

group test



Moving On

With mobile versions of the Celeron and K6-2 processors now available, **budget laptop performance** has been taken up another notch. We take a look at what's out there.

Mobile processors have long been an Intel-only speciality and to most notebook vendors proved uninviting. Although they consumed less power and generated less heat, which meant longer battery life and greater reliability, they also came fixed to the motherboard. This was a big snag for smaller vendors, who risked being stuck with outdated notebooks that they could not sell. Finally, Intel released the Mobile Module, letting vendors slot in processors as they sell the notebooks, and this idea has been a hit.

Up to a few months ago only Pentium MMX and PII mobile processors were available in this format, but Intel and AMD are both now addressing the

budget market with mobile versions of their popular Celeron and K6-2 processors. This brings notebooks down even further in price, so there are some real bargains to be had.

Here we look at six notebooks, all fitted with Celeron or K6-2 processors and all under £1300 ex VAT, to see how much portable power you can get without straining your pocket.

Ratings

- ★★★★★ **Highly recommended**
- ★★★★ **Great buy**
- ★★★ **Good buy**
- ★★ **Shop around**
- ★ **Not recommended**

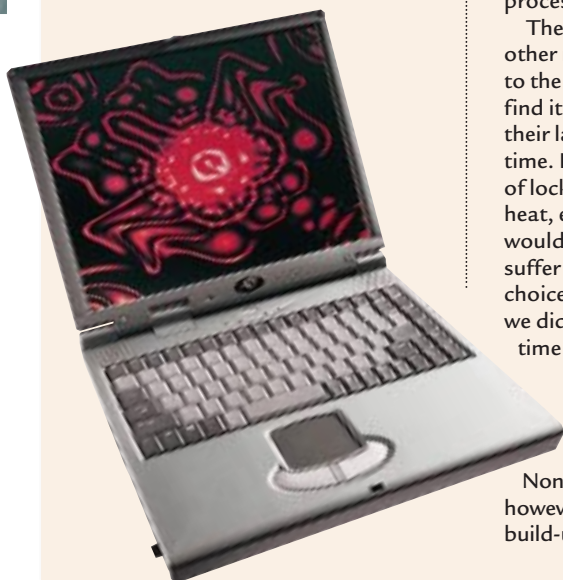
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♦ *Tested and reviewed by Jason Jenkins*

AJP 3100C

This notebook looks very good on paper, but the build quality lets it down. The most striking feature is the Celeron 433 processor, the fastest in our test, which helps to explain the high SYSmark score. AJP has chosen not to use a mobile Celeron, instead using



the same processor that you would find in any Celeron-based desktop PC. But the whole point of the mobile Celeron is that it uses less power and produces less heat — ideal for a laptop — and so it seems odd that AJP has sacrificed these benefits by opting for a desktop processor.

The 3100C runs hotter than the other machines in this group test, to the extent that some users will find it uncomfortable to have on their lap for an extended period of time. However, it showed no sign of locking up due to a build-up of heat, even after several days. We would also expect battery life to suffer as a consequence of the choice of processor, although we didn't test the battery this time round.

The ATi graphics chip is fast becoming a popular and reliable notebook favourite and suits this configuration.

None of the ports are covered, however, which could lead to a build-up of dust.

The 14.1in TFT display is not among the best we saw. The initial impression is one of a rather uneven luminescence with dark patches in the top left and bottom right of the screen. Our DisplayMate test fills the screen entirely with one colour, and uneven intensity was clearly apparent when green was displayed. Flexing was also apparent as the screen was moved.

PCW DETAILS

Price £1527.50 (£1300 ex VAT)

Contact AJP 0181 208 9701

www.ajp.co.uk

Good Points Good video card. Fast.

Bad Points Runs quite hot.

Conclusion Non-mobile processor, poor screen.

