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• DVDs reviewed by Riyad Emeran  
and tested by Lars-Goran Nilsson

## ratings

- ★★★★★ EXCELLENT  
★★★★☆ VERY GOOD  
★★★☆☆ AVERAGE  
★★☆☆☆ BELOW AVERAGE  
★☆☆☆☆ POOR

# Discover DVDs

DVD-ROMs are standard fare on new PCs these days but deciding which one to buy can be daunting. We've tested 12 of the best, including some with CD-RW features, to help you make your choice.

**T**he chances of buying a PC these days without a DVD-ROM drive are pretty slim. It seems that even budget PCs ship with DVD as

standard, indicating that DVD-ROM has become the *de facto* standard optical drive.

The transition from CD-ROM to DVD-ROM has been a lot less painless than the transition from floppy disk to CD-ROM. This is mainly because when the CD-ROM drive arrived, the lack of supporting software made the drive an expensive and somewhat useless addition to a PC. However, since a DVD-ROM can also read CD-ROM software and play DVD movies, it is an instantly useful piece of equipment, even if there isn't a lot of DVD-specific software available yet.

There's not a lot to separate DVD-ROM drives from one another other than performance. Testing aspects such as DVD movie playback is completely bogus, since that's down to the graphics card or MPEG2 decoder.

Several of the drives featured in this group test are DVD/CD-RW combo units, but we have only tested the DVD and CD read performance and looked at the CD-RW capability as a bonus.

What most users are looking for is a drive that will transfer data fast enough to ensure that they're not left twiddling their thumbs for too long.

To this end, we've rounded up 12 DVD-ROM drives, including some with CD-RW capability, and run them through a rigorous set of real-world tests.

PHOTOGRAPH PATRICK LLEWELLYN-DAVIES

## AOpen DVD 1640 Pro

DVD-ROM



**AOPEN HAS BECOME** a force to be reckoned with of late, producing components and peripherals in every area of PC construction.

The DVD 1640 Pro is the fastest

drive on test, spinning DVDs at a very impressive 16-speed and CDs at 40-speed, producing some lightning fast times. It managed to speed through the massive 2.3GB Baldur's Gate install in only three minutes 56 seconds, while copying the Encarta DVD-ROM took only six minutes 11 seconds. Only the copy of the MPEG file fazed the 1640, but it still turned in a respectable time.

The drive itself is a slot-loading unit, whether you prefer this to a tray loader is a matter of opinion, but the idea is that there is less dust ingress and fewer moving parts to go wrong.

On the front is a single eject button along with a headphone jack and volume wheel. In the retail box you'll find a manual, a driver disc and an audio

cable. It lacks an EIDE cable, but you do get a full copy of Cyberlink's excellent Power DVD movie player.

Ultimately, AOpen has produced a first-class unit that marries excellent performance with solid build quality. It's a close call between this drive and the Pioneer, but the DVD 1640 Pro just loses out due to its higher price.

## DETAILS

★★★★★



**PRICE** £128.07 (£109 ex VAT)

**CONTACT** Jungle.com 0800 0355 355

[www.aopen.nl](http://www.aopen.nl)

**PROS** Very fast; well built

**CONS** Slightly more expensive than the Pioneer

**OVERALL** The fastest DVD drive available, with smart design and solid build quality

## Asus E612

DVD-ROM



**LIKE AOPEN, ASUS** has built a very strong reputation for itself over the past few years, both as a motherboard manufacturer and for its expansion into areas such as optical drives.

The E612 is a 12-speed unit, so it's not quite cutting edge. The model we looked at was an early sample and refused to read CD-R media – presumably this is an issue that will be resolved in the production version.

Performance was a very mixed bag. The E612 managed to copy the Encarta disc in a reasonable time, although still slightly slower than the other two 12-speed drives. However, when it came to the Baldur's Gate installation, the Asus turned in a score of 13 minutes 32 seconds, which was on a par with the four-speed combo drives and slower than the five-speed Toshiba DVD-ROM.

On the plus side, the front panel is more comprehensive than most of the other DVD-ROM drives; featuring CD

audio controls for play/skip and stop/eject as well as the headphone jack, volume wheel and indicator light.

On the surface this looks like a disappointing effort from Asus, but hopefully the performance and compatibility issues will be addressed by the time the production models ship.

## DETAILS

★★

**PRICE** £116.32 (£99 ex VAT)

**CONTACT** Landmarq 020 8768 9301

[www.asus.com.tw](http://www.asus.com.tw)

**PROS** CD control buttons on the front panel

**CONS** Poor performance and compatibility

**OVERALL** The performance and compatibility issues should be addressed by the time you read this, but it's still only a 12-speed

## LG Electronics DRD 8080B

DVD-ROM



**THIS DRIVE FROM** LG Electronics is looking a little bit behind the times in terms of specification. The 8080B will spin DVDs at eight-speed and CDs at 40-speed. Considering that we have two

16-speed drives in this test, the LG was never going to win any prizes for speed. Unfortunately, performance wasn't the only problem that the 8080B encountered. After numerous tries we could not get the LG to perform the install of Baldur's Gate. Considering that software installations should be the staple diet for a DVD-ROM drive, we were not very impressed.

The copy of the Encarta disc went without a hitch, but as expected the performance was poor, with only the five-speed SCSI Toshiba drive turning in a slower score. The CD-ROM performance proved to be far better with the 8080B turning in the third fastest score for the MPEG copy.

The front of the unit is rather sparse

with a very small eject button, a headphone jack and a volume wheel, while the array of ports at the rear includes a digital audio output port.

It's hard to recommend the LG when there are much faster drives available that performed all the tests faultlessly.

## DETAILS

★★

**PRICE** £116.32 (£99 ex VAT)

**CONTACT** Dabs.com 0800 129 3120

[www.lge.com](http://www.lge.com)

**PROS** Good retail kit and documentation; good MPEG2 playback software

**CONS** Slow and outdated; it wouldn't run all the tests

**OVERALL** A disappointing drive; the specs are below par and the performance is poor

## Pioneer DVD-115

DVD-ROM



**PIONEER HAS LIVED** up to its name in the home DVD player market, producing some of the first and, some would say, best units. Although Pioneer was slow to hit the DVD-ROM market, it

managed to come up with a 10-speed drive while the competition was still producing six and eight-speed models. Now Pioneer has come up with a 16-speed drive, researched in alliance with AOpen, making it one of only two drives available at this speed. Unfortunately for Pioneer, the AOpen unit was marginally faster.

Unlike the AOpen drive, the Pioneer uses the traditional tray loading design. At the rear Pioneer has been considerate enough to supply a jumper with a small handle to allow easy slave/master selection, without the need for tweezers, something that the AOpen drive also sports. Performance wise, there was only a whisker's difference between the Pioneer and AOpen units on DVD read

performance, while CD read performance was identical across both drives.

The DVD-115 is a very fast unit and the few seconds' difference in speed between this and the AOpen are negligible. If you're after a fast drive you'll be happy with either, but the Pioneer just steals the Editor's Choice award due to its lower price.

### DETAILS

★★★★★

**PRICE** £116.32 (£99 ex VAT)**CONTACT** Dabs.com 0800 129 3120[www.pioneer.co.uk](http://www.pioneer.co.uk)**PROS** Very fast with a reasonable price**CONS** Just a whisker slower than the AOpen**OVERALL** A great drive. If you're after speed you'll love the Pioneer

## Samsung SD-612

DVD-ROM



**LIKE LG, SAMSUNG** is a Korean company that produces a wide range of products in both the IT and consumer electronics arenas. Although a relatively large player in the CD-ROM market,

Samsung has only just targeted the DVD-ROM market with serious intent, and the SD-612 isn't a bad start.

