

Apple Mac SE/30

To many observers, the personal computer world is dominated by two superpowers — the PC and the Apple Macintosh. In the last couple of years the Mac has steadily been losing ground to its technologically inferior rivals; now, as Guy Swarbrick found, Apple has trumped them again.

The Apple Mac's heritage (especially if you consider the ill-fated Lisa, launched in the middle of 1983 as part of the family) is almost as long as that of the PC. In that time the Mac has, until recently, always been ahead of its sheep-like cousins, technologically at least.

Many people, though, even people within Apple, will admit that the original 128k single-floppy Mac was never really in a position to challenge the PC world. In terms of raw processing power it had a significant edge, the 8MHz Motorola 68000 processor making it roughly equivalent to the IBM AT which was still a few months away, and the user interface was (and still is) the best available on a microcomputer. (This position may change in the next few months with the introduction of Unix-based windowing systems on machines like NeXT and Atari's Transputer Workstation, but it is reinforced by the fact that every revision of Microsoft's Windows/Presentation Manager brings it closer to the Mac.)

What the machine lacked which would have made it truly useful was a decent amount of memory and a built-in hard disk. There were other things which, though not essential, would certainly have helped, for instance colour and expandability.

The memory would come in two stages, first with the 512k so-called Fat Mac and then with the 1Mbyte Mac Plus.



The Mac SE/30 offers unparalleled performance for its size, and should increase interest in the Macintosh community

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Both machines, though, were still limited to a single floppy drive, though the capacity had been doubled to 800k; and at last the Mac came with a SCSI port to make the connection of an external hard disk less harrowing.

On the subject of a colour Mac, I have been told at different times that colour is 'a nonsense' *and* that a black and white machine is not worth buying. Both of these attitudes lack more than 30 seconds thought, but both have influenced buying trends over the last five years or so.

As for the lack of expandability, the slots in most PCs have always been filled with video cards and I/O ports which the Mac user had on-board anyway. For most people, most of the time, they were unnecessary.

It took the Mac SE, launched in April 1987, to make the Macintosh the machine it always should have been — a 1Mbyte RAM, 20Mbyte hard disk machine with an expansion slot. For those who were still unsatisfied there was the Mac II — not the conventional cuddly Mac box but 16.8 million colours, a considerable advance over the original two; the more powerful 68020 processor; and NuBus, and an

industry-standard expansion bus for those who needed it.

The timing of this launch was interesting in that although Apple had finally made the Mac truly useful (despite several operating system upgrades), it was still basically the same machine they had launched three years earlier.

Taking into account the fact that the

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Macintosh started from a position of strength (being the equivalent of a 16-bit 80286 machine before such a machine had been introduced), Apple had squandered the lead. In the same time as the PC had moved from the 8088 through the 8086 and 80286 to the 32-bit 80386 (by this time even IBM had a '386

box, in theory, at least), the 'compact Mac had remained at roughly the same technological level.

By the launch of the SE, the Mac had carved itself a nice little niche in areas such as desktop publishing and graphic design, and was a favourite tool among professional writers. However, the advantages it has had for the last few years — the excellent user interface in particular — are now being challenged by the newer, faster PC clones.

Now, with the Macintosh SE/30, Apple has catapulted the compact Mac standard back into the forefront of the technological race.

Hardware

Externally the machine is very similar to the current SE range. Indeed, the machine we were supplied for review was cased in a standard SE box, partly for security reasons and partly due to the fact that the new mouldings hadn't arrived from the States.

The external ports are identical to those on a standard SE: two Apple Desktop Bus connectors for mice, keyboards, trackballs and so on; an external floppy drive port; a SCSI port for

one of the growing range of SCSI devices from scanners to WORM drives; a serial printer port; AppleTalk connector; and a stereo headphone socket.

At 9kg the SE/30 is just as transportable as its older brethren, retaining its telephone-style hand grip. And, of course, the integral design means that once you have lugged it to another location there is no need to spend hours looking for two or three spare wall sockets.