Build Quality	★★
Performance	★★★★★
Value for Money	★★★
Overall Rating	★★★

Choice UL3000

Choice presented us with a notebook that struggled on nearly all our criteria. It looks and feels tacky, with the case feeling insubstantial and flimsy. The closing catch protrudes alarmingly, leaving it vulnerable to damage. However, the keyboard



is responsive and quiet despite its thin form factor.

All of the ports (bar the PS/2) are covered with lids that thankfully are a little more sturdy than other aspects of this machine. The ports are grouped in sections, with each section having a separate cover.

This is a nice touch: if you want to plug something into the parallel port, you don't have to leave the other ports uncovered.

A wheel at the side controls the volume of the internal speakers, which produce the tinny noise standard in most notebooks.

This was the only notebook with a floppy drive mounted on top of the CD-ROM, allowing you to use both at once without having to use two bays. And Choice has achieved this without increasing the thickness, or bulk, of the machine.

The display is average, although its luminescence is more even than

on most notebooks; however, dark patches were evident in the bottom right and left of the screen. Colours are vividly displayed, with no visible dead pixels on display. A 4Mb S3 Virge chipset drives this 14.1in TFT screen, producing a resolution of 1024 x 768.

PCW DETAILS

Price £1439.38 (£1225 ex VAT)

Contact Choice Systems

0181 993 9003

www.choicesystems.co.uk

Good Points Good covers on ports.

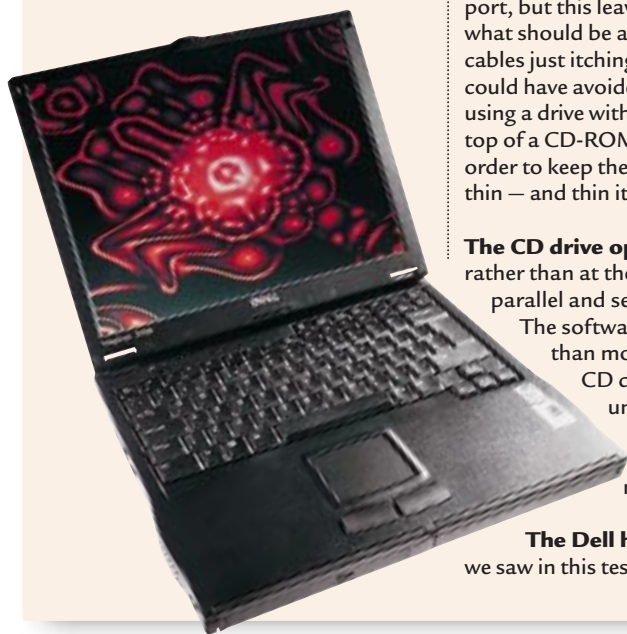
Bad Points Poor build quality.

Conclusion Not a good buy.

Build Quality	★
Performance	★★★★
Value for Money	★★★
Overall Rating	★★

Dell Inspiron 3500 366GT

The Inspiron exudes quality, although it does have some faults. The Celeron 366 processor and 64Mb RAM contributed to its high SYSmark score, and by the time you read this, Dell will be offering the same notebook with a Celeron 400MHz for the same price.



There are two bays into which you can put a CD-ROM, floppy drive, Zip drive and battery. This increases flexibility, but means you can't use the floppy and CD drives at the same time unless you remove the battery. You can plug the floppy drive into the parallel port, but this leaves drives hanging off what should be a neat package, with cables just itching to get snagged. Dell could have avoided this problem by using a drive with a floppy mounted on top of a CD-ROM, but chose not to in order to keep the notebook light and thin — and thin it certainly is.

The CD drive opens at the front rather than at the side, and only the parallel and serial ports are covered. The software bundle is better than most, though, as was the CD drive. The speakers are, unusually, mounted on each side and produce the standard tinny notebook noise.

The Dell had the best screen we saw in this test, with the brightest

and most uniform luminescence. Although there was a small dark patch at the top right of the display, the image was sharp and the Windows icons well defined. Also, the colours were vivid with no sign of intensity problems. The NeoMagic graphics chipset has only 2.5Mb of memory, but this is still more than enough to display 1024 x 768 on the 14.1in display.

