



# Technofile: sound cards and speakers

If the only noise ever emitted by your PC is Windows' welcoming refrain, then you could find this Technofile a real ear-opener.

Scott Colvey guides us through sound card and speaker technology and highlights the best buys for gamers, musicians and cinephiles

Virtually every modern computer is kitted out with audio facilities, but in the manufacturers' minds these play second fiddle to such headline features as processor speed, memory and hard disk capacity. For the PC builder, the audio output department is where they can save themselves a few quid. Particularly scandalous is the penchant for teaming an all-singing, all-dancing surround-sound audio card with a pair of tinny speakers offering all the resonance of a dead elephant. Similarly, it's ludicrous to invest a couple of hundred pounds in a meaty six-piece speaker system, only to connect it up to a dirt-cheap onboard sound card.

The upshot is that few PC users' audio equipment is capable of anything more than adequate output. Now if being greeted by a few chords when you switch your PC on is enough to convince you that the system has found its true voice, this

Technofile isn't going to persuade you otherwise. If, on the other hand, you want to learn what it is that makes a sound card tick, what those surround sound standards mean or which specifications to look for, read on and prepare to scale the heights of sound technology.

## Sound cards

In the early days of computing the most sound the average PC could muster was a muffled beep or two. Inevitably, though, just as the industry learned that there was life beyond 16-colour graphics cards and 10MB hard drives, the late 80s saw the rise of a new symphonic feast for audiophiles – the sound card.

Nowadays, even the most basic sound cards enable a computer to emulate musical instruments, and you don't have to pay a great deal extra to enjoy

full-throated surround sound audio.

Creative's SoundBlaster 4.1 Digital, for instance, promises the marvel of 3D sound for a mere £25. However, unless you're replacing a faulty card, chances are you'll be looking for a more advanced upgrade.

## Jargon explained

Unfortunately, the sound card market is awash with indecipherable acronyms and abbreviations so, if you're shopping for a new card, expect to confront words like wavetable, ADC, DAC, and DSP.

Fortunately, most of these terms are actually straightforward if you just try to visualise the processes behind them. The DAC, for example, is the digital-to-analogue converter. Computers (and sound cards) can only work with digital signals, so it's up to the DAC to convert this information into an analogue audio signal that humans can listen to. The ADC, or

analogue-to-digital converter, does the same job in reverse, allowing sounds from outside to be fed into a PC and stored digitally. You could use it, for instance, to attach a vinyl turntable to your PC and transfer your record collection to CD or hard disk.

Overseeing both DAC and ADC operations is the DSP (digital signal processor). This is the component that determines what the audio will actually sound like. The source of a DSP's audio is usually a wavetable, literally meaning a table of recorded soundwaves. Whereas older FM-synthesising cards try to mimic sounds of instruments, a wavetable-based model calls on a library of recordings of real instruments. If a program requires the output of piano sounds, a wavetable card can conjure up a truly faithful rendition because all it's doing is playing back a sample of a piano. Most sounds cards



↑ The cheapest card in our table on page 110, the SoundBlaster 4.1 Digital still provides great results

are polyphonic, meaning they can play more than one channel (or 'voice') at once. For example, a 64-voice sound card could, in theory, play up to 64 piano, drum or guitar sounds simultaneously.

DSPs also attempt to reduce the effects of 'noise', the background interference that affects all electronic communications. Noise itself cannot be eradicated but it can be lessened, and the DSP's ability to do so is expressed as the SNR (signal-to-noise ratio). SNR is measured in dB (decibels), and the formula to generate it is rather complex. Suffice it to say that a high number, say, 100dB, is better than a low one (40dB).

