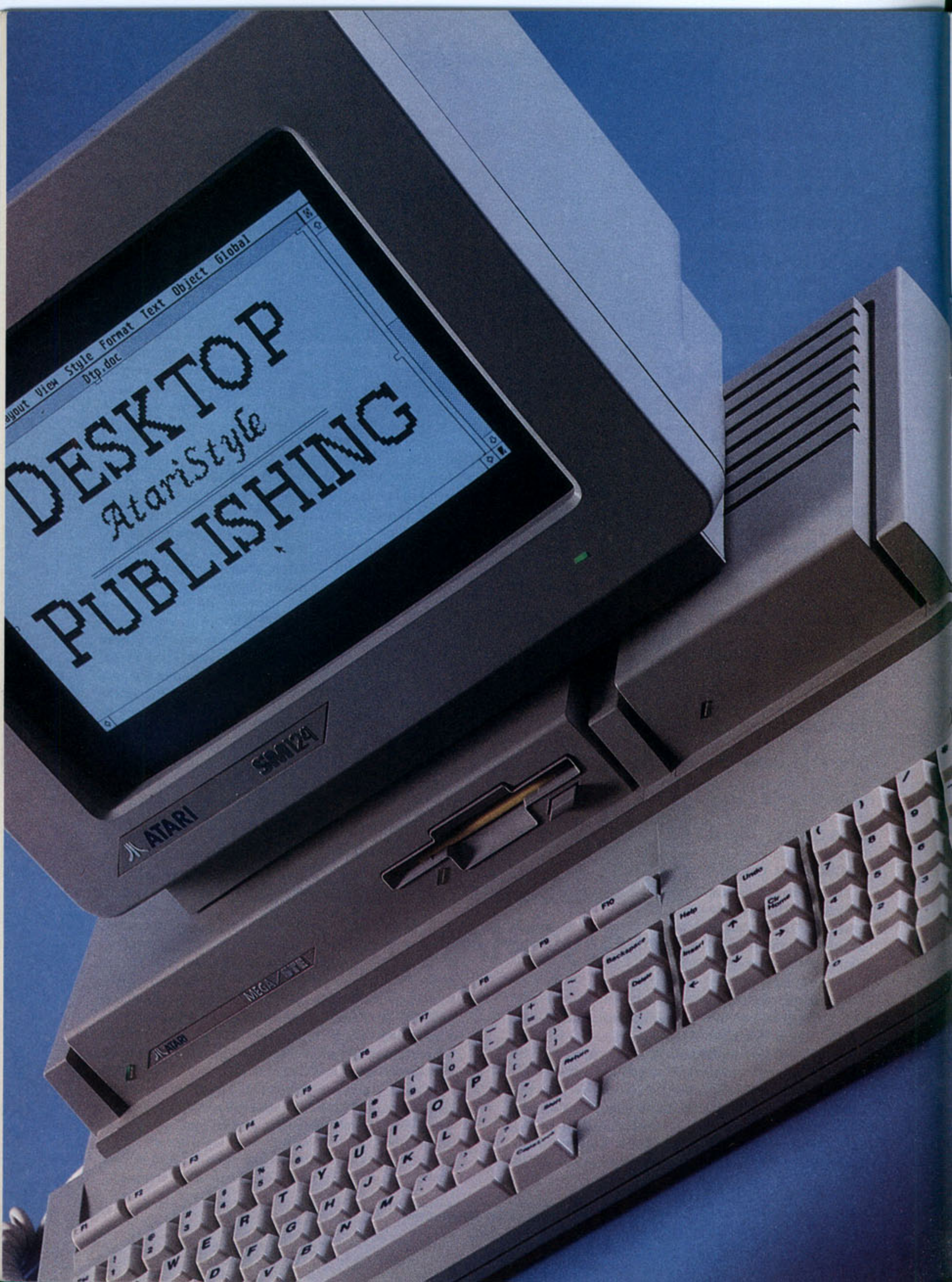
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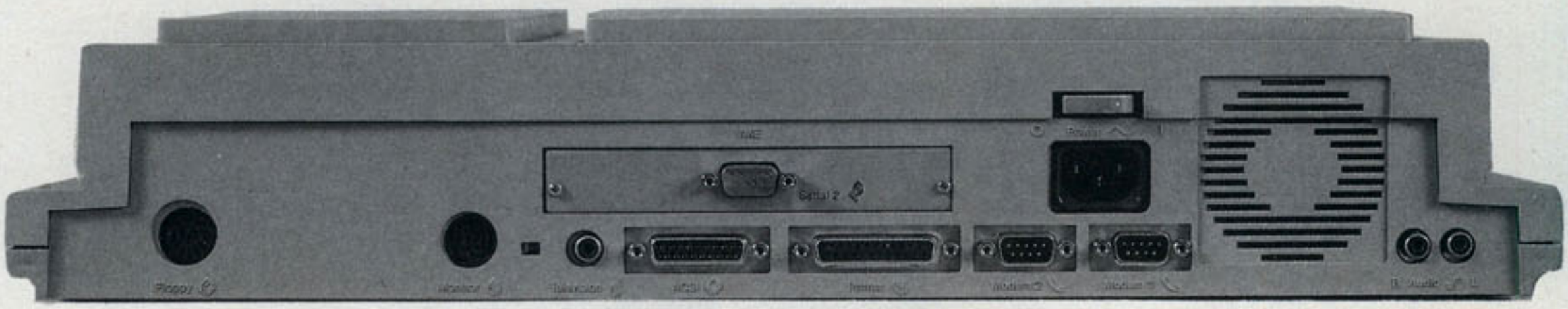
The Mega STe: Hands-on!

