots are available for PCIe 8 port Serial I/O Controllers, 22 COM ports are supported, including the two on the motherboard plus 4 on the AM-113-24 or AM113-50 boards.

The external USB ports can also use 8 or 16 port USB Serial IO controllers that can map these COM ports in the Serial Configuration page of the AM-9000. The current maximum number of total COM ports allowed is 36.

The maximum physically-installable AM-9000 configuration is 120 serial I/O ports with the optional AM113-50 configuration.

PC and AM-82 Thin Client Workstations on the AM-9000

PC workstations can connect to the AM-9000 serially or, more often, via Ethernet. Connection is supported by popular terminal software such as AlphaLAN^{++}, STEP^{++}, and ZTERM.

The AM-82 Thin Client is a small footprint, diskless PC that boots up directly into AlphaLAN. It supports Ethernet as well as serial connections. It offers the benefits of a full PC with lower cost of ownership, because it needs virtually no administration once set up.

In addition to the convenience of remote access, these workstations can enhance system performance. That's because, generally speaking, an Alpha Micro computer is more efficient in processing data for Telnet sessions than for serial connections. We've run benchmark tests to prove it. Our tests show the following:

1. For a given level of throughput, an Alpha Micro computer will support more users on a network than it will using serial terminals.
2. When you add users, an Alpha Micro computer will handle the increased load much more efficiently if the users are on Telnet connections. Throughput per user on Telnet sessions remains relatively constant as the load increases. On serial connections, throughput per user declines rapidly.

SAS and SCSI Support

The AM-9000 incorporate eight Serial Attached SCSI (SAS) ports for attaching high speed SAS hard disk drives.

In addition, PCIe Parallel SCSI controllers are optionally available for attaching traditional narrow and wide SCSI peripherals such as tape drives and disk drives.

SAS and SCSI Devices for the AM-9000

A wide choice of disks, tapes, and other SAS and SCSI devices helps tailor the AM-9000 to specific site requirements. An AM-9000 supports up to eight SAS or SCSI devices mounted inside the chassis (internal devices). To maximize the overall performance of the AM-9000, the highest speed SAS or Wide SCSI disk drives and/or RAID subsystems should be included in your system configuration.

SAS and SCSI Disk Drives

The AM-9000 can use a high speed SAS disk drive as the standard system disk. It attaches to one of the eight SAS ports contained in the system.

The AM-9000 can also support all Fast-Wide SCSI-2 and Ultra SCSI drives used in previous AM-8000 systems using an optional PCIe Parallel SCSI controller.

SCSI Tape Drives

The AM-9000 supports all current SCSI tape drives attached to an optional PCIe Parallel SCSI controller.

RAID Subsystems

For AM-9000 installations that require large, highly reliable mass storage, you can choose either our AM-453 internal SAS or Solid State Disk RAID subsystem, or the self contained AM-452 SATA RAID subsystem.

Software

AMOS Operating System

AM-9000 systems require AMOS 8.2 or later.

System Performance

Performance of the AM-9000, like that of any computer, is application dependent. The best way to determine actual throughput is to run an application and measure the results. If such a test isn't practical, benchmarks can provide a relative measurement.

The benchmarks in this bulletin are offered for general comparison analysis and example only. For definitive measurements, VARs and end users should verify actual performance based upon their specific applications and environments. The benchmarks we use give an overall indication of system throughput. It's important to note that the way your application software uses the system may produce results different from those suggested by our benchmarks.

System Index (SI)

The SI benchmark measures processor and memory performance in the AMOS environment. The measure is relative to the original 68000-based Alpha Micro computer, the AM-100/L, which was arbitrarily assigned an SI of 1. See Table 2 below, and the graph at the beginning of this bulletin; bigger numbers are better.

Keep in mind that the SI reflects processor, floating point, and disk speed only, not overall system performance as users will experience it. Factors such as methods of disk accessing and the effect of multiple users are not measured. For a more comprehensive view, see the DOABEN benchmark in the next section.

Table 2. AMOS System Performance Comparison Chart

System Model	CPU	*SI*	*DRY* Dhrystone Benchmark	*SI:DX* Disk Channel	*SI:4X* 48-bit Math
AM-100/L	68000	1.0			
AM-1600	68020	22.6			
Falcon/AM-PC 4.0	68340	16.1			
AM-2000M (33 MHz)	68020	28.0			
Eagle 100	68030	39.1	6510	15.3	34.3
Eagle 250	5102	59.9			
Eagle 450	5102	61.1			
AM-3000 VME	68030	43.6			
AM-4000M	68040	66.1	11293	14.8	30.0
Eagle 500	68040	79.9			
Super Eagle	68040	79.9			
AM-6000/6060	68060-66	146.3	15531	21.0	39.7
AM-7000	68060-75	193.3	21316	39.0	53.3
AM-8000 Series I	Dual Athlon MP-2800+	801	93567	2229	1264
AM-8000 Series II	Opteron 256	1070	113882	3716	1511
AM-8000 Series III	Opteron 2224	1172	142982	4335	1900
AM-9000	**X5677**	**1782**	**156259**	**9755**	**3505**