← The SonicFury is reasonably priced and has a great five-year warranty

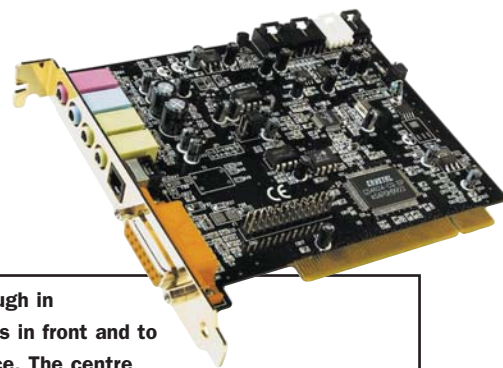
→ The Terratec DMX XFire 1024 is a budget option with an amazing 1,024 channels

## Audio for everyone

For gamers the fun doesn't stop there, and we could spend a whole page discussing surround sound standards. What's important is to find the standards most popular with sound card manufacturers and software developers. Choose a card supporting the industry standard EAX (environmental audio extension) or DirectSound 3D modes and you're safe.

Musicians need to think about sampling rates. If you're a professional musician, you probably don't need to be told that a card capable of sampling at 48KHz is better than one that reaches its limit at 44.1KHz. However, it's important to look at the facts behind the figures – some cards claim to be able to output at rates as high as 96KHz but, in fact, offer much lower sampling (input) rates.

Finally, a word about the connectors on the back of the card: almost all sound cards include 3.5mm jack sockets, designed to accommodate the vast range of headphones and PC speaker sets. A modern sound card will likely sport a Midi



↑ The Audigy Platinum gives wonderful audio, but you do have to pay for what you get

(musical instrument digital interface) socket allowing it to hook up to such professional musical instruments as a keyboard or electronic drum kit. A FireWire connection is handy for transferring large amounts of digital data in a beat, but on a sound card it's little more than a perk.

If your head started spinning towards the end of that paragraph then the chances are you don't need a high-end sound card. These days, if you stick to something reasonably priced and readily available at retail outlets, you can't go far wrong. If you're a notebook owner in need of an audio boost, an external sound card like Creative's Extigy is worth considering.



Set yourself up a surround-sound system at home or the office – and leave it that way when you're out and about.

## Speakers

Time was when two-channel 'stereo' speakers represented state-of-the-art audio output. Nowadays, though, cinemagoers are used to sounds that jump around the auditorium from any number of speakers, and many want to recreate the experience at home. So just how many speakers do you need? You'll see most sets referred to as 2.1, 4.1 or 5.1. This means they consist of two, four or five speakers plus a special speaker designed for low-frequency bass sounds, the subwoofer.

## Raising the standard

The number of speakers is a start, but far more bewildering are the various acronyms and branded technologies like DTS (Digital Theatre System), THX, Dolby Digital and Dolby Pro Logic. These mostly refer to surround sound audio standards. If you buy a DVD that boasts a Dolby Digital and/or DTS soundtrack, for instance, and hook your DVD player up to a speaker system capable of unravelling the encoded streams, you can enjoy full surround sound (see the *Ultimate sound studio* boxout on page 108).

Those are the superior standards, but there are less advanced versions (Dolby

← The Trust 514DX is a good budget card

→ For the audiophile rather than the gamer, the Videologic Sirocco provides great sound quality

Pro Logic I and II) capable of generating pseudo surround sound from a stereo source. THX is a rather different kind of technology. Here the aim is to interpret the environment in which the soundtrack will be played – meaning everything from the shape of the speaker cones to the layout of cinema auditoriums – and to adjust the sound accordingly to provide the most realistic results.

Just to make it more confusing, the decoding of surround sound audio isn't even handled by the speakers. In most cases, the sound card (or alternative decoding device) must perform the audio stream separations before pumping the sounds to the individual speakers.

We'd need an entire article just to scratch the surface of the subject of surround sound. However, if you want to learn more, Dolby's website ([www.dolby.com](http://www.dolby.com)) hosts a comprehensive Knowledgebase section.



## Ultimate sound studio

As every keen cinephile and audio enthusiast knows, lavishing £10, £100 or even £1,000 on a new audio setup isn't going to deliver the desired effect if you don't know where to place the speakers. When six, seven or even eight or more speakers are provided, determining the optimum position for each piece can be harder than choosing the system itself. The best solution is probably to get a professional to install the speakers for you, but if you don't have this option, read on for our essential guide to gearing up your room for audio.