Prior to last year's November Comdex, industry observers were speculating that the TT030 computer — Atari's long-awaited TOS/Unix-compatible — would be the focus of Atari's presence at the show. Yet while the TT was certainly a must-see, proving Atari's ability to bring workstation performance to the desktop at low cost, it was by no means the only focus of attention at November Comdex, either circumstantially or by design.

Atari's new 16 MHz Mega STe offers affordable power for business, networking, and more!

Sharing the spotlight with the TT030 was another new Atari computer that may, over the course of its product life, prove to be as significant an innovation. This is the Mega STe, an enhanced version of the STe computer introduced early last year. Sporting 16MHz microprocessor speed, 4,096 colors, DMA sound, multiple serial ports, a built-in LAN port, a VME slot, an in-

By AE TECHNICAL STAFF



Back view of the Mega STe, showing ports and connectors. From left to right, these are: floppy disk, monitor, TV, DMA, Serial 2, Printer, Modem 2, Modem 1, and stereo jacks.

ternal hard drive, and new systems software, the Mega STe is designed to form the basis of the product line for which the TT is culmination. Indeed, many aspects of the Mega STe's architecture — both internal and cosmetic — come out of the same lines of research that produced the TT030, and represent a back-application of advanced technology and ergonomics to a field-proven and stable product; a combination that delivers improvement without compromise.