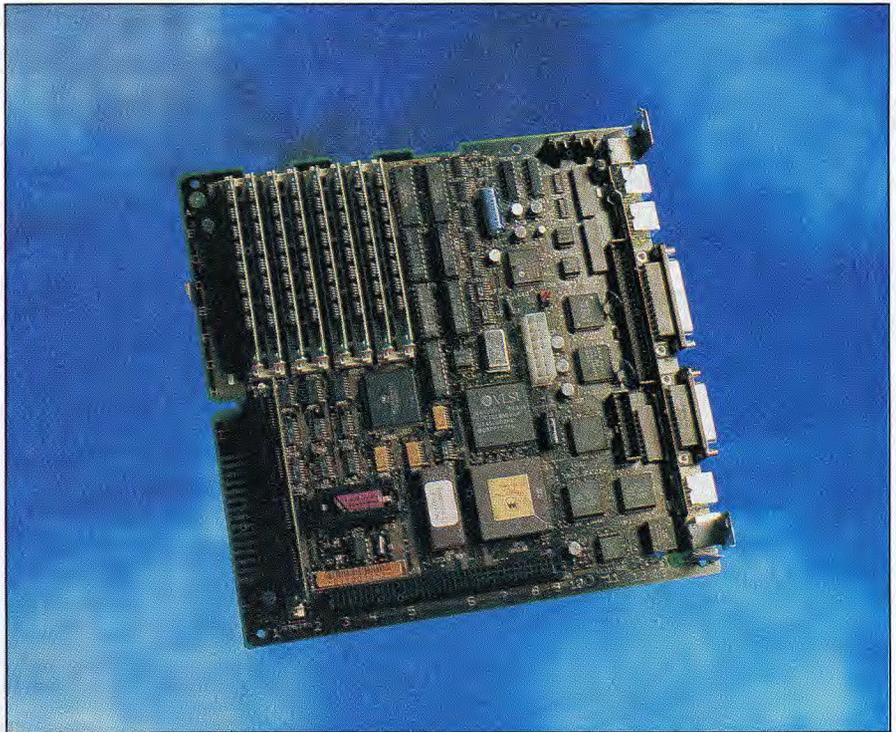
The heart of the Macintosh SE/30 is Motorola's 68030 processor. Not as fundamental an upgrade as the 68020 used in the Mac II was from the original Mac, it is nonetheless a significant upgrade from the 68000 in the other compact Macs.

Essentially the 68030 replaces the combination of 68020 processor and 68851 Paged Memory Management Unit (PMMU) by integrating their functions in one chip. In addition to the benefits this provides, the 68030 is also around 30 per cent faster than the older design. Being a direct descendant of the 68020, the '030 is 100 per cent instruction-compatible with its predecessor (hence the decision to use the 68020 Mac II ROMs).

The 68851 is a sophisticated demand-paged memory management unit which will, eventually, be used to bring true multi-tasking to the Macintosh. At present, the system software in both the SE/30 and the IIx is the same 256k ROM set which originated with the 68020-based II. Eventually — probably by way of a much improved MultiFinder designed around the PMMU — the Macintosh will be able to provide a stable multi-tasking environment by taking the memory management tasks away from the overworked 68030 and providing the hardware support that a multi-tasking system requires to be effective and secure.

The 68030 actually contains a slightly cut-down version of the 68851 and it would appear that Apple's reasoning behind the introduction of the Mac IIx and, in particular, the SE/30 (which bypassed the 68020 altogether) is to introduce new machines based around the 68030 now, before use of the 68851 is common, and to discourage use of the separate PMMU. In view of the Apple approach to software development and the strict guidelines it maintains, this kind of enforced standardisation has considerable benefits.

The processor runs at a respectable 16MHz which gives the machine a performance roughly four times that of a Mac SE. It is, however, rated to run at twice that speed. Apple's reasoning behind the relatively slow clock speed is partly the increased cost of the support



Other than the 68030 and the 68882 coprocessor, most of the SE/30 motherboard is made up of VLSI gate arrays

components (faster RAM and so on), but mainly the availability of these higher-specification parts.

This is not an unreasonable excuse, but in the light of Steve Jobs' decision to clock the NeXT cube at a far more zippy 25MHz, it does seem a little conservative. The parts obviously are available, although NeXT will require them in much smaller quantities (initially at least) and faster versions of the 68030 Macs are not beyond the realm of possibility.