The SD-612 provides 12-speed performance for DVDs and 40-speed performance for CDs. The performance results were favourable for the drive, with it turning in a time of six minutes 27 seconds for the Baldur's Gate install and eight minutes 50 seconds for the Encarta copy. What was most impressive though, was the MPEG file copy from CD which took only three minutes 22 seconds.

The drive itself feels very solid and there's a full complement of ports at the rear, including a digital audio output. At the front you've got an eject button, indicator light, headphone jack and

volume wheel. Like most of the DVD-ROM drives, the SD-612 has a 512KB data buffer for smooth transfer.

With the unit you get a driver disc and a CD audio cable for listening to audio CDs through your sound card.

All in all, the SD-612 is a decent unit, providing a good performance for a 12-speed device.

### DETAILS

★★★★★

**PRICE** £116.32 (£99 ex VAT)**CONTACT** Samsung[www.samsung-storage.com](http://www.samsung-storage.com)**PROS** Solid performance**CONS** Not as fast as the 16-speeds**OVERALL** A very good 12-speed drive, worth a look if you can't find the AOpen or Pioneer

## Toshiba SD-M1201

DVD-ROM



**THIS IS THE ONLY** SCSI DVD-ROM drive on test, so you could say that Toshiba has got the market sewn up. This is a surprising situation since there are a great many SCSI users out there

and they aren't likely to want to turn on an EIDE channel just to be able to use a DVD-ROM drive.

It's no surprise to see Toshiba producing this kind of unit, since the company also used to produce good SCSI CD-ROM drives. What is strange, however, is that Plextor, the leader in high-end SCSI CD-ROM drives, has not produced a competing unit yet.

Strangely, even though the SCSI bus has more bandwidth and causes less system overhead, Toshiba has chosen to make this drive only a five-speed unit with corresponding 32-speed CD-ROM performance. With this specification, it's unsurprising that the SD-M1201 didn't score too favourably in the tests. The copy of the Encarta DVD took 16

minutes 38 seconds, while the Baldur's Gate install was just a couple of seconds shy of 10 minutes. Bizarrely, it was slightly faster than the two 16-speed units when copying the MPEG file.

The SD-M1201 may not be the fastest drive on test or the most advanced, but if you want a SCSI-only PC, it could be your only option.

### DETAILS

★★★

**PRICE** £103.04 (£88 ex VAT)**CONTACT** SMCdirect 01753 550 333[www.toshiba.co.uk](http://www.toshiba.co.uk)**PROS** SCSI interface; very cheap**CONS** Not very fast**OVERALL** If you want a SCSI DVD-ROM drive, this is it. But at least it's cheap

## Toshiba SD-M1402

DVD-ROM



**TOSHIBA WAS ONE** of the first manufacturers to produce a DVD-ROM drive. The SD-M1402 provides 12-speed DVD performance and 40-speed CD performance.

The SD-M1402 managed to beat the Samsung 12-speed drive by over a minute when copying the Encarta CD. However, it only managed a time of eight minutes 37 seconds when copying the MPEG file, compared to three minutes 22 seconds on the Samsung. One reason for this could be the relatively small data buffer of 128KB, which could cause a bottleneck when transferring large amounts of sequential data. The other tests proved similar across the 12-speed devices.

The most obvious omission on this drive is the lack of a headphone jack and volume wheel. That means that you must have a sound card in your PC if you want to listen to music. The only features on the front fascia are

the eject button and the indicator light.

The build quality of the SD-M1402 is first rate, with the case feeling more solid than the other drives on test. But this does not really make up for the lack of features as fundamental as a headphone jack and volume wheel.

## DETAILS

★★★★

**PRICE** £129.25 (£110 ex VAT)**CONTACT** SMCdirect 01753 550 333[www.toshiba.co.uk](http://www.toshiba.co.uk)**PROS** Decent performer; excellent build quality**CONS** No headphone jack or volume wheel; faster drives available**OVERALL** Not a bad unit, but if you want a 12-speed drive, the Samsung is a better bet

## AOpen DRW 4624

DVD-ROM/CD-RW



**AOPEN MAY HAVE** produced some of the fastest test scores with its 16-speed DVD-ROM drive, but it's also managed to turn in the slowest score with the DRW 4624 DVD/CD-R combo drive.

Although we expected these drives to be considerably slower than the DVD-ROM drives, we were surprised to see the 4624 fall just one second short of 33 minutes, when copying the Encarta DVD. Strangely, it was only in this particular test that the AOpen scored so badly; across the other tests it was on a par with the other combo drives.

The rear of the unit has all the ports that you would expect, while the front has an eject button, indicator light, headphone jack and volume wheel.

Unlike AOpen's DVD-ROM drive, this unit ships with WinDVD, for MPEG2 playback. You also get the excellent Nero Burning ROM for CD-R mastering and InCD for packet writing to CD-RW discs. Thoughtfully, AOpen

has also included a copy of Norton Ghost so that you can image your hard disk to CD-R or CD-RW.

There's an audio cable included, but no EIDE cable, which is a little disappointing. That said, AOpen has put together a strong package with a decent software bundle.

## DETAILS

★★★★

**PRICE** £257.32 (£219 ex VAT)**CONTACT** Jungle.com 0800 0355 355[www.aopen.nl](http://www.aopen.nl)**PROS** Good software bundle**CONS** Disappointing performance when copying from DVD media**OVERALL** Not a bad drive, but there are better combo units around

## Memorex TriMAXX 200

DVD-ROM/CD-RW



**THIS DRIVE FROM** Memorex is actually a re-badged Ricoh unit even though it performed better than the Ricoh itself. Strange as this may seem, it's not that uncommon and could be

the result of something as simple as firmware differences.

Like the other combo drives on test, the Memorex boasts read speeds of four-speed and 24-speed for DVD and CD media respectively. It also writes CD-RW media at four-speed and CD-R media at six-speed.

Similarities aside, the Memorex was a very good performer, consistently ranking as the fastest combo drive, or at least near the top. The Baldur's Gate installation took only 12 minutes 34 seconds, while it made the MPEG copy in only seven minutes 46 seconds, beating many of the DVD-ROM drives.

Even though we're not testing the CD-RW performance in this test, the fact that the Memorex and Ricoh can

write CD-R media at six-speed gives them an advantage over the Toshiba and Samsung. Although its importance relies on how often you'll be burning CDs.

Cosmetically, this drive is identical to the Ricoh. But it's a great drive that's fast in all areas. Add to this an attractive price and you've got a deserving Editor's Choice winner.

## DETAILS

★★★★★

**PRICE** £199 (£169.36 ex VAT)**CONTACT** PC World 08705 464 464[www.memorex.co.uk](http://www.memorex.co.uk)**PROS** Very fast for a combo unit; six-speed CD-R performance; good price**CONS** None**OVERALL** This is the best of the combo drives

## Ricoh 9060A

DVD-ROM/CD-RW



**RICOH WALKED AWAY** with a Highly Commended award in our June CD-RW group test with this very unit. What Ricoh had done was combine decent CD-RW performance with DVD-ROM

functionality. This time, however, we're more interested in its DVD capabilities.

The 9060A's spec is identical to the Memorex, which isn't surprising since they're basically the same drive. You get four-speed DVD and 24-speed CD read performance, coupled with six-speed CD-R and four-speed CD-RW writing.

The copy of the Encarta disc took 26 minutes 32 seconds, which was a couple of minutes slower than the Memorex and the Samsung, but still a fair bit faster than the AOpen. The other scores were similarly nothing to write home about, but they weren't far off the mark.

The retail box is a good package including media, an audio cable and Nero Burning ROM for CD-R writing and InCD for CD-RW use.