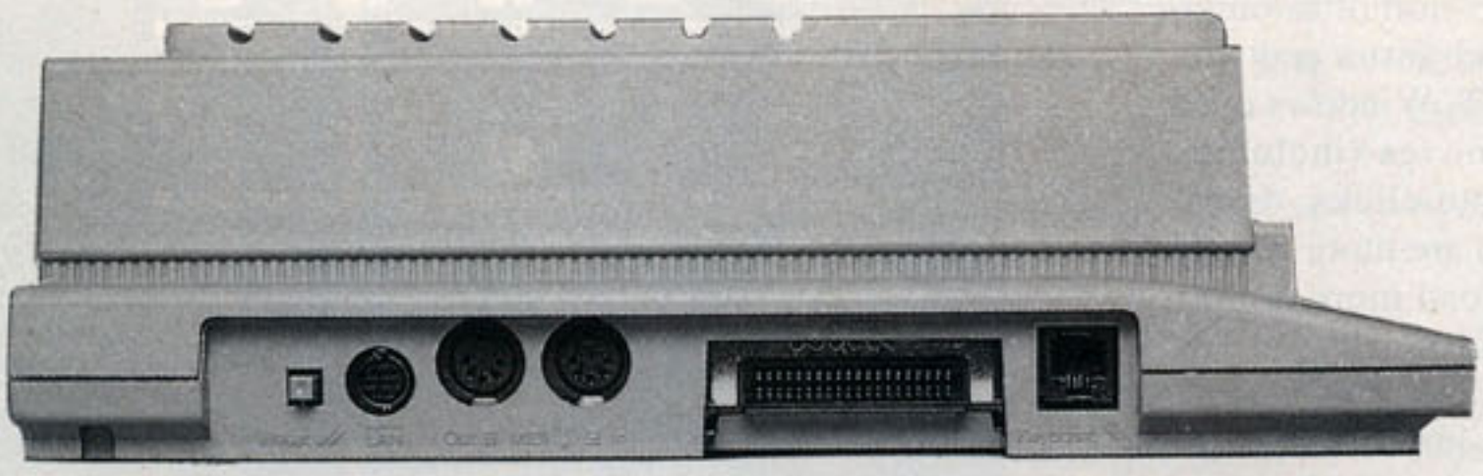
Small and Simple

Adapted from Ira Velinsky's design for the TT030, the Mega STe is small and easy to set up, offering the convenience of a low-profile, small-footprint enclosure and easily-accessible connectors. The grey base system unit, which contains the motherboard, one 720K ST-standard floppy drive, and a hard disk, measures a scant 19-1/4" wide by 11-1/4" deep by 3-1/2" high. The left side of the case, where the motherboard resides, is braced to support a monitor. Cooling vents, contained in shallow troughs atop the case, permit airflow no matter what the configuration of the monitor base. To the right of the motherboard enclosure, a separate hatch covers the hard drive, allowing for easy upgrade and servicing of the hard disk subsystem without sacrificing the elegance and simplicity of a monolithic case. Motherboard and hard drive subsystems rest on an "I/O pedestal" whose rear integrates with the backplane and whose left-hand side contains connectors for keyboard, MIDI, cartridge, and LAN. The front rim of the pedestal forms a rest for the detachable keyboard, so that the system may be set up as a one-piece workstation, if desired.

With the release of the Mega STe, all current Atari systems now possess the same set of enhanced graphics and sound features.

The separate keyboard, identical except in color to the one on the TT, is an evolutionary improvement on keyboards used with the original Mega series. Measuring only 6-1/2" from front to back, the new keyboard allows a bit more desk space, while maintaining the original Mega's full-size, sculpted layout. The main keyboard, cursor-control keys, and separate numeric keypad remain in the same relation to one another as in the original Mega design. The Mega's embedded function keys, however, have been replaced on the Mega STe with raised, full-travel keys, that are somewhat easier to press. Above the function keys is a convenient pencil well/template mounting. Particularly appealing is the fact that the mouse and joystick ports, long hidden beneath the keyboard in original Mega designs, now project accessibly from the right and left sides of the keyboard.

The Mega STe's backplane (see above) contains more ports than a standard ST or STe. Most notably, the Mega STe offers the STe-standard RCA "video out" port, which permits use of an NTSC color monitor or television (with RF adaptor), and left and right stereo audio ports. Replacing the STe's single 25-pin serial connector are three industry-standard 9-pin serial ports, labeled "Modem 1," "Modem 2," and "Serial 2," the latter mounted on a removeable plate that fits in a backplane knockout. The knockout, labelled "VME," can optionally be used to provide backplane access for an internally-installed single-Eurocard-sized (3U) VME board. It is expected that by the time this article reaches print, at least one third-party vendor will announce a 1 Mbit sec. VME Ethernet board that can fit in this slot.