PCW DETAILS

Price £1526.32 (£1299 ex VAT)

Contact Dell 0870 152 4850

www.dell.co.uk

Good Points Good screen. Thin.

Bad Points It's hard to use the floppy and the CD-ROM simultaneously.

Conclusion A well equipped and designed notebook with a few niggles.

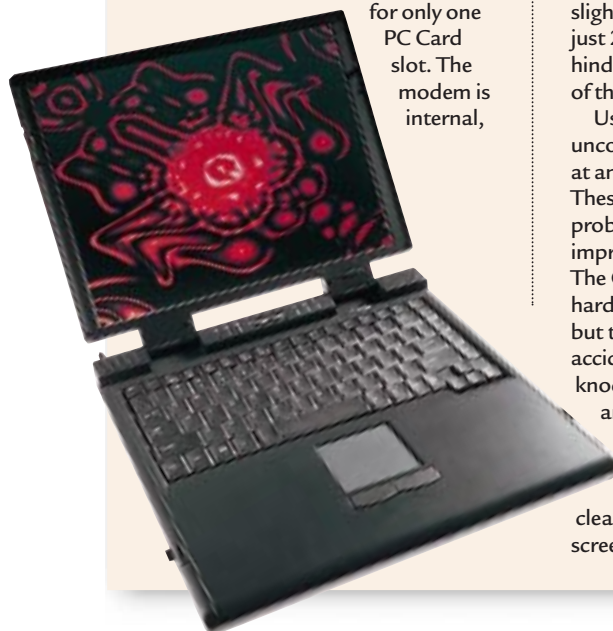
Build Quality	★★★★★
Performance	★★★★★
Value for Money	★★★★★
Overall Rating	★★★★★



Esprit Tycoon

Esprit is a sister company of monitor manufacturer ADI, and support for the Tycoon will be handled through existing ADI channels. The most striking thing about this notebook is that it's very thin — just over 3cm. Consequently, there's only room

for only one PC Card slot. The modem is internal,



however. The case is made from magnesium alloy, which gives the Tycoon a professional and hard-wearing finish. The BIOS on our pre-production model refused to drive the sound card, but this problem should be fixed in the final version.

The specification is let down slightly by the video card, which has just 2.5Mb of memory, but this won't hinder the internal resolution. None of the ports are covered.

Using the keyboard feels a little uncomfortable, as if it's been tilted at an angle away from the user. These are all comparatively minor problems, however, and the overall impression is of a well-built machine. The CD-ROM button needs quite a hard push to make the drawer open, but this is no bad thing if you tend to accidentally open the drive by knocking your notebook against another object.

The display was a disappointment. Flexing was clearly apparent at the base of the screen as it was moved, but this is

perhaps not surprising considering how thin the unit is. Dull in appearance overall, there was a small dark band to the right of the screen and two larger dark patches towards the middle of the base. Icons were well defined, but colours are not as vividly displayed as some of the better screens in this test.

PCW DETAILS

Price £1468.75 (£1250 ex VAT)

Contact 01670 737888

Good Points Very thin, attractive case.

Bad Points Screen could be better.

Conclusion A generally well built notebook that looks great.

Build Quality	★★★★
Performance	★★★★
Value for Money	★★★★
Overall Rating	★★★★



Pico Desknote

This notebook is built like a brick — it is far and away the thickest and heaviest in our test. On paper it appears to be quite a respectable machine. The 128Mb RAM and 8Mb graphics will compensate for the

comparatively slower 300MHz Celeron processor. The ATi Rage graphics chip had the largest amount of memory of all the machines here, and just about allows you to run some simple 3D applications or games at a low resolution — a rare achievement for a notebook, especially in this price range.

The Desknote looks like a solid home office notebook, but it's let down by the build quality. The keys are noisy, with the selector buttons making an annoying clicking noise. All of the ports are shielded by one large cover, with a smaller cover inside the large one opening to reveal the parallel port. The large cover does not feel as though it will stand up to repeated use, and the parallel-port cover, once opened, proved very difficult to close again.