It's easy to judge the Ricoh harshly due to its scores, but it's not far behind the pack and it does have one very impressive redeeming feature, its price. Costing only £165 ex VAT, the Ricoh offers amazing value, making it a great combo buy.

### DETAILS

★★★★

**PRICE** £193.87 (£165 ex VAT)

**CONTACT** Dabs.com 0800 129 3120

[www.ricoh-europe.com](http://www.ricoh-europe.com)

**PROS** Great value; six-speed CD-R performance

**CONS** Not the fastest performer in the test

**OVERALL** This drive has a great spec, but the identical Memorex performed better in tests

## Samsung SM-304B

DVD-ROM/CD-RW



**SAMSUNG IS DEFINITELY** proving that it's serious about DVD, submitting drives in both the DVD-ROM and combo categories.

The SM-304B shares the same specs

as the Toshiba drive, offering four-speed DVD and 24-speed CD read performance, while writing CD-R and CD-RW media at four-speed.

Performance was middle of the road with the SM-304B, it failed to either impress or disappoint us. Ultimately, you're making a compromise with a combo drive and a drop in performance over two standalone units is one of the prices you pay.

The unit itself is solid enough and the front panel sports the usual array of controls including an eject button, indicator light, volume wheel and headphone jack. All the necessary ports are at the back, including a digital audio out connector. The package also includes an analog audio cable along

with Adaptec's Easy CD Creator for burning CD-R discs and Direct CD for packet writing to CD-RW media.

The SM-304B is a decent unit with performance that's unlikely to disappoint. The price is also reasonable, so if you're happy with the four-speed CD-R performance, it's worth a look.

### DETAILS

★★★★

**PRICE** £199 (£169.36 ex VAT)

**CONTACT** Evesham.com 0800 038 0800

[www.samsung-storage.com](http://www.samsung-storage.com)

**PROS** Decent software; reasonable performance; good value

**CONS** Only four-speed CD-R performance

**OVERALL** This is a very good product, with a decent software bundle to back it up

## Toshiba SD-R1002

DVD-ROM/CD-RW



**WE LOOKED AT** this combo drive from Toshiba a couple of months ago in the CD-RW group test. In that test it didn't fare as well as the drive from Ricoh, although this time we're looking

at DVD and CD read performance.

A full complement of ports reside at the back, including digital audio out, while the front sports the usual headphone jack, volume wheel, indicator light and eject button.

The SD-R1002 managed to turn in the best score of all the combo drives in the Encarta copy test, producing a time of 22 minutes 49 seconds. It was also the second fastest combo drive in the Baldur's Gate test, finishing the 2.3GB installation in 13 minutes 45 seconds. The Memorex sneaks ahead in a few of the tests, but the Toshiba can hold its head high among the combo fraternity.

The software bundle includes a copy of WinDVD for movie playback and InstantCD for burning CD-R discs.

What's most impressive though is that this is the only drive on test that ships with an EIDE cable as standard, as well as an audio cable.

Toshiba has squeezed decent DVD performance from this drive, unfortunately the price is very high.

### DETAILS

★★★

**PRICE** £280.83 (£239 ex VAT)

**CONTACT** SMCdirect 01753 550 333

[www.toshiba.co.uk](http://www.toshiba.co.uk)

**PROS** Fast DVD performance; good bundle including EIDE cable

**CONS** CD-RW performance doesn't match the DVD performance; high price

**OVERALL** If you're after for a DVD-ROM drive with the bonus of a CD-RW, this is a great unit

## Software DVD players put to the test

Anyone with a domestic player will already know the joys of inserting a DVD movie, then sitting back and enjoying a picture that's far superior to VHS and even LaserDisc. Watching DVD movies on your PC, however, can be a different matter. You may have a DVD-ROM drive and modern operating system that can access the contents of the discs, but what are you going to do about decoding the highly compressed video and audio bitstreams, along with actually navigating the title in the first place?

There are two solutions for decoding DVD movies on a PC: one uses software and the other uses hardware.



**SoftDVD produced almost faultless results**

A hardware decoder card employs essentially the same chips that are used in a domestic DVD player to decompress the video into something you can see on your monitor or TV set. Creative Labs' DXR3 and Videologic's DVD player are two such PCI cards, that cost around £75.

Software decoders are small applications that harness the

processing muscle of modern PCs to navigate, decode and display DVD movies on your monitor. Even the fastest PIIIs can struggle with the load of decoding DVDs using a software player, but help is at hand. Most graphics cards designed in the past year boast built-in motion compensation, which takes care of decoding most of the video bitstream, removing much of the strain from your CPU.

While we could easily leave it at that, we wondered whether all motion compensation was created equal - ATi, for instance, is always claiming it has the best support for DVD. So we took four different graphics cards and tried them

out on the same system, using any supplied software, along with MGI's SoftDVD MAX (£14 to download) and InterVideo WinDVD (supplied with several graphics cards as well as with Creative's Live sound cards). We

wanted to measure the CPU workload on each card, so fired up the System Monitor accessory in Windows 98 under each configuration.

The test system consisted of an FC-PGA Pentium III 600E CPU with 128MB of SDRAM, an AOpen DVD-ROM drive and a 13.6GB Quantum Fireball Plus KX UltraDMA/66 hard disk, fitted on a Gigabyte

GA-6BX7+ motherboard. The Windows 98 SE system was set up for stereo output using a Creative Labs SoundBlaster Live! Platinum card, with the desktop running at 1,024 x 768 in 16bit colour. Our AGP graphics card candidates were an ATi Rage Fury MAXX, Asus AGP-V3800/32M TNT-2 Ultra, Abit Siluro GeForce 256 SDR, and a Matrox Millennium G400. We measured the CPU hit when playing chapter 29 of *The Matrix* (Region 1), where Keanu Reeves and Carrie-Anne Moss shoot up the reception of a high-security building.

The results were revealing. Using MGI SoftDVD MAX, the CPU hit bounced up and down between 20 and 85 per cent, but apart from a slightly lower hit on the ATi card, the other three achieved similar scores. In terms of quality, MGI's software player was almost faultless, albeit suffering from very occasional jerkiness.

In comparison, InterVideo WinDVD consumed a much more even supply of CPU power, with typically no more than 15 per cent variation. The Matrox G400 and Abit Siluro both averaged a 65 per cent hit, while the Asus scored a slightly better average of 60 per cent. The winner, however, in terms of CPU hit using WinDVD and especially its own supplied player was ATi, with an average of just over 50 per cent.

WinDVD on all cards and the ATi player on the MAXX both delivered very smooth image.

Out of interest we fitted a



**WinDVD gave an even CPU hit**

Creative Labs DXR3 hardware decoder card and ran the tests again using the Matrox G400 card. Using Creative's supplied software, we measured an average of 20 per cent, compared to the software average of 60 per cent on the same system. Just for fun, we replaced the 600MHz PIII with an 866MHz PIII and measured the Matrox G400 CPU hit under WinDVD. This time, the peak dropped from 80 to 20 per cent, and the average from around 65 to 13 per cent. Both the hardware player under 600MHz, and the software player under 866MHz produced faultless playback.