Side view of the Mega STe, showing (left to right) LAN connector, MIDI ports, catridge slot, and keyboard connection.

All serial ports support full handshaking. Modem 1 and Modem 2 are drawn, respectively, from one of the Mega STe's two 68901 Multi-Function Peripheral chips and from the Mega's new Zilog 8530 Serial Communications Controller (SCC). Serial 2 is drawn from the second channel of this controller, which may be reprogrammed to drive the LocalTalk-compatible LAN interface. The SCC can also be programmed to provide support for both asynchronous (RS-232, RS-423) and synchronous byte-oriented protocols (HDLC, SDLC) used in wide-area networks.

Our test unit came equipped with 4 MB of RAM, and a 50 MB built-in hard drive. Like the original Mega series, a built-in muffin fan cools the motherboard, though at no time during testing or subsequent use did we notice any particular tendency of the system to overheat. The hard drive subsystem is well-integrated with the Mega STe system as a whole. Fast and reliable, it comes preformatted with system software installed, though the end-user is naturally free to reformat and/or repartition the drive as necessary. The problem of turning on the whole system from one power switch has been solved with circuitry that delays bootup until the hard disk has come up to speed. The pause also makes it easier to boot the system from floppy disk, in the event that the hard disk should become corrupted. Additional hard drives or other ACSI-compatible peripherals may be added to the system by plugging them into the DMA port.

With all speed-up options active, the Mega STe's performance is nothing short of astounding.

High-speed Processing

The Mega STe is capable of substantially faster throughput than a standard ST or STe, while retaining the highest possible degree of compatibility with existing ST software. Indeed, in its most basic mode of operation, the Mega boots in a fashion that makes it electronically identical to a standard STe, insuring total compatibility with even the most "system-hostile" programs (e.g., programs that use software loops for timing, that modify their own instructions on the fly, that employ the high bytes of pointers as data, etc.)

Using the enclosed General Setup utility (part of a suite of Control-Panel Extensions distributed with the machine), the system can be configured to boot with the CPU at 16 MHz, with or without memory caching. With cache disabled, the Mega's CPU executes individual instructions twice as fast as that of a standard ST or STe, though access to all other system features —notably RAM memory — still occurs at the overall system clock rate of 8 MHz. With memory caching enabled, however, an entirely new dynamic takes over. In this mode, sections of code are moved into a 16K fast-RAM buffer, from which they can be executed at the processor's full speed. The algorithm used to fill the memory cache is highly intelligent, employing both statistical and analytic methods to determine which sections of code will be cached; and is even capable of caching sections of code which normally reside far apart in main memory.

Also distributed with the Mega STe is Atari's disk-caching utility, CACHEnnn.PRG, that attacks the performance-limiting factor of hard-disk access speed. Installed at boot time from the \AUTO folder, the cache establishes a user-definable set of RAM buffers into which File-Allocation Tables (FATs), directories, and sectors are read from disk, according to the order and frequency with which they are accessed by software. As a work-session continues, the contents of the cache typically become better and better "tuned," until eventually, a very high percentage of disk access is actually taking place in the form of transactions to and from main memory — in other words, at RAMdisk speeds.

With all of these speed-up options active, the

Mega STe's performance is nothing short of astounding. Subjectively, things happen much faster and with greater fluency than on a standard ST. Windows open and close more quickly; mouse moves (including menu selections, single- and double-clicks, drags, resizes, and other gestural controls) are more crisply and reliably processed; programs load more rapidly and terminate more neatly; disk files are read and written in half the time, on average, and often better.