Alongside the processor is the 68882 numeric coprocessor. Said to give a 100 per cent improvement in speed over the older 68881 device found in the Mac II, the 68882 was designed with faster throughput, rather than outright mathematical speed, in mind. The claimed 100 per cent speed increase is obtained only when the coprocessor is driven by true 68882 code, but even with 68881 instructions an improvement of up to 30 per cent on that chip is suggested. We were unable to obtain any software which used the 68882 in its native mode, but even driven as a 68881, floating-point operations were improved by nearly 1800 per cent using the coprocessor directly and by 110 per cent using Apple's SANE (Standard Apple Numerical Environment) routines, which allow software to run on standard machines but take advantage of a coprocessor if it is available.

Also carried over from the Mac II is the sound chip. Fans of the Apple IIGS will welcome this cut-down version of that machine's sound chip as a replacement to the traditional Mac method of driving the speaker directly with software.

The chip is basically a four-channel version of the 16-channel stereo chip in the IIGS and, as well as the four-voice wave-table synthesiser, it provides stereo sound with a sampling rate of up to 44.1KHz. Although a cut-down version of the IIGS chip, it is nonetheless a welcome addition and will go some way to relieving the load on the main processor.

The two main components on the well laid-out 9in square circuit board are the 68030 itself and a larger VLSI glue chip containing what would have been dozens of small logic chips in days of yore. In fact, VLSI chips make up most of the chip count, controlling the SCSI ports (one external and one internal for the built-in hard disk), the floppy disk drive, the AppleTalk network bus and so on. The rest of the board is made up of the 68882 floating-point coprocessor, the cut-down version of Ensoniq's Digital Oscillator Chip (DOC), a SIMM containing the system ROMs, and four SIMM sockets containing the standard 4Mbytes of 120ns RAM. Up to 16Mbytes will be possible once the necessary 4Mbyte components become available.

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The standard hard disk on the Australian specification Macintosh SE/30 will more than likely be the comparatively fast (28ms) 40Mbyte hard disk currently in use in the higher spec SEs. This unit, as well as being quicker, is considerably quieter than the 20Mbyte device.

The floppy disk drive on the SE/30 is also significant, especially for those working in mixed PC/Mac environments. Many offices produce text on PC word processors and transfer it to the Mac for desktop publishing. There are many ways of achieving this, but the new FDHD 3.5in drive fitted as standard to the SE/30 and IIx has to be the easiest. As well as reading single and double-sided Mac disks, the drive can read 720k and 1.44Mbyte MS-DOS format disks and Apple II disks.

The Finder can still only read Mac format disks, and Apple's File Exchange program must be used to transfer files to and from foreign formats, but the process beats a serial cable hands down. File Exchange also allows for specific file format conversions as documents are copied, which should make life a lot less complicated.

The SE screen is the same 9in 512 by 342 as other compact Macs, as are the keyboards available for the machine and the excellent single-button mouse.

Perhaps the best news for current Macintosh SE owners is that the SE/30, like the Mac IIx, is available as an upgrade to existing machines. The job is a half-hour dealer upgrade and although the price hadn't been set when this review was written, it is unlikely to be less than the price difference between an SE and an SE/30 as everybody would buy an SE and upgrade it (nor will it be much more, as Apple wants to encourage people to upgrade rather than force them to buy new machines).

System software

The system software in the SE/30 is disappointing at first, but it is a disappointment rooted deeply in PC/Macintosh psychology. Because it is so easy to use, people somehow expect the Mac to outperform every other machine on the market, and because the PC world treats its customers so badly, these same people expect Apple to be perfect.

The operating system is the 256k Mac II ROM set (System 6.0) and as such, is written in 68020 code, allowing it to take advantage of the features of that chip, if not of the '030. My first thought was that the machine shouldn't have been

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launched until an '030 operating system, taking full advantage of that processor's new instructions and the built-in PMMU, was written and tested. I still feel that in an ideal world this would be the case, but in the real world the competition is quite happy to produce '286 and '386 machines running an 8086 operating system. In those terms, the use of '020 code, omitting only the use of the PMMU, is a huge advance.