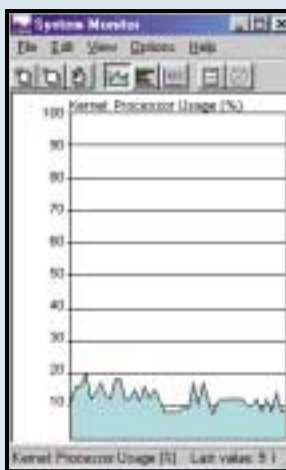
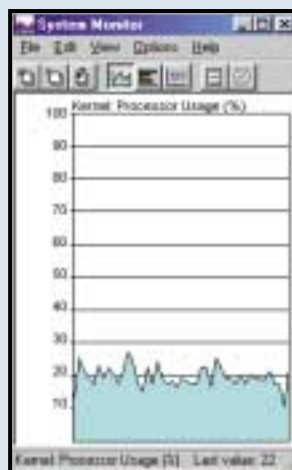
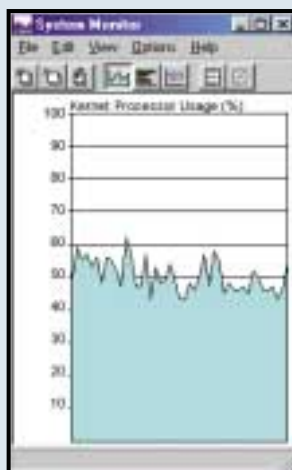
Motion compensation works and is an adequate solution under a 600MHz PIII. ATi proved its claims to be true and delivered the best software results, but for the ultimate in DVD playback, you're still looking at a faster main CPU or a hardware decoder.

GORDON LAING

MGI: [www.mgisoft.com](http://www.mgisoft.com)

InterVideo:

[www.intervideoinc.com](http://www.intervideoinc.com)



From left to right: the same DVD sequence played on the ATi Rage Fury MAXX and its own player running on a 600MHz PIII, the Matrox G400 and WinDVD on a 600MHz PIII, Creative Labs' DXR3 hardware card on a 600MHz PIII, and finally the Matrox G400 and WinDVD on an 866MHz PIII. In each case, Windows 98's System Monitor measures the CPU workload - smaller is better

## The flip side of DVD

**D**VD-ROM drives are only half the story and, to a degree, the lesser half of the story. Although data storage and distribution were always meant to be a major driving force for the DVD medium, the main use so far has been in the entertainment arena.

DVD-Video has finally taken off in a big way in the UK after a shaky start. Initially the UK software was slow to appear and disappointing compared to the US catalogue, but that has been addressed of late and now we're seeing UK DVD releases appearing only a couple of weeks after their US counterparts.

Unsurprisingly, as a result of the increased software availability, the uptake of standalone DVD-Video players has increased greatly. Also, the cost of a DVD player has dropped so much, that it's no longer prohibitive to mass consumption.

However, as with most things, you do get what you pay for and the type of performance you get from a £199 DVD player isn't going to match that of an £800 player. However, the difference in quality between various ranges of equipment may be imperceptible to most people.

Whatever end of the price spectrum you are going for, there are a few things you need to consider when buying a DVD player. The most important is regional coding. The DVD forum has split the world into regions, with the US and Canada making up Region 1 and Europe and Japan making up Region 2. This has been done because Hollywood wants to be able to

stagger the releases of films and it doesn't want us to be able to buy movies on DVD from the US before they're released at the cinema in the UK. Of course, for a lot of people, myself included, being able to obtain films from the US very early is appealing, not to mention that the US discs still tend to have more extra features than the Region 2 UK equivalents. Although officially, you're not supposed to be able to buy a DVD player that plays more than one Region of discs, they are freely available from the right sources. In fact, some retailers will even sell you a chip to make your player multi-region, but you'll need to be pretty handy with a soldering iron to fit one. However, fitting the modification yourself will invalidate your warranty, whereas most shops that sell multi-region machines will warranty the devices themselves, even if the manufacturers won't.

The next thing to consider is whether you want a Dolby Digital Processor built into the player. Now, real home cinema enthusiasts will never use an integrated Dolby Digital Processor, instead they

will take the pure digital output from the player and feed it into their external Dolby Digital Processor or amplifier. That said, even if you use an internal processor, you'll still need an amplifier with five analog inputs to receive the signal. Also, deciding to get the best from the sound will require you to fill your room with speakers, so the decision is one of practicality and aesthetics as well as movie enjoyment.

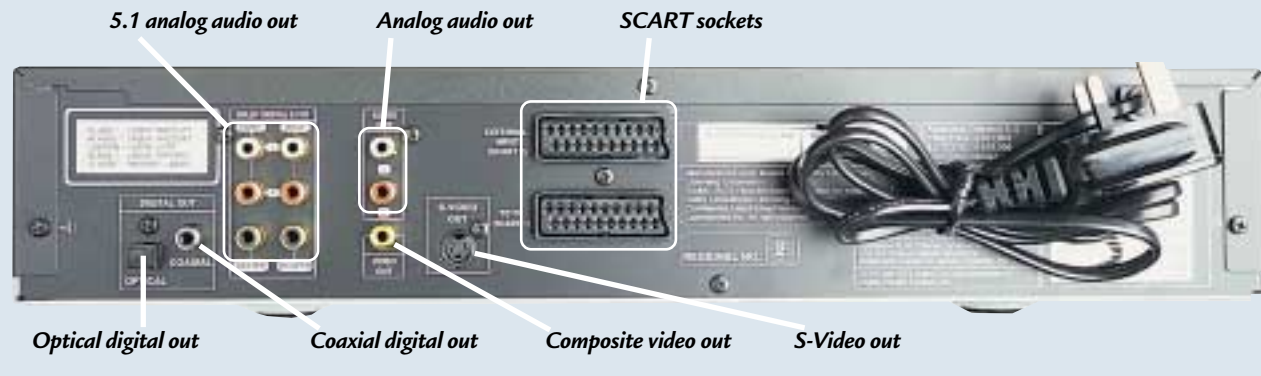
If you have a Dolby Digital or DTS amplifier, you'll want to check what kind of digital outputs a player has. Most decent models will have both optical and coaxial digital outputs, but some budget models may have only one.

The sound is only part of the DVD experience. The picture quality is also first rate, but how good this looks can depend on how you connect the player to your TV. There are several ways to connect a DVD player to your TV. The most common is the SCART connector which carries video and audio. SCART is unique to Europe and allows a one-stop solution for AV connection. Another

common connector is composite video, which looks like a standard phono socket. This will transmit video, but the chrominance and luminance will be mixed as it travels along the cable, resulting in picture degradation. A better solution is S-Video which looks like a small DIN socket. S-Video splits the chrominance and luminance as it travels along the cable, producing a far cleaner picture. The video can also be transmitted as discrete RGB along a SCART cable. This also gives a far superior picture to composite video. It is important to find out what connectors your TV has. The chances are that you'll find a couple of SCART sockets on your TV with one wired for S-Video and one for RGB. Older or cheaper TVs may only have a SCART socket that accepts composite video, which narrows your options a bit. While really old TVs may have no AV inputs at all, so make sure that your TV is up to the job before you set your heart on a DVD player.

All this aside, no matter how you connect a DVD player up, the improvements you'll see over VHS will be huge. So, if you're a movie fan, what are you waiting for?

RIYAD EMERAN





## Movie surround sound

We can thank the invention or rather threat of television for most of the major cinematic technical innovations of recent decades, including widescreen and surround sound.

Dolby, then known almost exclusively for noise reduction systems, came up with its Dolby Stereo standard, widely used on cinematic releases from 1977 – indeed, *Star Wars* was one of the first films to aggressively use a Dolby Stereo soundtrack. Unlike stereo sound in the home which employs two channels of audio, Dolby Stereo in the cinema was at first a four-channel system.

The first two channels delivered sound to the conventional front speakers, usually located in the left and right corners on either side of the screen. The third channel was used to drive a centre speaker located behind the middle of the 'acoustically transparent' cinema screen. The idea of a centre channel was to solve the problem of ensuring some sounds always appeared to come from the middle of the screen, regardless of where you were sat in the auditorium. Finally the fourth channel contained surround sound effects, and was shared between an array of speakers fitted in a U shape round the rear sides and back wall of the cinema.