To quantify these subjective impressions, we developed a series of three benchmark tests designed to stress different aspects of machine function. Benchmarks were programmed using the Mark Williams C-language Development system. The first benchmark is processor-intensive, employing no I/O and little memory access. Basically, it just sets one of the 68000's registers to zero, then increments this register half a million times. The second benchmark is disk-intensive. Employing standard I/O library functions, it creates a disk file 1,000 characters in length, then reads this file back into memory, character-by-character. The third benchmark involves compiling and linking a 900-line C-language source file with multiple include files and library references. This is a sort of "worst case" application scenario: a task involving both a substantial amount of computation and almost continual disk access.

The first two benchmarks were timed by executing them as subroutines of a master program that references the system's 200 Hz timer interrupt, insuring that the results would reflect only execution time, and not loading time. The compiler benchmark was timed using the Mark Williams "time" function, a profiler that times execution of a program from start to finish, including load time for the compiler, assembler, linker, and various overlays. Benchmarks were executed on the Mega STe at 8 MHz, at 16 MHz without memory cache, and at 16 MHz with cache enabled. Additionally, the disk and compile benchmarks were executed in all permutations both with and without disk caching.

The results confirmed our subjective impressions. Our processor-intensive benchmark ran moderately better when the CPU was kicked up to 16 MHz alone; more than twice as fast when memory caching was enabled. On the surface, this would seem impossible, since true doubling of performance would require increasing the speed of all components — not the case in the Mega STe. We speculate, however, that part of the performance edge demonstrated here may result from the fact that the system services disproportionately fewer interrupts during execution of the routine at higher speeds.

Our disk-intensive benchmark revealed some interesting facts about how different performance enhancements can work synergistically to produce dramatic results. When the benchmark was executed with the Mega's disk-caching utility disabled, perfor-

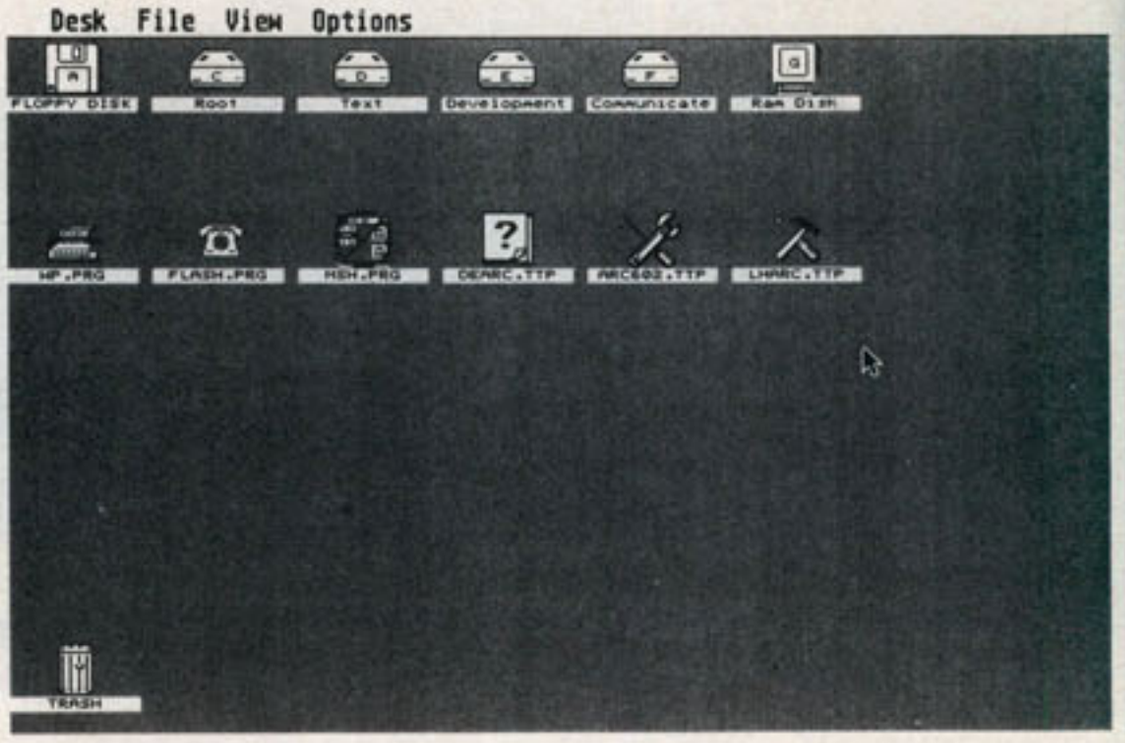


Figure 1. The Mega STe desktop, showing icons for standard devices and a typical working suite of applications