One of the spin-offs of using the Mac II ROMS without alteration is that Colour Quick Draw routines are available, even though it is a black and white machine. The addition of a colour board in the expansion socket should allow colour applications to run without change.

System 6.0 also includes the latest ver-

Technical specifications

Processor:	Motorola MC68030
Coprocessor (standard):	68882
RAM:	4Mbytes
ROM:	256k Finder (68020 code)
Mass storage:	400/800/720k/1.44Mbyte FDHD floppy disk drive
Keyboard:	Standard 81-key or Extended 105-key
Monitor:	Built-in 9in 512 by 342 black on white
Standard interfaces:	Apple Desktop Bus (2), External floppy disk, SCSI, serial (printer), serial (modem), stereo audio output
Expansion:	Internal 32-bit expansion socket
Size:	343mm by 241mm by 279mm
Weight:	9kg
Bundled software:	HyperCard 1.21
OS:	Macintosh Finder 6.1, System 6.0.2, MultiFinder 6.0.1

sion of MultiFinder which is far more stable than previous versions. I managed to keep FullWrite Professional, Turbo Pascal and HyperCard in memory at the same time with no problems while I was writing this review. I even ran a couple of unfriendly games under MultiFinder without upsetting other applications.

The only compatibility problem I had was with a copy-protected version of Adobe Illustrator 88 which ran fine on a standard SE with the same version of Finder, but steadfastly refused to run on the SE/30.

Also supplied are a couple of useful utilities including the invaluable MacroMaker. MacroMaker enables any series of mouse movements and keystrokes to be remembered and played back with a single keystroke. At first, not being a macro fanatic of the Kewney/Cohen ilk, I thought the program was an interesting but pointless gimmick. A little experimentation, however, led to large amounts of word-swallowing *chez* Swarbrick.

Finally, for the complete beginner, there is the Apple Tour disk. As twee as ever, it nonetheless provides an excellent and comprehensive introduction to the machine.

Applications

Bundled with the SE/30, as with all other Macs, is HyperCard, currently version 1.21.

Documentation for HyperCard is limited and provides no information about the HyperCard programming language, HyperTalk. A HyperTalk manual, though, is available for those who need it and there are a large number of third-party books now available on the subject.

Expandability

The expansion socket on the SE/30, as with the standard SE, is not a true expansion bus but an extension of the processor bus onto which a single expansion card may be added. Unlike the SE, though, it has a 32-bit socket to match the 68030 processor, so ordinary SE expansion cards won't fit in an SE/30.

Although potentially an area for criticism, the choice of a new expansion socket was really unavoidable within the framework of the compact Mac. Unlike the PC/AT which was able to expand its bus by adding a second connector to handle the extra address lines, no such option was available to Apple in the far more cramped conditions on the SE board.

Indeed, even in the PC world the

problem of going from 16 to 32-bit buses is one that has still to be resolved satisfactorily. Apple's solution should, in fact, affect very few people. The main problem will be with people who bought expansion cards for their existing SEs and want to upgrade without losing this investment. In fact, most of the boards which have been purchased for the SE are accelerator cards, which would be redundant in the SE/30.

Colour boards and an Ethernet adaptor are among the options expected to be

basic hardware specification (although some of this, obviously, was not applicable to the review machines, much was, particularly details of the I/O ports) and, although they have the characteristic friendly Macintosh feel there is a surprisingly high technical content, far greater than is normally the case with user manuals. For those who require more, however, Apple also offers a superb range of hard-bound reference guides covering subjects from HyperTalk to the LaserWriter.

Second opinion

As a Mac sceptic, I viewed Apple's latest machine with very mixed feelings. Right from the beginning, the easy-to-use interface of the Mac has led people, myself included, to expect the screen handling to be as fast as a text display. Seeing the SE/30 in action I finally saw a machine that provided the facilities I wanted without the sacrifice in speed brought about by the heavy overhead of processing the graphics. And the 'superdrive' floppy disk drive makes using such a machine in a mixed Mac/PC environment easier. If there was a machine that would persuade the individual power user to switch to a Mac, this would be the one.