The PC Card ports are buried inside the case itself, with a flap protecting the entrance, making it difficult to inset and remove PC Cards. It does come loaded with Windows 98 second

edition, although this made no discernible difference to performance.

The 14in TFT screen suffered from a dark patch in the top right and a dull appearance generally. Colour purity suffered in parts of the screen on the colours green and cyan on our DisplayMate test. Pixels were displayed well, though, with edges of icons smooth and clear.

PCW DETAILS

Price £1369 (£1165 ex VAT)

Contact Pico Direct 01483 402111
www.picodirect.co.uk

Good Points Good video card.

Bad Points Build quality, weight and thickness.

Conclusion An unremarkable brick.

Build Quality	★★
Performance	★★★★
Value for Money	★★★★
Overall Rating	★★★



Toshiba Satellite 2520CDT

All of the other companies in this test buy notebooks from other manufacturers and rebadge them. Toshiba is the only company to actually make its own notebooks, and has built up a reputation as a producer of quality

machines. In light of this, we found the 2520CDT to be relatively disappointing.

The core of this notebook is AMD's K6-2 chip running at 300MHz — one of the slowest clock speeds in this group. There's only 2Mb of video memory, but this is more than ample for the 12.1in screen. Build quality is generally solid, with better-than-average speakers giving a fuller sound than others. An internal modem is a nice touch and frees up a PC Card slot.

However, Toshiba has let itself down on small but important aspects such as the lack of covers on all the ports bar the USB and, of course, the PC Card slots. And the trackpoint is way too sensitive, even on the lowest possible setting, making the pointer difficult to control.

The screen is surprisingly poor, with uniformly dull luminescence and dark patches around the borders, increasing in severity to the right of

the screen. Colour was displayed uniformly across the screen but was affected by the overall dullness and appeared washed out. It was possible to pick out individual pixels more than on other models, partly due to the low 800 x 600 resolution. Unfortunately, the smaller screen didn't result in a smaller form factor.

PCW DETAILS

Price £1495 (£1272.34 ex VAT)

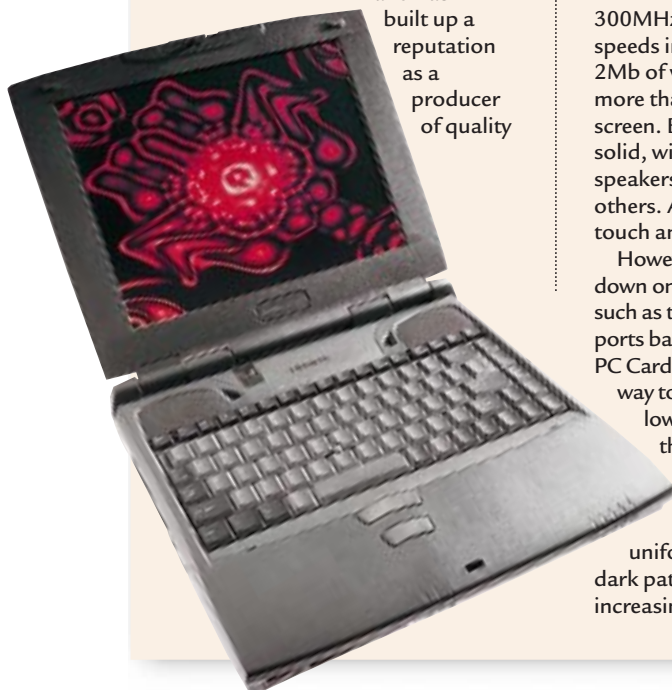
Contact Toshiba 01932 828 828
www.toshiba.co.uk

Good Points Internal modem. Toshiba power management.