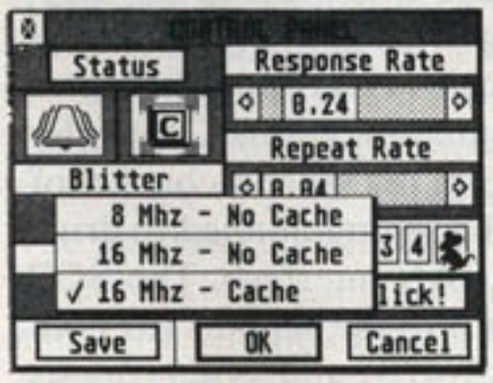


Figure 2. The Extended Control Panel's General Setup CPX, showing its submenu of Mega STe processor speed options.

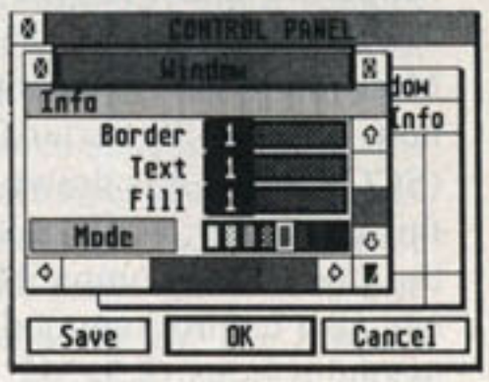


Figure 3. The XCP's Window Colors CPX, shown in the process of applying custom halftones to window sections.

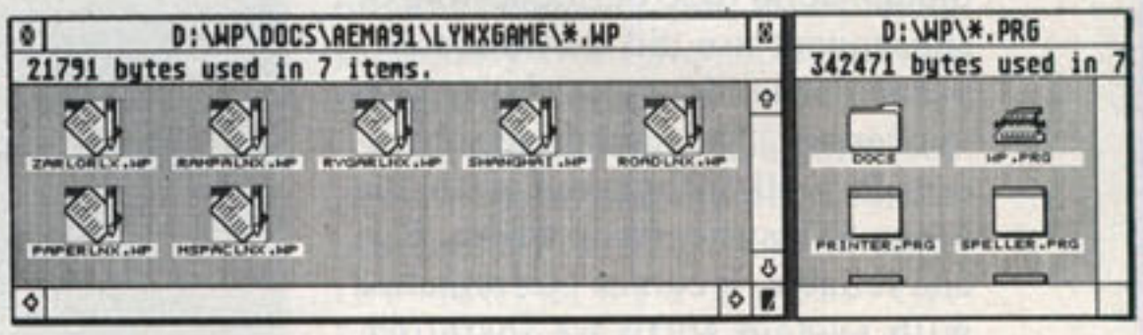


Figure 4. A pair of semi-custom windows, showing installed icons for an application (WordPerfect) and its data files (.WP files). Note use of file-masking to display only relevant items.