Apple's pricing policy is another matter. The different profile of Mac ownership between Australia and the US is striking. In the US everyone and their child has a Mac in the garage. People 'love' their Macs, and the Mac has become the way into serious computer usage for many people. However many Macs exist in corporate environments in both Australia and the US, it is the individual ownership in the US which has fulfilled Apple's promise of the Mac being a computer for the rest of us.

But in Australia the rest of us cannot afford one.

The profit figures for Apple show that its strategy of selling a high-priced prestige computer product pays well. And the company claims that this profitability will enable it to branch out and develop further areas of Mac ownership. So, Apple Australia is saying that 1989 will be the year of the CPU.

The Mac SE/30 will increase the interest in Macintosh computing. But until Apple either reduces the prices of some of its machines or introduces low-end products, many people will have to forego the pleasure of using a Mac.

I like the SE/30 — it's the first Mac I would consider having on my desk, though I'm not sure how I'd cope without colour. But until Macs become more widely owned, computing with a Mac may remain something which, in Apple's own words, 'people aspire to' rather than actually enjoy.

D Cohen

available by the time the machine is launched.

Documentation

The four spiral-bound manuals supplied with the review machine were all for a standard SE. Presumably some alterations will be made, particularly in the spec sheets and the chapter in the SE Owner's Guide which details the Macintosh internals, but there should be no need to change three of the manuals ('HyperCard', 'System 6.0 Software' and 'Utilities') at all.

The manuals are up to Apple's usual high standard — well laid out with clear diagrams throughout. Separate manuals are supplied for system software and the

Prices

Unfortunately, prices had not been fixed by the time APC went to press. We understand, however, that it is Apple's intention to fit the Macintosh SE/30 in between the top of the SE range and the bottom of the II/Ix range. The price of a 2Mbyte RAM, 40Mbyte hard disk SE is \$8495 and the price of a 4Mbyte RAM, 40Mbyte Mac II is \$12,440.

Conclusion

Apple's pricing structure, which places the SE/30 at the head of the compact Macintosh range — the SEs and the Plus — but below the Mac II (see 'Second opinion') leaves the Mac look-

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ing frighteningly expensive. But in performance terms this machine is the equivalent of a good '386 and the price reflects that. If you must have colour and expandability then there still isn't a suitable compact Mac, but if you can settle for one or the other then the SE/30 could well be for you.

Apple has once again produced one of the most powerful microcomputers of the current era. (Many Intel groupies would argue that the 80386 is a superior chip. This is a complex, usually heated and in the end, fairly pointless argument. Suffice to say that the '386 and the '030 are the most powerful of the current commercial processors.) The SE/30 offers unparalleled performance for its size and it would be a shame to see Apple settle into an IBM-like technology suppression cycle rather than continuing to make the Macintosh the best machine it can possibly be.

Much of the performance, however, has come from unashamed devotion to the V8 approach. The Mac's main performance problem has always been that the processor has to do all the work and the solution, traditionally, has been to fit a bigger, faster processor.

Now, at last, the foundations are there for a Mac where the processor spends the majority of its time doing what it does best, rather than trying to function as a numeric processor, memory management unit and sound chip. The MMU is there waiting for the software to drive it and the benefits to be gained from its use are substantial. The use of SIMMs for the ROMs should make the upgrade a painless one. What is still missing, however, is a dedicated graphics processor to handle the complexities of the Mac's windowing system. Although the scrolling speed is much improved in the new machine it is still slower than an equivalent text-based system. The idea of a separate graphics processor is not totally alien to Apple as the IIGS proved, but it still seems some way off for the Macintosh.

Throughout 1988, Apple constantly told us there would be no new CPUs that year (despite sneaking in the 68030-based IIx). Now the company tells us 1989 will be the year of the CPU. Hopefully, the SE/30 is the shape of things to come, and with 16MHz to spare on the processor speed there is no reason why this superlative performer should not be improved still further.

Until now, my ideal writing environment has been a Mac II and a LaserWriter II. The availability of a compact 68030 machine changes that — and reduces the cost as well.