






GRAPHICS CARDS		Last month's position	First reviewed	Price (ex VAT)	Warranty	Graphics processor	Graphics architecture	Installed/maximum RAM	DDR RAM	Memory interface		Ramdac	8x AGP	Maximum resolution @ 75Hz	DirectX version supported	DVI	TV-out	Dual screen support	Anti-aliasing	Software
	1 Gigabyte Maya II R9700 Pro 01908 362 700 http://uk.giga-byte.com	NEW	Dec 02	£260	3-year	ATI Radeon 9700 Pro	256bit	128/256MB	yes	256bit		400MHz	yes	1,920x1,440	9x	yes	yes	yes	SmoothVision 6x	PowerDVD, games pack
	2 Sapphire Radeon 9700 Atlantis Pro 0870 467 0753 www.sapphiretech.com	NEW	Dec 02	£250	1-year	ATI Radeon 9700 Pro	256bit	128/256MB	yes	256bit		400MHz	yes	1,920x1,440	9x	yes	yes	yes	SmoothVision 6x	ATI Catalyst Suite
	3 AOpen Aeolus Ti 4200 S-DV128 0800 138 5196 www.aopen.nl	NEW	Dec 02	£125	2-year	nVidia GeForce4 Ti 4200	256bit	128/128MB	yes	128bit		350MHz	no	2,048x1,536	8x	yes	yes	yes	Accuvieu 4x	WinDVD
	4 Sapphire Radeon 9000 Atlantis Pro 0870 467 0753 www.sapphiretech.com	NEW	Dec 02	£70	1-year	ATI Radeon 9000 Pro	256bit	64/128MB	yes	128bit		400MHz	yes	1,920x1,440	8.1x	yes	yes	yes	SmoothVision 6x	ATI Catalyst Suite
	5 PNY Verto GeForce4 Ti 4200 01844 261 872 www.pny.co.uk	NEW	Dec 02	£145	5-year	nVidia GeForce4 Ti 4200	256bit	64/128MB	yes	128bit		350MHz	no	2,048x1,536	8x	yes	yes	yes	Accuvieu 4x	DVD
	6 PNY Verto GeForce4 Ti 4600 01844 261 872 www.pny.co.uk	NEW	Dec 02	£215	5-year	nVidia GeForce4 Ti 4600	256bit	128/128MB	yes	128bit		350MHz	no	2,048x1,536	8x	yes	yes	yes	Accuvieu 4x	DVD, WinProducer, games pack
	7 Albatron GeForce4 Ti 4600 0870 729 7818 www.albatron.com.tw	NEW	Dec 02	£199	3-year	nVidia GeForce4 Ti 4600	256bit	128/128MB	yes	128bit		350MHz	no	2,048x1,536	8x	yes	yes	yes	Accuvieu 4x	WinDVD, Serious Sam, Motocross
	8 ECS EliteGroup AG400T8-D64 0870 429 3220 www.ecs.com.tw	NEW	Dec 02	£50	1-year	SIS Xabre 400	256bit	64/64MB	yes	128bit		375MHz	yes	2,048x1,536	8.1x	no	yes	no	Jitter 4x	DVD
	9 Chaintech GeForce4 MX A-G441 0120 447 4747 www.chaintech.dk	2	Aug 02	£49	2-year	nVidia GeForce4 MX 440	256bit	64/64MB	yes	128bit		350MHz	no	2,048x1,536	8x	no	yes	no	Accuvieu 4x	WinDVD, Aquanox, MDK 2
	10 Gainward GeForce4 Pro Ti/650 Golden Sample 0870 220 0700 www.gainward.de	1	Sep 02	£85	3-year	nVidia GeForce4 MX 460	256bit	64/64MB	yes	128bit		350MHz	no	2,048x1,536	8x	no	yes	no	Accuvieu 4x	DVD, WinProducer

1 Gigabyte Maya II R9700 Pro

 After three years of total domination over the graphics card market, nVidia's stranglehold has been broken with the emergence of ATI's Radeon chip. The 9700 Pro is crammed with a range of features that push frame rates and graphics quality to new levels. Increased image quality allied to trailblazing speed is the aim of the Gigabyte/ATI combination. With the original GeForce card, nVidia brought the industry a fully programmable graphics engine. The Radeon 9700 Pro takes the technology further, offering increased numbers of pixel and vertex shaders and 128bit floating point precision colour.