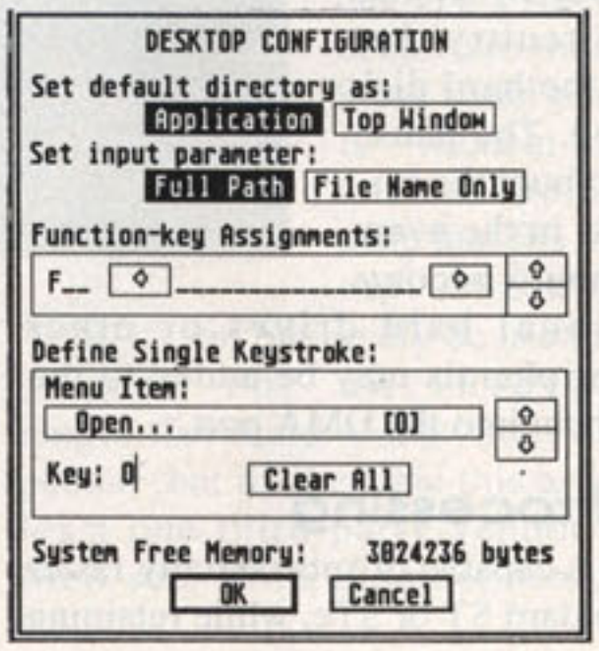


Figure 5. The Desktop Configuration dialog, which permits the user to define keyboard equivalents for Desktop functions.

mance was only very slightly improved by switching to higher processing speeds. But when the disk cache was installed, results more or less paralleled the processor benchmark — performance improved moderately at 16 MHz, almost 100% when the memory cache was also enabled. In other words, when the disk cache utility was not present, disk-access speed became a performance-limiting factor that far outweighed the importance of processor speed. When the disk cache was installed, however, disk access became sufficiently rapid so that processor speed was significant in determining overall execution time.

	8 MHz	16 MHz	16 MHz/ cache
BENCHMARK #1:			
(register increment)	142 ms.	116 ms.	64 ms.
BENCHMARK #2:			
(file create/read)			
w/o disk caching	68 ms.	69 ms.	70 ms.
w. disk caching	51 ms.	49 ms.	28 ms.
BENCHMARK #3:			
(compile and link)			
w/o disk caching	52.205 s.	51.660 s.	41.230 s.
w. disk caching	47.120 s.	46.620 s.	32.250 s.

Table 1. Benchmark comparisons of Mega STe performance. Tests were performed on a 4 MB Mega STe with factory-installed 50 MB hard disk. Performance at 8 MHz is equivalent to STe performance.

Our compile-and-link benchmark proved about equally vulnerable to processor speedup and disk caching, topping out at a little over 80% improvement when all speed-enhancing options were in effect. We would hazard that for most typical processes (spreadsheet recalculations, database searches, file conversions, etc.), the Mega STe user can expect this degree of performance enhancement over ST norms.

Moreover, though processor speed and disk-caching are framed as options on the Mega STe, ostensibly for the sake of software compatibility, we have found no software that is not capable of exploiting all of the Mega STe's speed-up options productively. Our test unit, running flat-out at 16 MHz with memory cache enabled and and disk cache installed, has quietly and reliably (not to mention quickly!) taken over Explorer's editorial, financial, program development, and internal desktop publishing work — all without a single hitch. Such standard programs as WordPerfect, PageStream, LDW Power, Mark Williams C, Flash!, DBMAN V, and others, all function perfectly in the Mega STe environment.

System Software

Another feature the Mega STe shares with the TT is the new Desktop and Extended Control Panel, both of which were described in detail in a feature article in Explorer's January/February 1991 issue (see "The TT Desktop: Hands-on," Atari Explorer, Jan/Feb 1991, page 36). Briefly, the ST's standard desktop has been improved by the addition of numerous new features that make it a far more powerful and flexible tool for file- and system-management. Among the new features are the ability to alter the color and style of desktop background and window details, to establish unique icons for different classes of devices and files, to move file and application icons to the desktop for easy access, to search directories and subdirectories, and to display only selected files in a window via filename-masking conventions. Additional improvements include the automatic resizing of windows and reshuffling of their contents to permit the display of the maximum amount of information. The new Desktop conceals numerous hidden enhancements as well, among them, the ability to establish a startup environment for GEM applications, and the ability to define keyboard equivalents for desktop functions.