In the cinema, Dolby Stereo delivered its four

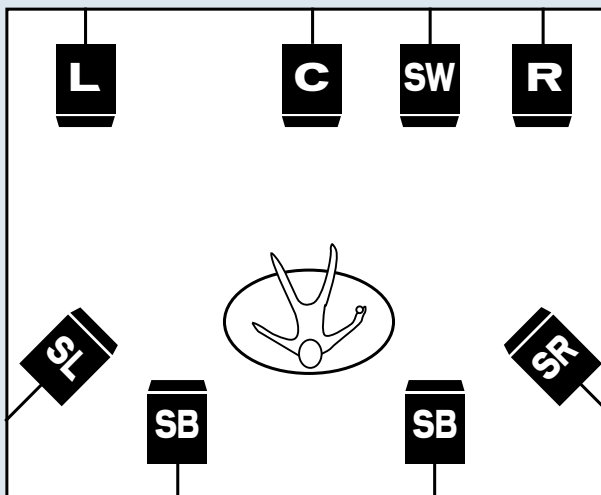
channels of audio as separate tracks alongside each other on magnetic strips or optical film, normally located on the edge of the actual film itself. Dolby, however, had a more cunning plan for delivering soundtracks to installations with varying numbers of speakers.

### The matrix

By cleverly recording some channels out of phase with the others, Dolby discovered it was possible to encode four channels of sound into just two. Called matrix encoding, it offered two huge advantages of delivery and compatibility required for the home environment. First, there were plenty of two-channel stereo devices in the home which could quite easily deliver two-channel matrix sound instead, such as TV, VCR and LaserDisc. Second, the actual two-channel matrix-encoded soundtrack sounded fine when played on a conventional stereo system. Best of all, though, the two channel output from the stereo player could be fed into a matrix decoder to extract the original four channels of sound.

### Dolby Surround

The first home matrix decoders extracted the surround channel, but did nothing about the original centre channel. These were labelled as Dolby Surround in



THX surround EX includes rear centre effects channels

the home. Considerably superior was Dolby ProLogic, which not only reinstated all four original channels, but also employed steering logic to better direct sounds to their desired locations.

While Dolby ProLogic became the *de facto* standard for analog surround sound systems in the home, it suffered from several limitations. By converting four channels into two, then back to four again, the centre and especially surround channels became compromised. The centre was not as well defined as it should be, and the surround was restricted to a limited range of frequencies, not to mention being effectively shared between a pair of rear speakers.

### Be discrete

By the late Eighties, most major blockbusters were being digitally recorded and mixed in no fewer than five full range, full frequency channels: left, right and centre at the front and separate left and right at the rear. While each of these five digital channels was fully capable of delivering extreme dynamics and deep bass, a separate channel was also dedicated to low frequency effects only. Such a system was named 5.1, for the five full range channels and the single sub-woofer deep bass channel. Since each channel was entirely independent from the others, it was also described as

being a discrete system. The only problem was how to get this complex 5.1 digital soundtrack out of the Hollywood recording studio and into our cinemas and homes.

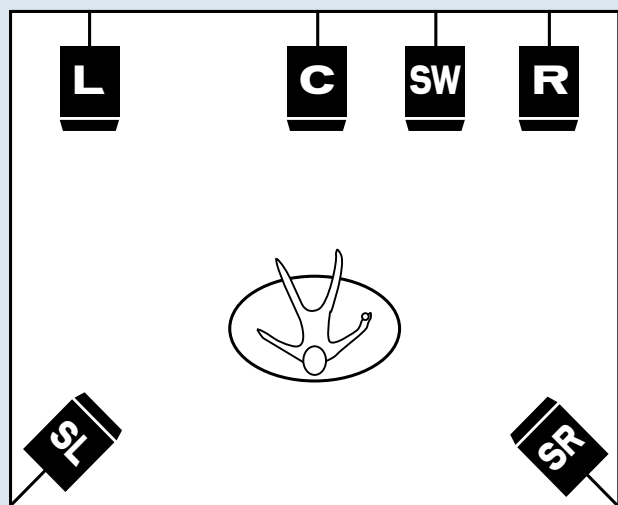
### Dolby Digital

Compression was, of course, the answer to delivering huge 5.1 digital movie soundtracks, where each original channel was essentially the same quality as an audio CD. Dolby decided to employ an algorithm known as AC-3 for taking the original 5.1 channels, compressing, then encoding them into a single digital bitstream. Naturally called Dolby Digital, the AC-3 system was set to deliver an encoded 5.1 bitstream typically measuring between 384 and 448Kbits/sec. Not bad when you consider uncompressed two-channel CD audio measures near 1,500Kbits/sec.

The first movie to use Dolby Digital was *Batman Returns*, and at the time it was described in the cinema as Dolby Stereo Spectral Recording Digital. Several confusing name changes later, and Dolby Digital is now known in the cinema simply as Dolby

### Alternatives

Dolby Digital is just one way to deliver 5.1 audio. Digital Theatre Systems (DTS), believes it has a better system which uses considerably less



A standard 5.1 channel surround system

compression and supposedly superior encoding algorithms. The DTS bitstream typically measures between 768 and 1,536Kbits/sec. The first movie to employ DTS was *Jurassic Park*. Sony also has its own discrete sound system called SDDS, although this normally employs more than 5.1 channels, and is so far only used theatrically. The Motion Pictures Expert Group (MPEG) too has many encoding systems for delivering multi-channel audio, but generally to a home environment only.

It's important to note that Dolby Digital, DTS, SDDS and MPEG audio can be used to deliver a number of channels from mono up to 5.1 and in some cases beyond. Also note that for compatibility, most theatrical releases are available in Dolby, DTS and SDDS, and it's up to the cinema owner which version they show.

#### THX

Lucasfilm's THX is an often recognised logo in the cinema, and indeed on many home components, but it isn't a standard in the same way as Dolby. THX was originally conceived to be a quality control standard for a number of components, from amplifiers to speakers, and movie media to entire cinema installations. Lucasfilm devised minimum requirements for each, and if met (along with subscribing to a lucrative licensing scheme), the owner or manufacturer could use the elite THX badge.



Lucasfilm also had ideas about surround sound though, and in the early days believed that the sound from behind should be diffuse. Consequently, surround sound decoders with THX processing (for cinema or home) would somewhat blur the rear channel into a diffuse field of sound; so-called THX rear speakers employing dipoles were in fact designed to direct sound at anywhere but the listener. While the THX program is undeniably responsible for upping the ante in terms of movie sound, the actual use of a diffuse rear is very much one of personal preference. Most processors labelled as THX allow you to turn it off if you prefer a more direct approach.

#### Precisely behind you!

Lucasfilm and Dolby haven't rested, however, and recently jointly developed an extension to conventional 5.1 audio. Known as Dolby Digital EX in the cinema, or THX Surround EX in the home, it introduces a sixth discrete channel in the mix for a rear centre channel. Mirroring the front centre, it allows sound mixers to precisely position sounds directly behind the listener

regardless of where they're sat, and is great for aircraft or spaceship fly-overs. The first movie to use EX was *Star Wars Episode I*, but other titles since include *Austin Powers 2*, *Fight Club*, *The Haunting*, *Toy Story 2*, and *The World is not Enough*.

New 6.1 algorithms would, however, be incompatible with existing 5.1 systems, so Dolby and Lucasfilm drew on an old and trusted solution: analog matrix encoding. An EX decoder is nothing more than a 5.1 digital decoder, with analog ProLogic applied to the decoded rear left and rear right channels. The result is a new centre channel, and of course, if desired an additional 'rear-surround' channel. Currently movies are not being mixed to deliver information to this ProLogic rear-surround channel, but it could be used in the future.

Some of the very latest THX Ultra home decoders support EX, but experimenters could try connecting a conventional ProLogic processor to the analog stereo rear outputs from their 5.1 decoders, and only using the 'front' three outputs to drive their existing pair of rear speakers and a new centre rear speaker.