Such technology requires plenty of RAM and the Radeon does its best to keep memory pipelines clear thanks to its 256bit memory interface and 128MB of DDR (double data rate) RAM.


The image quality the Gigabyte produces is astonishing and the Radeon is the most attractive card on the market. The benchmark results are equally emphatic. In Comanche 4, Aquanox and Quake III, the 9700 established a clear lead at lower resolutions and destroyed its rivals at 1,600x1,200 and beyond.

 Watch out nVidia! Radeon steals the US chip manufacturer's crown with its 9700 Pro

Although the GeForce4 Ti 4600 was able to keep within sight of the Radeon's 200fps (frames per second) in Quake III, at higher resolutions it dropped between 50 and 70fps in contrast to the Radeon's steady 15-20fps decline.

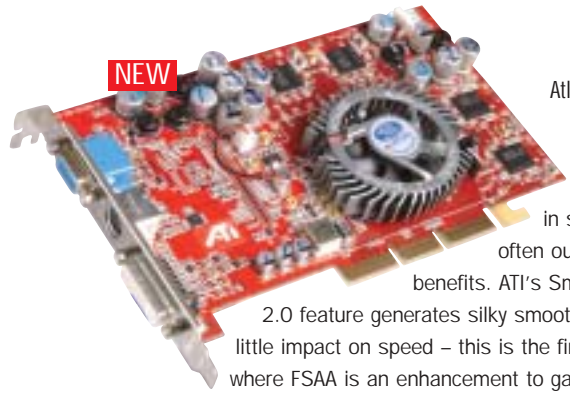
The Gigabyte may be marginally more expensive than the Recommended Sapphire Radeon, but the increased performance, three-year warranty and bumper software bundle makes this the best overall package. The only real question mark hanging over the Radeon 9700 Pro is whether you want to spend £260 on a product that may only be the best technology in the world until the next big release from nVidia.

2 Sapphire Radeon 9700 Atlantis Pro

 With the Radeon 9700 Pro, ATI is very much preparing for the future of 3D graphics and games, so there are a host of features that you're unlikely to be using any time soon. The card works with the new 8x AGP slot, for instance, which is good news if you're looking to upgrade your motherboard, but won't be relevant to the average user for another 12 months.

The 9700 Pro offers full support for the latest version of Microsoft's gaming interface, DirectX 9. With its advanced shading and texture abilities, this will make a difference to the quality of graphics. The bad news is that the first proper DirectX 9 games won't be available until 2003.

But there's still plenty to enjoy with the 9700 right now – for example, the impressive anti-aliasing feature. FSAA (full scene anti-aliasing) smooths out the unwanted jagged lines of computer graphics, but it also consumes PC resources. The resulting drop



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← The future-proofed Atlantis Pro is the second card that utilises ATI's Radeon 9700 Pro chip

in speed often outweighs the benefits. ATI's SmoothVision 2.0 feature generates silky smooth graphics with little impact on speed – this is the first Radeon card where FSAA is an enhancement to gameplay rather than a compromise.

This 128MB version of the Radeon 9700 Pro was capable of showing a clean pair of heels to the GeForce4 Ti 4600, regularly collecting between 10 and 20fps (frames per second) more than the 4600 cards. It's a testament to the impressive hardware behind the processor that the performance lead over the other cards grew as the levels of detail were piled on. As games titles become more demanding this is the card that will keep pace.

Whether you buy this card or the Best Buy Gigabyte will probably be down to availability as much as anything. The Sapphire is the slower of the two cards, although you're unlikely to see the difference. The lack of software and one-year warranty are also niggles, although the £10 price difference makes up for that to some extent. Essentially, though, you're buying the chip rather than the card. If you can afford £250 for the greatest show in town, the Sapphire Radeon 9700 Atlantis Pro is guaranteed to give satisfaction.