We would hope that the layout of a stereo speaker pair ought to be fairly obvious, but a full surround kit will probably pose rather more questions. Most PCs are now equipped with a 5.1 (six speaker) system. Mastering the basic 5.1 layout and adding additional speakers is as easy as saying 'Testing 1, 2, 3'.

When you unpack the box you'll discover left, right and centre speakers, left and right surround (or satellite) speakers and one subwoofer. As the human ear is oblivious to the direction of low-frequency sounds, the subwoofer can go pretty

much anywhere – though in cinemas, it usually sits in front and to the left of the audience. The centre speaker will output a soundtrack's dialogue, and should be positioned directly ahead of the listener, with the left and right speakers sitting either side.

Perfectionists might want to plot imaginary lines between the listener and the left and right speakers – these should form an angle of 45-60 degrees. Received wisdom suggests that the left and right satellites should be placed some distance behind the listener. In fact, the correct positioning should be to either side and set back just a little.

In a 6.1 system, the only difference is that there's an extra back surround speaker. This should be placed directly behind the listener. You can also get 7.1 systems, which aren't so different to the 5.1 setup. The two additional components consist of left-back and right-back surround speakers, and these should be placed behind the listener at a 60-90 degree angle.

## A song is born

One of the main reasons for buying a top-notch sound card is to aid the composition and production of audio – that is, to make music, (and hopefully) sweet music. Competing with the professionals can cost a fortune, so if you're unsure of your musical ability it's best to experiment with a basic package to begin with.

One such application is Cakewalk Music Creator 2002, which is a pared-down offering of Cakewalk's pinnacle product, the Sonar studio software. Though not aimed at out-and-out novices – if you're to get on with any professional production package, you should be able to read sheet music and play an instrument or two – Music Creator does much to simplify the process of compiling and capturing instrument input.

However, if you'd prefer to dive straight in at the deep end then opt for Sonar. Its list of features reads like a musician's lexicon, with no term left untouched. Obviously, mixing digital

audio and Midi (musical instrument digital interface) tracks through a multiple inputs/outputs sound card can be a complicated business and not everyone favours Sonar's busy interface to get the job done.

Many professional musicians rely instead on Steinberg's equally costly Cubase. It's not for us to pass judgement on the particular quirks and foibles of each program and we'd advise seeking a demonstration of each system before parting with any cash.

• Cakewalk Music Creator 2002 Et Cetera Distribution; 0870 873 8731; [www.cakewalk.co.uk](http://www.cakewalk.co.uk); £34.03.  
• Cakewalk Sonar 2.0 Et Cetera Distribution; 0870 873 8731; [www.cakewalk.co.uk](http://www.cakewalk.co.uk); £211.91.  
• Steinberg Cubase SX Arbiter Music Technology; 020 8970 1909; [www.steinberguk.com](http://www.steinberguk.com); around £500.