#### What you need

The essentials of any surround sound system are five amplifiers and speakers, preferably as similar as possible. You'll also need a decoder, and most now handle ProLogic, Dolby Digital and DTS. All they need is a suitable sound source, and for ProLogic, it's simply a stereo TV, VCR, LaserDisc player or indeed, the analog stereo outputs from a DVD player. As explained above, 5.1 audio, be it Dolby, DTS or anything else, is delivered to a decoder through a single digital bitstream. This bitstream is transported through a single 'S/PDIF' connector, using either an optical interface or an electrical phono plug.

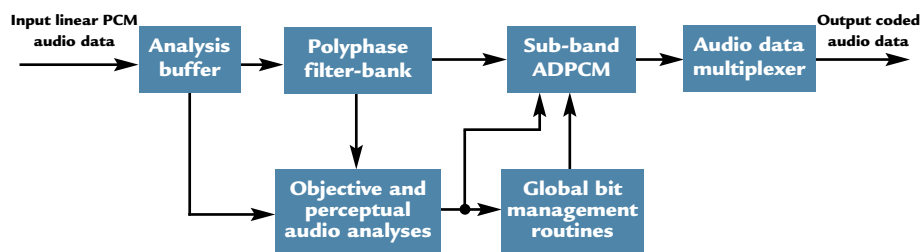
Most domestic DVD and LaserDisc players feature S/PDIF outputs as do PC DVD decoder cards. Many software DVD players can redirect the 5.1 bitstream to an alternative S/PDIF connector, such as one on a sound card. All you need now is a range of DVD titles with Dolby or DTS 5.1 soundtracks – note that many older films use Dolby Digital to deliver just two channels (2.0), which at best will only drive a ProLogic decoder. Also watch out for labelling. EX is already encoded onto several titles, such as the films mentioned above, but is rarely labelled as such on the packaging.

Multi-channel digital surround sound is an unbelievable experience, and it's fantastic that we now have access to the same bitstream at home as they do in the cinema – when you look at it that way, it'd seem almost rude not to use it.

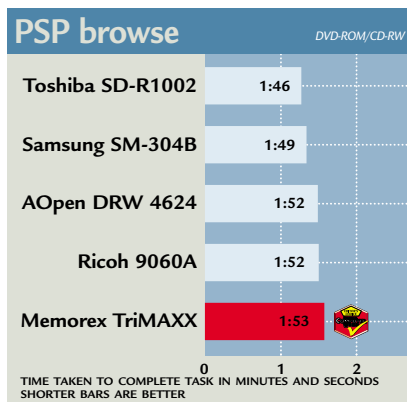
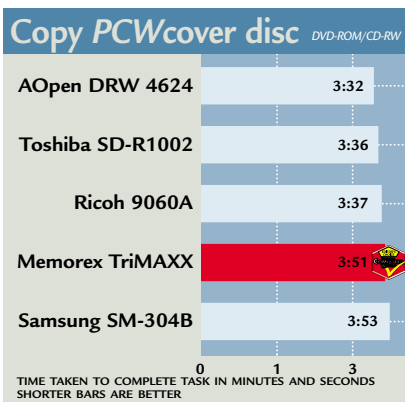
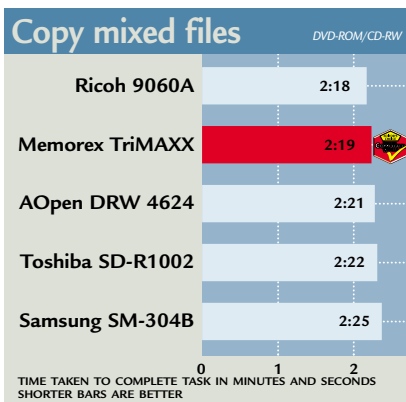
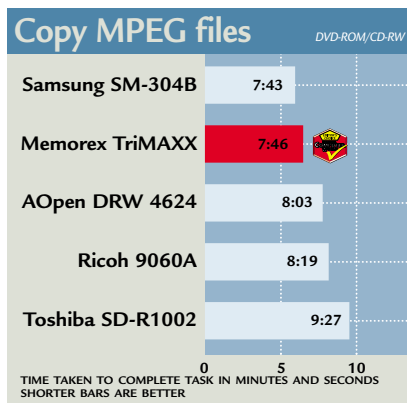
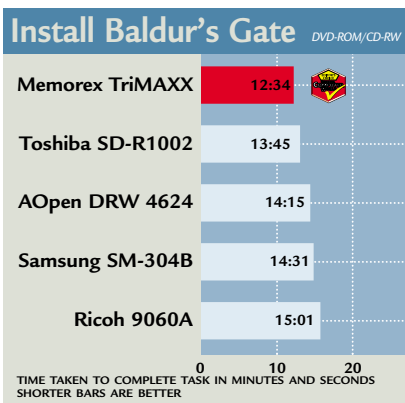
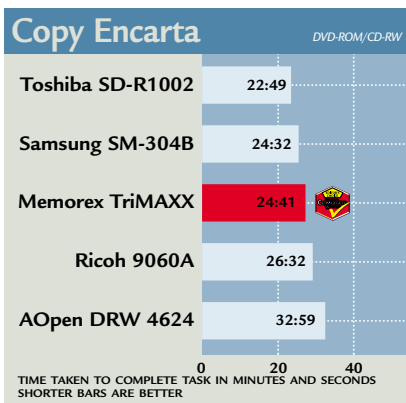
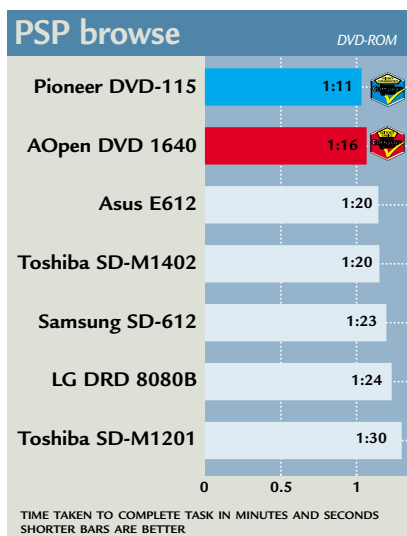
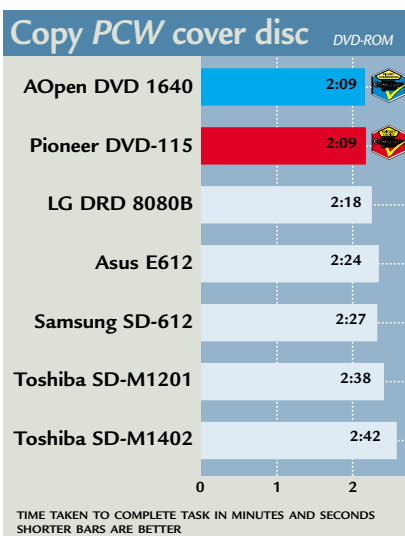
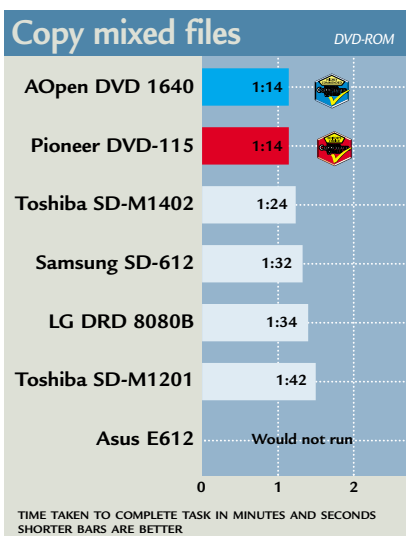
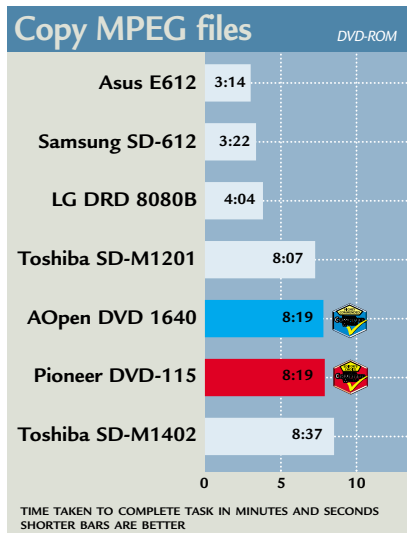
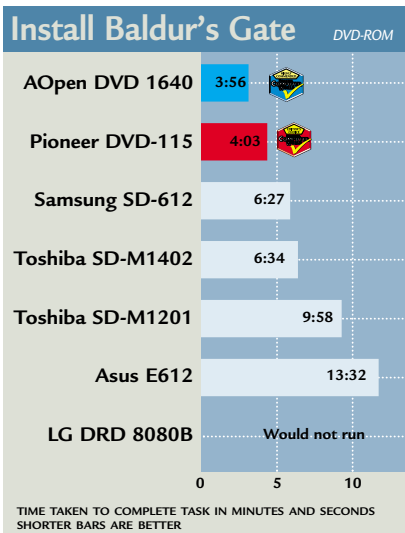
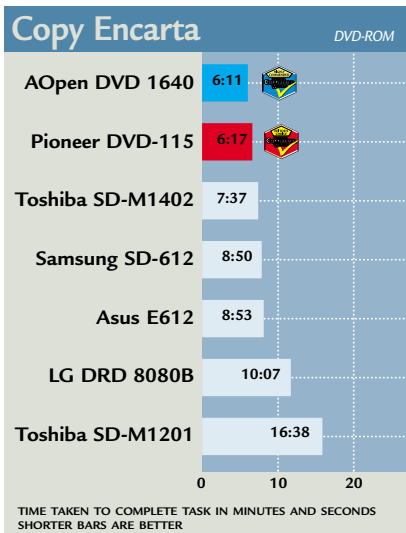
Dolby: [www.dolby.com](http://www.dolby.com)  
DTS: [www.dtstech.com](http://www.dtstech.com)