3 AOpen Aeolus Ti 4200 S-DV128

 With the Aeolus, AOpen has managed to unlock the full potential of nVidia's mid-range chip, the GeForce4 Ti 4200. For a start, memory hasn't been skimped on – the Aeolus is equipped with 128MB of fast DDR (double data rate) RAM. Dual screen support is built in and nView allows users to plug in a second monitor and instantly double the amount of workspace, while Accuvieu offers adequate anti-aliasing. But the Aeolus' real benefit is its speed. At resolutions of 1,024x768 and 1,280x1,024 it was rarely more than 5fps (frames per second) behind the more expensive GeForce4 Ti 4600. Even at 1,600x1,200 and beyond, games remain playable and the Aeolus never dropped below the magic 30fps mark.

If we were going to criticise AOpen's card, we could point to the poor software bundle. We could also suggest that the lack of DirectX 9 support and 12-month-old technology will leave it struggling to keep up with 2003's games scene. But in the current environment this is more than enough for gamers that don't want to splash out in excess of £200.

→ An excellent choice if your budget is tight, the AOpen Aeolus is based on nVidia's mid-range chip, the GeForce4 Ti 4200



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4 Sapphire Radeon 9000 Atlantis Pro

For a card this cheap, the Radeon 9000 Pro is a revelation. Generally, the specifications – 64MB of DDR (double data rate) RAM and 128bit memory bus – are modest, but the card does boast DirectX 8.1 support. More notable is the inclusion of vertex shader units and for high graphics quality this is the best in the sub-£100 range. The connectors are excellent as the RGB connector and TV-out port are joined by a second outlet for a DVI (digital visual interface) screen. DualView is built into the card, allowing you to plug in a second screen. For anyone intending to do this, this card must be one of the cheaper solutions available.

There's no complaints about performance either: the Radeon 9000 Pro was superior to the other sub-£100 models. At resolutions of 1,024x768 and 1,280x1,024 this card is a dream,

➤ The Sapphire Radeon 9000 is another budget card which will suit all but the most demanding gamers

notching up rates in excess of 160fps (frames per second) during Quake III. It's only when you up the detail that the performance drops off, so if you need high frame rates at 1,600x1,200 the GeForce4 Ti 4200 cards are still the best bet. It's also disappointing that the 9000 Pro doesn't employ enhanced FSAA (full scene anti-aliasing) techniques. But if you don't mind sticking to lower resolutions, or want a cheap DualView option, this budget card stands out.

5 PNY Verto GeForce Ti 4200

This card from PC Advisor newcomer PNY is the second to feature the GeForce4 Ti 4200. Though the Verto still has plenty to offer,



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← New to the chart, PNY's fifth-placed Verto has a decent five-year warranty

it lacks the all-round excellence of the high-calibre AOpen Aeolus package in third place. This is partly due to its price tag: at £145, the Ti 4200's asking price is getting close to that of the faster Ti 4600 cards. It's the performance that asks the most questions of PNY, though, and the decision to equip the card with just 64MB of memory leaves it short on firepower. Frame rates are solid enough, although the card was always 4-5fps (frames per second) behind the Aeolus at lower resolutions, with the lead stretching to 8-10fps when confronted with more demanding graphics.

Essentially there's nothing wrong with the Verto GeForce Ti 4200. It has good dual screen and TV-out facilities and the lengthy five-year warranty offers peace of mind. But if you're in the market for a good mid-priced graphics card, the AOpen Aeolus is the more polished of the two.

6 PNY Verto GeForce4 Ti 4600

Only last month the GeForce4 Ti 4600 revelled in its 256bit GeForce4 architecture. The nfiniteFX II engine and Accuvieu anti-aliasing generated searing graphics quality, while the Lightspeed memory squeezed every last frame out of the latest games titles. Fast forward to the present day and it's now the Radeon 9700 Pro that holds all the aces. It's not just a

→ The Verto GeForce4 Ti 4600 is no slouch, although its ageing technology may mean that soon it will fail to keep up



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nVidia's death throes?