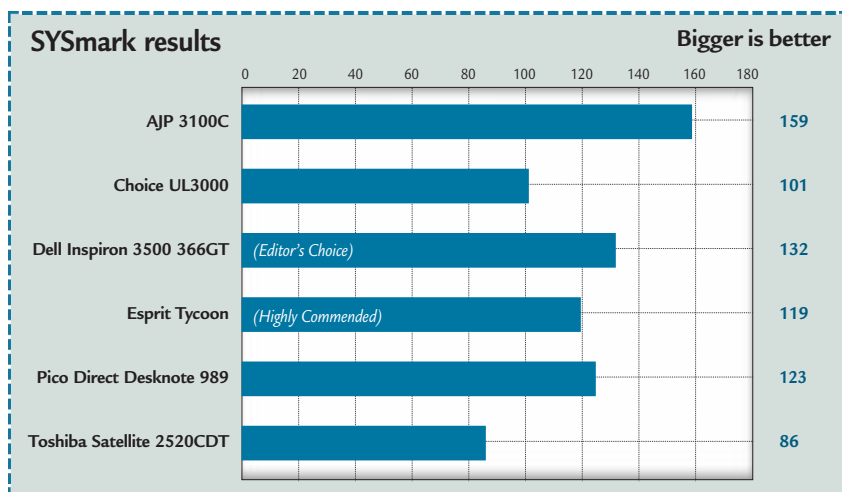
Bad Points Screen, 2Mb video memory.

Conclusion Full of promise, but the screen lets it down.

Build Quality	★★★
Performance	★★
Value for Money	★★★★
Overall Rating	★★★



PCW Labs Report



The wide range of results we attained in the SYSmark tests can be explained by the variety of processors on offer, together with the varying amounts of system memory. AJP's high showing is due to the fact that it featured the fastest processor (which produced problems of its own) and the largest amount of RAM. Toshiba's low score can be explained by the combination of the 300MHz AMD K6-2 and 64Mb RAM. Pico and Choice had processors of the same speed, but were manufactured by rivals AMD and Intel. Pico's higher score should not necessarily be taken to mean that the Celeron has the edge over the K6-2: its 128Mb RAM will have had an effect on its improved score.

How we did the tests



SYSmark measures the time it takes the PC to perform a variety of tasks in 14 common office and content creation applications. Each test is run three times to ensure consistent results. The applications are:

- Office Productivity:** Corel CorelDraw 8, Microsoft Excel 97, Dragon Systems NaturallySpeaking 2.02, Netscape Communicator 4.05 Standard Edition, Caere

OmniPage Pro 8.0, Corel Paradox 8, Microsoft PowerPoint 97 and Word 97.

- Content Creation:** MetaCreations Bryce 2, Avid Elastic Reality 3.1, Macromedia Extreme 3D 2, Adobe Photoshop 4.01, Adobe Premiere 4.2, and Xing Technology XingMPEG Encoder 2.1.

Performance depends on processor speed, RAM, graphics card and disk I/O. As the tests are based on widely available software packages.

SYSmark scores accurately reflect how the machine will perform in a real-world situation.

WINDOWS CE DEVICES: THE NOTEBOOK ALTERNATIVE

Microsoft has for some years had a cut-down version of Windows on the market, Windows CE. This is designed to be the backbone of what Microsoft likes to refer to as 'handheld PCs', essentially another term for the more familiar Personal Digital Assistant (PDA).

Using the familiar Windows interface, Windows CE has been designed specifically to run on devices with limited memory and lower processing power. Windows CE devices do not come with floppy drives, CD-ROMs or hard disks, which makes them more portable, saves on power consumption, increases reliability and decreases the overall cost. The operating system and other programs are loaded directly into solid state memory that also functions as the storage for any files you generate. Instant bootup is therefore a reality for these machines.

There are disadvantages, however. The fact that the operating system and other programs are contained in solid state memory means that your applications won't be as feature rich as their hard-disk-based counterparts. Also, the amount of RAM supplied in handheld PCs is usually quite small, restricting the number and size of files you can store.