GORDON LAING

#### Functional block diagram of the DTS Coherent Acoustics encoder



**DTS uses less compression to encode a 5.1 soundtrack and hence, to most ears, sounds superior to Dolby Digital – it does, of course, occupy more space on the disc though**



### Table of features



DVD-ROM DRIVES						
MANUFACTURER	AOPEN	ASUS	LG	PIONEER	SAMSUNG	
MODEL NAME	DVD 1640 PRO	E612	DRD 8080B	DVD-115	SD-612	
Price (ex VAT)	£109	£99	£99	£99	£99	
Price (inc VAT)	£128.07	£116.32	£116.32	£116.32	£116.32	
Manufacturer URL	<a href="http://www.aopen.nl">www.aopen.nl</a>	<a href="http://www.asus.com.tw">www.asus.com.tw</a>	<a href="http://www.lge.com">www.lge.com</a>	<a href="http://www.pioneer.co.uk">www.pioneer.co.uk</a>	<a href="http://www.samsung-storage.com">www.samsung-storage.com</a>	
Supplier	<a href="http://jungle.com">jungle.com</a>	<a href="http://Landmarq">Landmarq</a>	<a href="http://Dabs.com">Dabs.com</a>	<a href="http://Dabs.com">Dabs.com</a>	Not available	
Supplier phone number	0800 0355 355	020 8768 9301	0800 129 3120	0800 129 3120	Not available	
Supplier URL	<a href="http://www.jungle.com">www.jungle.com</a>	<a href="http://www.landmarq.co.uk">www.landmarq.co.uk</a>	<a href="http://www.dabs.com">www.dabs.com</a>	<a href="http://www.dabs.com">www.dabs.com</a>	Not available	
<b>HARDWARE SPECS</b>						
Type	DVD-ROM	DVD-ROM	DVD-ROM	DVD-ROM	DVD-ROM	
DVD read speed	16	12	8	16	12	
CD read speed	40	40	40	40	40	
CD-R write speed	N/A	N/A	N/A	N/A	N/A	
CD-RW write speed	N/A	N/A	N/A	N/A	N/A	
Buffer size	512KB	256KB	512KB	512KB	512KB	
Interface	EIDE	EIDE	EIDE	EIDE	EIDE	
Loading mechanism	Slot	Tray	Tray	Tray	Tray	
Front panel controls	Volume	Volume, Play/Skip	Volume	Volume	Volume	
Front panel sockets	Headphone	Headphone	Headphone	Headphone	Headphone	
Analog audio out	✓	✓	✓	✓	✓	
Digital audio out	✓	✓	✓	✗	✓	
<b>SOFTWARE</b>						
DVD/CD-RW software	PowerDVD	None	PowerDVD	✗	None	
Region code protection	✓	✗ (Early firmware)	✓	✓	✓	



## How we did the tests

There are many component-based benchmarks for testing DVD drives. A quick search on the Internet will bring back pages of results with performance tests for such devices. However, here at *PCW*, we believe that readers are interested in how devices will perform doing the tasks that users need them to do. It's all very well running a DVD-ROM benchmark and giving a score at the end of it, but it's hard to equate that score to what you need from the device. Therefore we devised a set of tests that simulated the everyday use of a DVD-ROM drive, to give you an accurate picture of what to expect from each unit on test.

People don't buy DVD-ROM

drives to benchmark them, they buy them to transfer data and install applications, and it's how fast each drive manages these tasks that separates the wheat from the chaff.

To give all the drives a true run for their money we devised a series of tests using various types of media, and the same test machine for each drive. The test bed consisted of a 700MHz AMD Athlon processor, 128MB of PC100 SDRAM, a TNT2 M64 graphics card, an Adaptec 29160N SCSI card and an 18GB Quantum Atlas V hard disk. We opted for a SCSI I/O solution to ensure there were no bandwidth problems when performing the tests. Also, the speed of the SCSI drive ensured that the defining factor was always the DVD-

ROM read time rather than hard disk write time.

### Raw data transfer rate

The first test was to determine the raw data transfer rate of each drive from DVD media. We used Microsoft's Encarta Reference Suite 2000 on DVD-ROM. This disc holds approx 4GB of data which we dragged and dropped onto the hard disk. The timing of the test is taken from the moment the files were dropped onto the hard disk to the point at which the copy completes. This type of file copy will be part of the staple diet of a DVD-ROM drive and the result represents the amount of time you'll be left twiddling your thumbs while waiting for your files to transfer.