Enhancing the power of the Desktop is the Extended Control Panel, a complete reformulation of the original Control Panel desk accessory that creates an entirely new class of "sub-application": the so-called "Control Panel Extension," or CPX. CPXs are somewhat like desk accessories, in that they can be accessed cooperatively through the Control Panel from within GEM applications. Unlike desk accessories, however, CPXs can either be loaded automatically at boot time or left on disk for loading only when required. Up to 99 CPXs can swiftly be accessed in this fashion.

Functions formerly associated with the Control Panel, such as RS-232 parameter-setting, clock-setting, color- display management, etc., have been reframed under the new system as CPXs. Several CPX utilities are included with the Mega STe, including extensions for managing processor speed and other basic system parameters, defining the extensive color pallettes, configuring the Mega STe's superb stereo sound, setting serial port parameters, and other functions, including one for the management of CPXs! The Extended Control Panel and CPXs, moreover, are compatible with all ST's and STe's. We have tested them extensively on our own Mega 4 ST, and have discovered to our gratification that not only does the XCP work perfectly well on this older system, but that the CPXs adapt themselves

to whatever hardware they're running on, offering the user only those options that are meaningful in context. On an old-style Mega ST, for example, the General Setup CPX shows only a blank where the "processor speed" control would normally be displayed.

Also included with the Mega STe is Atari's newest set of hard-disk utilities, and the abovementioned user-configurable disk cache. All of this software is also compatible with previous ST models.

Graphics and Sound

Though the Mega STe's three graphics modes are compatible with ST-standard low (320 x 200, 16 colors), medium (640 x 200, 4 colors), and high (640 x 400, black and white) resolutions, like the STe, it draws color information from a much broader pallette of 4,096 RGB combinations. Obviously, this enhanced color capability is immediately useful in a variety of application areas: games, entertainment, and color graphics software among them. Perhaps less obviously, the greater freedom offered by the Mega's STe-style pallette will make possible a variety of new applications, as well as promote the addition of new features to existing software. For example, a sufficient number of shades of the same color can now be displayed to permit efficient anti-aliasing to be incorporated in CAD, paint, and image-processing programs.

Also like the STe (and TT), the Mega STe offers stereo DMA sound. The sound hardware is capable of conveniently reproducing digitized music at high fidelity, of handling the grunt-work of voice-synthesis, and other audio effects. Sound can be output with full stereo balance and tone control, through standard hi-fi equipment. Like the enhanced color pallette, the Mega's DMA sound capability should make possible the development of an entirely new generation of software in categories such as entertainment, education, and multimedia.

As important as these capabilities are, it is also significant to consider that with the release of the Mega STe, all current Atari systems now possess the same set of enhanced graphics and sound features. Software developers can proceed with confidence to develop products that address these features, secure in the knowledge that a large and growing number of consumers possess equipment that can take advantage of what they produce.

A New Standard

The Mega STe's release marks a watershed for the Atari in the American market. For the first time in several years, Atari has introduced a significant new product on these shores, a fact that emphasizes Atari's committment to its American customers. Perhaps just as important, the Mega STe project proves that Atari has significantly shortened the lag time between product announcement and delivery: announced at November Comdex, the Mega STe passed FCC Class A certification in a flash, and is presently on its way to dealers. The ability to promise, and then to deliver on-schedule, is crucially important in maintaining credibility in today's fast-paced and competitive computer market.

As noted above, the release of the Mega STe also serves to establish STe-quality sound and graphics as the Atari norm. Beyond this, the Mega represents a zone of overlap between low-end STe's, currently being marketed to the home and basic productivity user, and the high-end TT, which will be aimed at technical users, engineers, and others who require its exceptional speed and Unix compatibility.

Positioned between these two extremes, the Mega STe is destined to serve the myriad users, in business and the professions, who require a field-proven, high-performance system capable of running state-of-the-art software in a wide variety of categories. ■