Windows CE based machines initially failed to attract the

enthusiastic response that Microsoft had hoped for. The market was already fairly evenly divided between Psion and Palm Pilot users, and the first batch of CE devices were comparatively cumbersome and slow. But the arrival of cheaper colour screens, and the resolution of some of CE's technical teething problems, led to a new breed of machines that can show off CE's full potential.

Should you buy a notebook or a CE device? Microsoft would like you to buy both, for obvious reasons. Its website states that 'Windows CE-based handheld PCs are mobile companions designed to extend the capabilities of Windows-based desktop and notebook computers, rather than replace them.' If your pockets aren't that deep, however, the choice comes down to how important portability is to you. **Handheld PCs are smaller, lighter and cheaper than notebooks, and will appeal to those users who need quick access to information, compose the odd email and use Word for a quick bit of text editing on the move.**

For full mobile functionality, though, you'll find a CE device woefully inadequate, and your only choice is a notebook PC running a full-blown Windows operating system.

Table of features



MANUFACTURER	AJP COMPUTERS PLC	CHOICE	DELL COMPUTERS
MODEL NAME	AJP 3100C	UL3000	INSPIRON 3500 366GT
Price (ex VAT)	£1300.00	£1225.00	£1299
Price (inc VAT)	£1527.50	£1439.38	£1526.33
Telephone	0181 208 9700	0181 993 9003	0870152 4850
Fax	0181 208 9701	0181 993 9936	01344 723699
URL	www.ajp.co.uk	www.choicesystems.co.uk	www.dell.co.uk
Processor	Celeron 433MHz	Mobile AMD- K6-2 333	Mobile Celeron 366
RAM	128Mb	64Mb	64 Mb
Hard-disk size	6.4Gb	3.2Gb	4.8Gb
No. of PS2/USB/Serial/Parallel/PC Card	1/2/1/1/2	1/1/1/1/2	1/1/1/1/2
CD-ROM speed/removable?	24X/✓	24X/✓	24X/✓
Sound card manufacturer/model	ESS Maestro PCI ES1869	ESS	NeoMagic NM3298
Graphics card manufacturer/model	ATi Rage LT Pro	S3 Virge	NeoMagic MagicMedia 256AV
Graphics card memory/ interface	4Mb/AGP	4Mb/AGP	2.5Mb/AGP
Screen size/type	14.1in/TFT	14.1in/TFT	14.1in/TFT
Max. screen resolution	1024 x 768	1024 x 768	1024 x 768
Battery type/claimed life	Li-Ion/2 hours	Li-Ion/2.5 hours	Li-Ion/2.5 hours
Modem manufacturer/model/interface	n/a	n/a	Psion Dacom/PCMCIA
Weight inc battery	3kg	3.2kg	2.97kg
Bundled software	Windows 98	Windows 98	Windows 98, Works 99
Standard Warranty	1 year back to base	1 year back to base	1 year collect & return Euro-wide



MANUFACTURER	ESPRIT	PICO DIRECT	TOSHIBA
MODEL NAME	TYCOON	PICO DESKNOTE	SATELLITE 2520CDT
Price (ex VAT)	£1250	£1165	
Price (Inc VAT)	£1468.75	£1369	£1,495
Telephone	01670 737888	01483 402111	01932 828 828
Fax	01670 737555	01483 402112	01932 845 606
URL	none	www.picodirect.co.uk	www.toshiba.co.uk/computers
Processor	Mobile Celeron 333MHz	Mobile Celeron 300MHz	Mobile AMD K6-2 300MHz
RAM	64Mb	128Mb	64Mb
Hard-disk size	4.6Gb	4Gb	4.03Gb
No. of PS2/USB/Serial/Parallel/PC Card	1/1/1+1(IR)/1/1 type II	1/1/1/1/2	1/1/1/1/2
CD-ROM speed/removable?	24X/✓	24X/✓	24X/x
Sound card manufacturer/model	Soundmax codec AD1881	Yamaha OPL3 Sax	Yamaha OPL3-SA3
Graphics card manufacturer/model	SMI Lynx 3D	ATi Rage LT Pro	S3 Virge MX
Graphics card memory/interface	2.5Mb/PCI	8Mb/AGP	2.0Mb/PCI
Screen size/type	14.1in /TFT	14.1in/TFT	12.1in/TFT
Max. screen resolution	1024 x 768	1024 x 768	800 x 600
Battery type/claimed life	Li-ion 3000maH	LiON/2.5 hours	Li-Ion/3 hours
Modem manufacturer/model/interface	Ambit 56K/PCI	Pico Platinum/PC Card	Lucent V.90/PCI
Weight inc battery	2.7kg	4kg	3.1kg
Bundled software	Windows 98	Windows 98, Winfax/Norton	Windows 95/98, Microsoft Works 4.5
		Mobile Essentials, Comptons	
		Journey Planner	
Standard warranty	1 year collect and return	1 year on-site	1 year back to base