Features comparison

Product	Telephone	Website	Price (ex VAT)	Warranty	Aimed at	Maximum sampling rate		Signal-to-noise ratio (decibels)	Number of channels/ voices	3D sound standards	Internal or external	Breakout box	Dimensions if external (width x depth x height)	Special connectors	FireWire
Sound cards															
Audiotrak Inca 88	0800 085 0452	www.audiotrak.net	£153.18	1-year return to base	musicians	48kHz		115dB	8 in, 8 out	none	internal	yes	N/A	SP/DIF	no
Creative SoundBlaster 4.1 Digital	0800 376 7954	www.europe.creative.com	£25	2-year return to base	budget buyers/ gamers	48kHz		94dB	16	EAX, DS3D	internal	no	N/A	SP/DIF-out (DD+DTS pass-through)	no
Creative SoundBlaster Audigy Platinum eX	0800 376 7954	www.europe.creative.com	£204	2-year return to base	musicians	48kHz		100dB	64	Dolby Digital, EAX, CMSS, DS3D	internal	yes	N/A	SP/DIF, mini-DIN Midi	yes
Creative SoundBlaster Extigy	0800 376 7954	www.europe.creative.com	£127	2-year return to base	notebook users	48kHz		100dB	64	Dolby Digital, EAX, CMSS	external	no	200x222x45mm	SP/DIF, 5-pin Midi	no
M-Audio Delta Audiophile 2496	0870 717 7100	www.midiman.co.uk	£152.34	1-year return to base	musicians	96kHz		104dB	4 in, 4 out	none	internal	no	N/A	phonos	no
Terratec SoundSystem DMX 6Fire 24/96	0118 982 1612	www.terratec.net	£144.67	2 year return to base	musicians	96kHz		104dB	64	DS3D, Sensaura 3D, A3D 1/2, EAX	internal	no	N/A	SP/DIF	no
Terratec SoundSystem DMX XFire 1024	0118 982 1612	www.terratec.net	£38.29	2-year return to base	budget buyers/ gamers	48kHz		97dB	up to 1,024	DS3D, Sensaura 3D, A3D 1/2, EAX	internal	no	N/A	SP/DIF	no
Trust 514DX 5.1 Sound Expert Optical	01376 500 770	www.trust.com	£42.54	1-year return to base	budget buyers/ gamers	48kHz		120dB	unspecified	Dolby Digital, EAX, DS3D	internal	no	N/A	SP/DIF	no
Videologic SonicFury	01923 260 511	www.videologic.co.uk	£59.56	5-year return to base	budget buyers	48kHz		96dB	64	DS3D, Sensaura 3D,	internal	no	N/A	no	no

Product	Telephone	Website	Price (ex VAT)	Warranty	Aimed at	Speaker configuration	Power output, RMS: subwoofer (Watts)	Power output, RMS: centre speaker (Watts)	Power output, RMS: satellites (Watts)		Frequency response	Surround sound standards	Dimensions: subwoofer (width x depth x height)	Dimensions: centre speaker (width x depth x height)	Dimensions: satellites (width x depth x height)	Weight	Controls
Speakers																	
Creative Inspire 5.1 Digital 5700	0800 376 7954	www.europe.creative.com	£238	2 year	gamers/ cinephiles	5.1	31W	21W	4 x 7W		35Hz to 20kHz	Dolby Pro Logic, Dolby Digital, DTS, CMSS, EAX	261x261x281mm	91x165x112mm	100x100x118mm	9kg	Power on/off, volume (subwoofer, centre, surround, master), mute, digital/PCM, analogue, effects
Labtec Arena-530	020 7458 0059	www.labtec.com	£42.54	2 year	budget buyers/gamers	4.1	15W	N/A	4 x 4W		40Hz to 20kHz	M3D	191x191x241mm	N/A	122x91x91mm	4kg	Power on/off, volume (front and rear), M3D on/off
Logitech Z-560	020 7309 0127	www.logitech.com	£170.20	2 year	gamers/audio buffs/cinephiles	4.1	188W	N/A	4 x 53W		35Hz to 20kHz	M3D (plus THX certification)	310x310x310mm	N/A	140x80x100mm	20.5kg	Power on/off, bass, fade, volume, M3D on/off
Teac PowerMax 2000	0800 0853 704	www.teac.co.uk	£199	1 year	audio buffs	5.1	45W	15W	4 x 15W		50Hz to 20kHz	Dolby Pro Logic, Dolby Digital	250x348x275mm	96x278x136mm	105x95x105mm	14kg	Power on/off, test tone, mute, input-select, level (for individual speaker-volume settings), mode
Terratec HomeArena 5.1	0118 982 1612	www.terratec.net	£102.09	2 year	gamers/ audio buffs	5.1	25W	6W	4 x 6W		20kHz to 30kHz	Dolby Digital, DTS, EAX, DS3D	315x290x290mm	90x95x133mm	90x95x133mm	15kg	Power on/off, volume (centre, rear and subwoofer), remote control
Videologic Sirocco Pro	01923 260 511	www.videologic.co.uk	£509.79	2 year	audio buffs	2.1	50W	N/A	2 x 25W		10Hz to 100kHz	Dolby Pro Logic, Dolby Digital	245x430x395mm	N/A	165x170x250mm	25kg	Power on/off, volume (subwoofer), mid/high frequency tone adjuster, monitor switch, source selection
Videologic ZXR 500	01923 260 511	www.videologic.co.uk	£59.56	2 year	budget buyers/gamers	5.1	25W	8W	4 x 8W		20Hz to 20kHz	Dolby Pro Logic, Dolby Digital, DTS	165x250x340mm	85x112x98mm	85x112x98mm	10.6kg	Power on/off, volume (front, centre, rear and subwoofer)