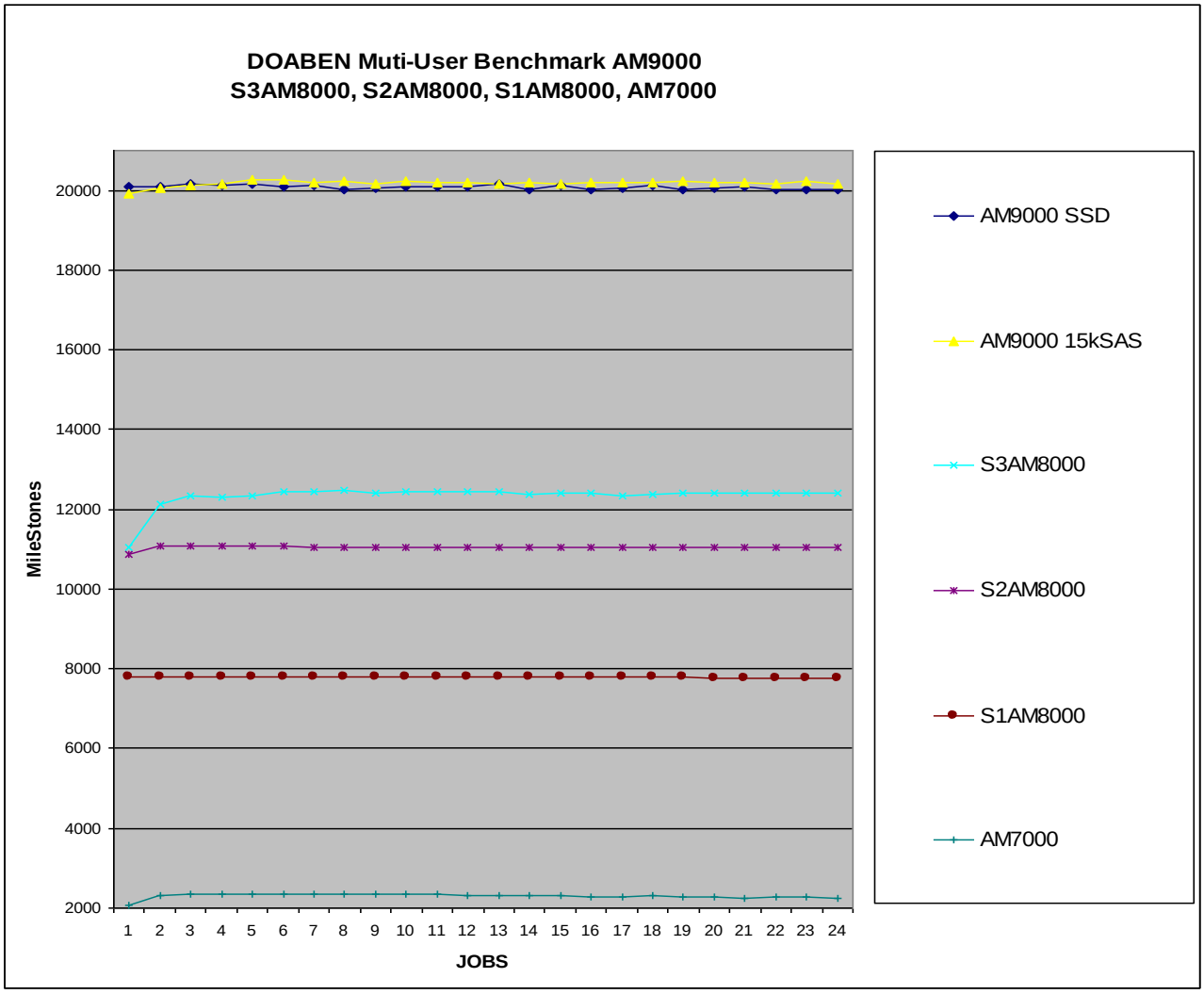
DOABEN Benchmark

DOABEN (**do a ben**chmark) is a suite of tests that measure multi-user throughput on Alpha Micro computer systems. Performance is measured in units called Milestones, which represent the number of tasks that can be done in a certain period of time for a prescribed number of users. Programs in the DOABEN suite exercise the system by cycling through functions such as database access, program loading, and CPU usage.

The results of DOABEN testing on the AM-9000, AM-8000 Series I, Series II, Series III and three other high-end systems: the AM-7000, are shown in Figure 3.

- **156% faster than an AM-8000 Series I** — The AM-9000 sets the record for DOABEN performance.
- **More than 8 times faster than the AM-7000** — and of course, further ahead of the older high end systems.

Figure 3. DOABEN Comparison



Dhrystone Benchmark

The Dhrystone benchmark is a widely used measure of CPU performance. The Dhrystone algorithm is written in the C programming language and performs a variety of tasks including manipulating strings and arrays, and handling integer math and subroutines. While the Dhrystone test measures CPU performance only, and not disk activity or other system loading, it does provide a useful comparison of one processor with another.

Our Dhrystone tests of the high end servers gave these results (bigger is better):

AM-8000 Series I:	93567 Dhrystones per second	40% slower than AM-9000
AM-8000 Series II:	113882 Dhrystones per second	27% slower than AM-9000
AM-8000 Series III:	142982 Dhrystones per second	8% slower than AM-9000
AM-9000:	156259 Dhrystones per second	