INTEL & AMD FACE THE MOBILE CHIP CHALLENGE

Space isn't the only thing that's too tight to mention in a notebook. Heat dissipation is crucial, as is reduced power consumption. These are the challenges facing Intel and AMD, which both offer 'mobile' equivalents of their desktop processors.

AMD offers three: the Mobile K6-2, Mobile K6-2P and Mobile K6-IIIP. The K6-2 is available in 300 and 333MHz flavours, while the K6-2 'Performance' version operates at 350, 366, 380 and 400MHz. The quick new K6-IIIP is available in 350, 366 and 380 variations. The front-side bus on all three speeds along at 100MHz. Note that the plain K6-2 runs at 1.9V compared to the hungrier 2.2V of both the K6-2P and K6-IIIP.

All three processors feature 64Kb on-die Level-1 cache, but only the K6-IIIP boasts any Level-2 cache: 256Kb on-die. The two K6-2's rely on Level-2 cache present on the motherboard, the absence of which could explain their relatively poor performance in this test.

Intel offers two mobile ranges, based on its PII and Celeron processors. If you thought the desktop models were close in specification, the mobiles are even tighter. They're both available at 266, 300, 333, 366 and 400MHz,

run externally at 66MHz, and operate at 1.5V. The only difference is their on-die Level-2 cache: 256Kb on the mobile PII, and 128Kb cache on the mobile Celeron.

On 14th June when both mobile 400's were launched, they carried prices per thousand of \$530 and \$187 for PII and Celeron respectively. However, one 366 mobile Celeron in this feature scored identically to a recently tested 366 mobile PII, making the mobile Celeron a bit of a bargain. Infuriatingly, you'll only tend to find it fitted into portables with mid-range components.

All these mobile processors are manufactured using a 0.25 micron process, although the new mobile PII 400 is the first Intel chip to also be available in the finer 0.18 micron process. Finer processes allow faster speeds, lower power consumption and less heat generation, all highly desirable in a mobile chip. Strangely, Intel is currently selling both 0.25 micron and the more desirable 0.18 micron 400MHz PIIs at the same price. AMD says it will move to 0.18 micron for mobiles in the second half of 1999. Mobile PIIs are expected in Q3.

GORDON LAING

WHAT TO LOOK FOR IN A NOTEBOOK

Buying any PC is difficult, but with notebooks, getting it right from the start is imperative: upgrading your portable pal later can prove both tricky and costly.

First and foremost, the processor: be sure to get the fastest one you can afford. This may seem like obvious advice, but this is one part you almost certainly will not be able to update in a notebook, so don't cut corners here.

Memory is also important, but in most cases you'll be able to upgrade it as and when the need arises. Consider 32Mb the minimum, but the more the merrier, particularly if you're planning on running several applications at the same time.

Storage space is less of a concern than it used to be with notebook PCs — most machines now come with at least a 4Gb hard disk — but you should still weigh up how much you might need. 4Gb should be fine for most people, but if you intend installing lots of specialist applications, or work on graphically-heavy (and hence storage-hungry) documents, go for 6Gb or more.