After months and months of promising the earth but failing to deliver, ATI has finally created its breakthrough product and seized the initiative in the fierce battle for pole position in the graphics card market. Or has it? We're unlikely to find out the truth for a few months yet but, if the details leaking across the web are anything to go by, nVidia's response, the NV3x, could well turn the graphics market on its head.

With the Radeon 9700 Pro, ATI has taken a leaf or two out of nVidia's book. The unwieldy anti-aliasing techniques of the Radeon 8500, for instance, have been thrown out in favour of a more streamlined and efficient piece of coding strongly reminiscent of the GeForce4 range. The memory controller, too, follows in nVidia's footsteps.

But the US graphics giant looks hellbent on taking the graphics market to an entirely new level of performance. nVidia's next-generation GeForce chip won't stint on

technology. Besides full DirectX 9 and 8x AGP support, the NV3x will embrace blistering DDR-II memory. The chips are also being manufactured using the smaller 0.13 micron core.

The GeForce range pioneered the concept of a fully programmable graphics engine, offering increased colour depth and equipping programmers with a versatile vertex and pixel architecture that allowed them to reach new levels of graphics realism. While ATI has taken the existing technology and tweaked it slightly, the NV3x promises a radical overhaul – 128bit colour, a huge increase in the abilities of the vertex and pixel shaders and an ultra-efficient programming language.

At the time of writing, it looked unlikely that nVidia would have a potential ATI vanquisher released in time for the Christmas market. But if the NV3x realises its potential, the rumours of nVidia's demise could be very much exaggerated.

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matter of inferior frame rates. The 9700 Pro led the way in five of our six tests, although it's only with full detail and at a resolution of 1,600x1,200 or more that you'll notice a real difference. PNY's rendition is no slouch, though, and managed to beat all non-Radeon 9700 Pro cards on performance.

However, the Ti 4600 technology is now 12 months old and lacks many of the Radeon's forward-thinking features. You won't get support for DirectX 9.0, for instance. Neither will you get a device that utilises 8x AGP slots. Undoubtedly you don't currently need these features, but if you're paying around £200 for a card you should expect some future-proofing.

7 Albatron GeForce4 Ti 4600

One difficulty about reviewing graphics cards is that the price tends to change from one moment to the next.

Take the GeForce4 Ti 4600. Previously a surefire winner on performance, the cards featuring this chip have now been batted away by the Radeon 9700 Pro models. Worse still, the price tags, on paper at least, are still around the £200 mark. But imminent price cuts (and the huge discounts available on the web) means that, by the time you read this, the Albatron Ti 4600 might be a distinct bargain.

And, at the right price, the Ti 4600 is worth looking at. True, this isn't the best example we've seen. And the Albatron's frame rates were generally beaten – not just by the Radeon 9700 Pros, but also by PNY's Ti 4600 card. Despite this, frame rates were always playable and even at a resolution of 1,600x1,200 most of the games fell within the 40-45fps (frames per second) range.



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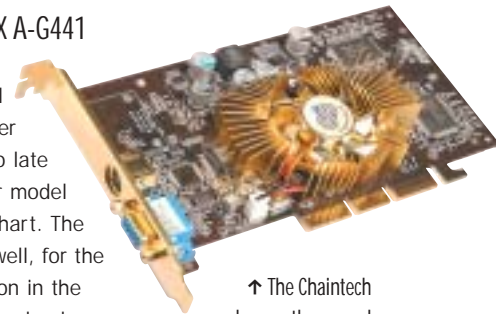
↑ With a price cut, the Albatron GeForce4 Ti 4600 could be worth a look

In performance the card is erratic, although it managed acceptable frame rates at lower resolutions. Compared to the GeForce4 MX cards, the Xabre looks good value for money, but it's unfortunate to be competing with the finely honed Radeon 9000 Pro. It's also a shame for SIS and ECS that the good-value Xabre 400 is likely to be overlooked in the quest for speed.