**DVD-ROM/CD-RW COMBO DRIVES**

TOSHIBA	TOSHIBA	AOPEN	MEMOREX	RICOH	SAMSUNG	TOSHIBA
<b>SD-M1201</b>	<b>SD-M1402</b>	<b>DRW4624</b>	<b>TRIMAXX 200</b>	<b>MP9060A</b>	<b>SM-304B</b>	<b>SD-R1002</b>
£88	£110	£219	£169.36	£165	£169.36	£239
£103.04	£129.25	£257.32	£199	£193.87	£199	£280.83
<a href="http://www.toshiba.co.uk">www.toshiba.co.uk</a>	<a href="http://www.toshiba.co.uk">www.toshiba.co.uk</a>	<a href="http://www.aopen.nl">www.aopen.nl</a>	<a href="http://www.memorex.co.uk">www.memorex.co.uk</a>	<a href="http://www.ricoh-europe.com">www.ricoh-europe.com</a>	<a href="http://www.samsung-storage.com">www.samsung-storage.com</a>	<a href="http://www.toshiba.co.uk">www.toshiba.co.uk</a>
SMCdirect	SMCdirect	jungle.com	PC World	Dabs.com	Evesham	SMCdirect
01753 550 333	01753 550 333	0800 0355 355	08705 464 464	0800 129 3120	0800 038 0800	01753 550 333
<a href="http://www.smcdirect.com">www.smcdirect.com</a>	<a href="http://www.smcdirect.com">www.smcdirect.com</a>	<a href="http://www.jungle.com">www.jungle.com</a>	<a href="http://www.pcw-software.co.uk/shop/">www.pcw-software.co.uk/shop/</a>	<a href="http://www.dabs.com">www.dabs.com</a>	<a href="http://www.evesham.com">www.evesham.com</a>	<a href="http://www.smcdirect.com">www.smcdirect.com</a>
DVD-ROM	DVD-ROM	CD-RW+DVD	CD-RW+DVD	CD-RW+DVD	CD-RW+DVD	CD-RW+DVD
5	12	4	4	4	4	4
32	40	24	24	24	24	24
N/A	N/A	6	6	6	4	4
N/A	N/A	4	4	4	4	4
256KB	128KB	2MB	2MB	2MB	2MB	2MB
SCSI	EIDE	EIDE	EIDE	EIDE	EIDE	EIDE
Tray	Tray	Tray	Tray	Tray	Tray	Tray
Volume	N/A	Volume	Volume	Volume	Volume	Volume
Headphone	N/A	Headphone	Headphone	Headphone	Headphone	Headphone
✓	✓	✓	✓	✓	✓	✓
X	✓	✓	✓	✓	✓	✓
X	WinDVD	WinDVD, Ahead Nero	Adaptec Easy CD Creator, DirectCD	Ahead Nero, InCD 1.3	Adaptec Easy CD Creator	WinDVD + Instant CD Wizard Gold 5
✓	✓	✓	✓	✓	X	✓

### Application install

The next test represented the other major part of a DVD-ROM's duty, the application install. We used the DVD-ROM version of the game Baldur's Gate. We chose this particular application because it allowed the largest install we could find at 2.3GB. Software installation is always a pain, and waiting for ages for your new application to install is not something that anyone enjoys. This test was timed from the second that the install button was pressed to the moment that the DirectX install dialog box appeared.

### CD tests

The remainder of the tests used CD media, since for

the most part CD-ROM discs are still more common than DVD-ROM discs. Here, we used similar tests to the ones we used in the CD-RW group test in the June 2000 issue.

The first test involved copying a 495MB MPEG file from a VideoCD. This tests the sustained transfer rate when copying one large file. This should result in the drive's best transfer rate since the heads do not have to realign every time it has to read a new file, since there is only one large file being read. This test is performed from an original VideoCD movie disc.

The next test uses CD-R media. It's vitally important

that all drives can read CD-R media as this type of disc is becoming more popular with the recent price drops in CD-RW drives. We burned a 214MB folder to a CD-R disc, containing a mix of Word documents, Excel spreadsheets, Adobe Acrobat PDF files and HTML pages, then dragged the folder from the DVD drive to the hard disk.

This tested how good each of the drives was at copying multiple files. This meant that a sustained transfer rate could not be achieved since the head was continually moving onto the next file before reading commenced once more.

To test transfer of large and small files from pressed CD-ROM media we used PCW's April 2000 cover disc, which contained 490MB of data. This showed a mix of sustained transfer and access time as the drives negotiated files of varying size.

Finally we used Paint Shop Pro's browse facility to access a total of 44 TIFF images totalling 203MB. This gave an idea of the seek time of the drive as it accessed each of the images and displayed them on the screen. Each drive was timed from the moment that the files were selected until the last image had been displayed on screen.



# Editor's Choice

It's taken a while, but DVD has finally started to take off. Unfortunately, for the IT industry, the major area where DVD has become successful is the movies. Even though almost every PC ships with a DVD-ROM drive of some kind these days, the amount of software that actually ships on the medium is very low. As a result, many people use their DVD-ROM drives to watch DVD movies on their PC monitor, which in itself is no bad thing.

That said, we can only hope that the vastly increased saturation of DVD-ROM drives in the PC marketplace will improve the software situation and we'll start to see more major applications shipping on DVD rather than multiple CDs.

One of the major issues that DVD suffers from, and has always suffered from, is compatibility. Even though DVD-RAM drives have been available for a couple of years now, there is still no way to read your RAM discs in your ROM drive. Although this is an issue that should be dealt with in the not too distant future. Also, the DVD-RAM discs are still limited to 2.6GB per side, compared with up to 9GB per side on a dual-layered DVD-ROM disc. That said, Panasonic is on the verge of releasing its 4.7GB per side drive. And while the competing format, DVD-RW, claims to be readable in any DVD-ROM drive, we have yet to see a unit, and have therefore never been able to substantiate this claim.

As things stand, DVD-ROM drives have dropped in price sufficiently so that it no longer makes sense to include a

CD-ROM drive in a system, no matter how low the price point. So, hopefully, this increased market penetration will make DVD-ROM the standard and the CD-ROM will die out as the standard distribution medium.

Of course, one area where DVDs are becoming more prevalent is on the cover of magazines such as PCW. This month is the first time that we have given the reader the choice of either a CD-ROM or DVD-ROM version of our cover disc. The DVD format gives us much more space to include regular content as well as full software products. This also represents another step towards the industry adoption of DVD-ROM as the preferred distribution media for PC applications and content.

Judging the drives in this issue's group test was a matter of real-world testing weighed against value and features. We saw drives with DVD-ROM performance ranging from four-speed up to 16-speed. The pack was also split between standard DVD-ROM drives and DVD/CD-RW combo units. To be fair, and to address the market accurately, we separated these two categories and awarded an Editor's Choice award in both.

## The winners

In the DVD-ROM category, the **Editor's Choice** goes to the Pioneer DVD-115. This is a very fast drive, sporting 16-speed DVD-ROM and 40-speed CD-ROM performance. The DVD-115 performed superbly across all the tests, with its 512KB data buffer helping it

achieve smooth data transfer. What really impressed us about this drive, however, was the price of only £99 ex VAT. That's not a lot to pay for what is the cutting edge of technology.

Taking the **Highly Commended** award in the DVD-ROM category is the AOpen DVD 1640 Pro. This is more or less the same drive as the Pioneer, with the same high performance specs. That said, the AOpen proved to be marginally faster than the Pioneer, and it sports a slot loading design, rather than the conventional tray setup. The only thing that held the AOpen back from the Editor's Choice spot was the fact that it was £10 more expensive. However, you do get a copy of Cyberlink's PowerDVD player with it, so if you haven't got a movie player it might be a more attractive buy than the Pioneer.

The DVD/CD-RW combo section was a close fought battle, but in the end the **Editor's Choice** goes to the Memorex TriMAXX 200. Even though this is exactly the same drive as the Ricoh MP9060A, it proved to be faster in the tests. This unit sports four-speed DVD and 24-speed CD read performance, along with six-speed CD-R and four-speed CD-RW writing. Obviously you're making a compromise with a combo drive, but if you don't have the space inside your PC or the cash to buy two separate units, a solution like this makes a lot of sense, and the Memorex is a great choice. Not only does this drive boast impressive specification and performance, it's also great value, with a price of only £169.36 ex VAT to match.



*Pioneer's DVD-115 is top DVD-ROM for its speed, performance and price*



*The Memorex TriMAXX 200 takes the top accolade in the DVD/CD-RW category*



*AOpen's DVD 1640 Pro includes a copy of Cyberlink's PowerDVD player*