Screen-wise, big is not necessarily better. As well as increasing the overall size of the machine, and being quite hefty, larger screens drink battery juice in big gulps. Unless you've got expansive spreadsheets to view, you'll be well served by any display measuring over 12in.

One of the main reasons for plumping for a notebook over desktop PC is portability: you want to be able to carry it around with you and work on the move. But striking the right balance between weight and functionality isn't easy. Buying a machine with all the bells and whistles — built-in CD-ROM and floppy drives, for instance — might seem

like a good idea, but stop and think for a moment: how often do you use a CD-ROM drive, for example? Once you've installed your applications, it lies dormant. A better bet would be to opt for a notebook with an external CD-ROM drive. The weight-saving will be appreciated by your carrying arm.

But perhaps the most important question is this:

do you really need a notebook PC? For many potential users, a notebook may not be the best solution. Unless you intend to do lots of heavy-duty work on the move, a notebook could be little more than an expensive toy.

SCOTT COLVEY

► FLEXIBLE DEVICE
BAYS MAKE MOBILE
COMPUTING EASIER



Editor's Choice

The key to doing well in this group test is build quality. Many of the manufacturers provided us with highly specified machines, especially when you bear in mind that we're looking at budget notebooks.

The greatest challenge for the vendors is trying to produce a machine that overcomes the traditional failing of budget notebooks — poor build quality. Taken as a whole, we felt that most had not risen to this task, although two machines did rise above the others and represent solid budget purchases. This is reflected in our overall score, which is often lower than the scores for

performance and value for money.

Our most common complaint was the quality of the screens: typically, luminescence

was uneven. Thickness and weight varied enormously: Pico, for example, opted for

a thick, heavy machine, while Dell and Esprit produced thinner designs. Although both of the awards go to thin notebooks, a thin notebook will not necessarily suit your needs. The space has to be regained somehow, and this is often achieved by sacrificing a spare drive bay. Another common problem on this group of machines was the lack of covers on the ports. Hard-

disk space averaged out at around 4Gb — slightly stingy, but adequate for home office use.

Only Toshiba and Esprit opted for an internal modem. Our advice is to think before you buy about whether the loss of one PC Card slot will be a problem.

Only two awards have been given this month as we felt that, in general, the build quality of most of these notebooks was disappointing.

➤ **The Dell Inspiron 3500, our Editor's Choice**, did not achieve the highest SYSmark result, but made up for it with its outstanding build quality.

The screen is the best in this group, sporting even luminescence, vivid

colours and a sharp display. The keyboard is excellent — responsive and comfortable, while the side-mounted tinny-sounding speakers represented only a minor fault.

The difficulty in using the floppy and CD-ROM drive together could be a problem for some, but it's not a major shortcoming. There's also a very good software bundle.

➤ **The Highly Commended award goes to the Esprit Tycoon.** Visually stunning, with a sleek, light, thin case, this notebook came third in our SYSmark test. Its svelte dimensions mean that there is only one PC Card slot, and the screen flexes when moved. However, Esprit has managed to squeeze both a floppy and a CD-ROM drive into the space.

The Tycoon is let down slightly by the quality of its screen, which is dull with a dark band to the right. Also, we would liked to have been able to test the sound card, but this pre-production model did not have this facility.

The Esprit Tycoon has some faults, but on the whole, the sleek design and light weight, coupled with the built-in modem, won us over.

Two machines did rise above the others and represent solid budget purchases



▼ **THE DELL INSPIRON 3500** STOOD OUT IN THIS GROUP DUE TO ITS EXCELLENT BUILD QUALITY



➤ **The Dell Inspiron 3500, our Editor's Choice**, did not achieve the highest SYSmark result, but made up for it with its outstanding build quality.

◀ **THE SLEEK, SVELTE ESPRIT TYCOON IS DISTINGUISHED BY ITS GOOD LOOKS**