9 Chaintech GeForce4 MX A-G441

Although the price of the Chaintech GeForce4 MX fell dramatically in the November issue, the change came too late for us to push this popular model back to the top of the chart. The price drop is just as well, for the increased competition in the sub-£100 sector is clearly starting to get on top of Chaintech. The technology may boast the same

256bit graphics architecture and efficient memory management that has made previous GeForce cards such a force, but the GeForce4 MX 440 is the second slowest chip in the current nVidia range. As such, the card failed to match the speed of its competitors. In fact, so superior in performance is the Sapphire Radeon 9000 Atlantis Pro that, with just a £20 difference in price, only the very miserly would choose the low-cost Chaintech as their best buy.



↑ The Chaintech houses the second slowest nVidia chip, the GeForce4 MX 440

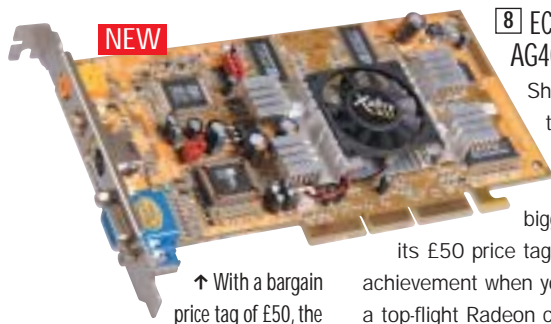
10 Gainward GeForce4 Pro Ti/650 Golden Sample

The relative demise this month of the previous chart-topping GeForce4 MX cards illustrates how fickle the world of graphics cards can be. The Gainward earned its stripes by combining bearable performance figures with incredible value for money. When you needed to pay out £125 just to get hold of GeForce4 Ti technology, the Gainward offered a great deal for anyone happy to play their games at a resolution of 1,024x768.

But this month, pitted against the superior Radeon 9000 Pro and with prices of the top GeForce cards continuing to plummet, suddenly that £85 price tag doesn't look so enticing. Within its price range, the Gainward remains a competent performer, beating the Chaintech convincingly, while also managing to keep ahead of the new Xabre 400 card. But both of these cards retail for around £30 less than the Gainward, while the similarly priced Radeon 9000 Pro eclipsed the Gainward in all of our speed tests. Add to this the Radeon's more attractive graphics rendering, and the inclusion of dual-screen support as standard, and it's hard to justify buying the Gainward in preference.

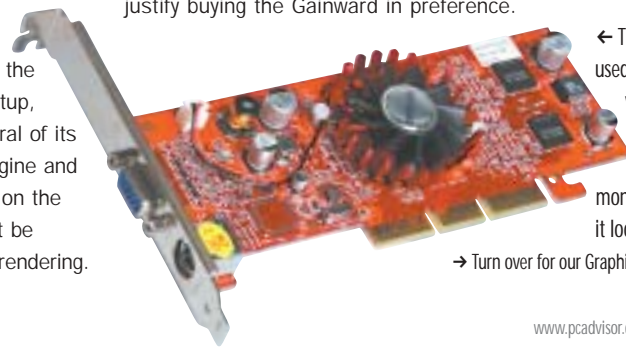
8 ECS EliteGroup AG400T8-D64

Shamelessly targeting the lower end of the market, the EliteGroup's biggest weapon is its £50 price tag – an amazing achievement when you consider that a top-flight Radeon card will cost you almost six times as much. In terms of hardware specifications, however, the Xabre chip bears comparison with any of the sub-£100 models. In fact, with its sophisticated TV-out setup, support for 8x AGP and DirectX 8.1, it's a cut above several of its competitors. It also features an advanced pixel shader engine and an efficient anti-aliasing technology. Predictably, switching on the latter causes a drop in frame rates, so you probably won't be wanting to take advantage of its more attractive graphics rendering.



NEW

↑ With a bargain price tag of £50, the EliteGroup is a worthy Top 10 entrant – just as long as speed is not your main priority



← The Gainward used to offer great value for money, but compared to this month's entrants it looks overpriced

→ Turn over for our Graphics cards buying advice