Watt a difference

When choosing speakers, always look at the power or volume level. Don't be fooled by big figures – if a supplier claims a speaker set offers 2,000W output for under £50, then alarm bells should ring immediately. Speaker manufacturers quote one of two figures to describe the output potential of their wares – RMS (root-mean-squared) or PMPO (peak music power output). Of these, only the first has any real meaning. Sneakier sellers will try to convince you of the worth of a speaker set's 'peak output' but the reality is that the PMPO will almost never be attained. Moreover, it doesn't indicate a speaker's performance across a wide frequency range. As a rule of thumb, a higher RMS figure equals greater volume potential.

Another important specification is the frequency response figure. This will consist of a range (for example, 35Hz-20KHz) and describes a speaker's ability to reproduce sound frequencies within that range – the wider the range, the better. However, you should also look at the 'smoothness' of the reproduction curve (look for the graph towards the back of the manual). If it's an uneven line – for example, rising or falling sharply by more than a few decibels – it could indicate poor output, with hissing at high frequencies or buzzing at low ones. Ideally you want a 'flat' or 'straight' curve.

Verdict

For the average home or office user, any of the basic sound card models in our table will suffice, with Creative's

SoundBlaster 4.1 Digital providing outstanding value for money. The cheaper cards haven't the best features or the finest range and output, but they will do a solid job. If you're a notebook owner, the Extigy can beef up your portable's audio capabilities. Most speaker systems will produce palatable audio, although Labtec's Arena-530 kit is probably the safest choice.

For more ambitious users who want to try games, music or ground-shaking DVD playback, Videologic's SonicFury is an excellent all-rounder for less than £60. Team it with the ZXR 500 or Terratec HomeArena speakers for good results.

For any self-respecting gamer, environmental audio is all. Onscreen action may give you a window on the virtual world, but it's 3D audio that takes

you there. The Terratec SoundSystem DMX XFire 1024 has in-depth surround sound support to make your gaming experience a heart-stopping one, and isn't too pricey. If you do want to spend, Creative cards are the ones that set the standards, and with the immensely powerful SoundBlaster Audigy you'll have access to the best games support on the market.

Look for as many speakers as you can afford. The Creative Inspire Digital 5700 system is the choice for gamers, although the Videologic ZXR 500 will leave you with a bit more cash to spend on new games.

Musicians are the most demanding of all audiophiles. Where the average user struggles to tell the difference between a £25 and a £250 sound card, the experienced musician will be scrutinising



↑ The Terratec HomeArena 5.1 is a well-priced choice for the gamer or moderately demanding muso

not just every note, but every silence between the notes. You can expect to pay at least £150 for a top model and the unsurpassed audio quality and superior multitrack recording of M-Audio's Delta Audiophile 2496 is the only real answer to their dreams. There are other cards with plenty to offer musicians, and the Terratec SoundSystem DMX 6Fire 24/96 and Audiotrak Inca 88 will also make great buys for the professional.

For musicians, audio quality – rather than the number of speakers – will be key. This is why the three-speaker Videologic Sirocco Pro set is a fantastic deal in spite of its £500-plus price tag. For the budget-conscious consumer, Teac's PowerMax 2000 will make a mouthwatering – if back breaking – choice. ■