Technofile: scanners

Scanners can be a vital piece of office equipment, bridging the gap between the paper and digital culture. Now falling prices mean the buyer faces a wide range of prices and functions. Tom Gorham guides you to the perfect scanner

Over the past few years scanner prices have fallen dramatically. Once the preserve of high-end print production houses, fast, accurate devices can now be picked up for the price of a couple of theatre tickets. However, this is not due to lack of demand – even in the age of the digital media, there is little sign of a decline in the popularity of the scanner. This fact owes much to its versatility. As well as being the cheapest and easiest way to get photos on to your PC, it can also be used as a photocopier or fax machine. With OCR (optical character recognition) software often bundled with scanners, they even promise to reduce your office paper mountain by digitising it.

Given these disparate roles, it isn't surprising that the scanner market is as fractured as ever. There are three broad categories of scanner user: first-time PC users who need a cheap way of digitising photos or documents, small business users who need a versatile and powerful workhorse and high-end business and graphics users who need fast, colour-accurate scans. In this feature we'll look at each of these categories and recommend the scanners that best suit the requirements of each.

Scanning interfaces

Scanning interfaces will receive an overhaul over the next couple of years as FireWire and USB 2.0 scanners usurp older, slower technologies (see the boxouts on pages 100 and 104 respectively). The speed limitations of USB 1.1 – the standard most current scanners support – are apparent during high-resolution scans, and while SCSI in its various incarnations can support data-transfer speeds of up to 40MBps (megabytes per second), it lacks the ease of use of FireWire and USB.

But don't be in too much of a rush to trade in your old device. Although on paper USB 2.0 is 40 times faster than the initial USB specification, you can't expect to see that level of increased performance passed directly on to scans from a USB 2.0-equipped scanner. The major reason for this is that the greater proportion of a scanner's speed is determined by the scanning mechanism itself, the speed of which is independent on the interface used. Scanners themselves therefore aren't equipped for fast data throughput. The promised hike in speed from USB 2.0 also suffers from a couple of other drawbacks – most notably that if it is used on the same chain as a standard USB 1.1 device (with which USB 2.0 is fully backwards-compatible), the scanner will operate at the slower speed.

One other factor to consider is that PCs are unlikely to come with either USB 2.0 or FireWire ports as standard, which means that to use high bandwidth peripherals based on these standards, you'll need to fork out for an extra PCI card, which can cost between £40 and £70. The good news is that many scanners and other peripherals that offer these interfaces usually bundle the cards for free. It's worth checking before buying.

The speed of the different scanner interfaces in megabytes per second

USB 1.1	1.5MBps
SCSI	40MBps
FireWire	50MBps
USB 2.0	60MBps

What is a scanner?

Nowadays most people associate scanners with flatbed devices, but while this is the most adaptable type, there remains a wide variety of other options targeted at specific markets. These range from the high-end 10,000dpi (dots per inch) drum scanners used in print production houses to handheld and sheetfed scanners, which are still popular in the home and office.

Irrespective of the technology behind them, most scanners work in a similar fashion: by reflecting light from the scanning source via a series of mirrors and lenses on to a CCD (charge-coupled device) array. This array comprises a row of optical sensors that detect variations in light intensity and frequency as it moves along the scanning bed, and transform it into digital data. Sheetfed scanners work in reverse by moving the source through the static CCD array.

Not all flatbeds use the same method. CIS (contact image sensor) scanners dispense with the mirrors and lamps of CCD devices and instead employ LED sensors that sit very close to the document. The result is that CIS scanners are much thinner than their CCD equivalents and consume significantly less power. Traditionally, the down side has been poor colour fidelity and limited resolution support – originally CIS scanners were limited to 600dpi. But this is improving and Canon's tiny CIS-based scanners don't suffer from the same colour or resolution limitations.

↓ Always look for the optical resolution, rather than the (artificially generated) interpolated resolution

Optical and interpolated resolution

The most commonly cited scanner feature is its resolution, but there are two types quoted by manufacturers. Optical, or physical, resolution refers to the number of pixels a scanner can capture, in dots per inch. The higher this figure, the more detail a scanner can grab from the source. Don't confuse this with interpolated resolution, which uses arithmetical algorithms to calculate and create extra dots between existing pixels. This adds no real information to a picture, so its usefulness is negligible.

↑ In addition to the obvious, scanners often fulfil the additional functions of a fax and photocopier

Bit depth

Bit depth is the number of bits used to describe each pixel in an image. The more bits used, the more colours the scanner can distinguish. Just about every scanner on the market claims to be 24bit, which represents eight bits per pixel for the three channels (red, green and blue) used when scanning a colour image.

Some scanners can now scan at 14 or 16 bits per channel, which results in 42 or 48bit images. This doesn't automatically produce better scans, however. Some manufacturers use software to artificially boost bit depth and even those who use true hardware bit depth can use the extra bits simply to hide noise and extraneous visual artefacts caused by a poor scanning mechanism.

Scanning above 24 bits also dramatically increases file size and lengthens scanning time; the results often aren't worth it as the extra colours are at the edge of the eye's perception. The fact that most modern displays are 24bit means you'll invariably never appreciate the extra information captured.

The benefit of high bit depth in quality scanners occurs during scanning. Processes such as altering the colour balance slightly degrades the original image, but by scanning at a higher bit depth, the degradation is less marked.

Density range

Less frequently quoted by scanner manufacturers is a scanner's density (or dynamic) range, which measures the range of tones the scanner can record on a

scale of zero to four. For most purposes, density range isn't critical – although it's a good indication of scanner quality. In simple terms, a dynamic range above three is fine for scanning reflective media such as photographs. If you're scanning transparencies, look for a higher figure.

Interface types

While some scanners still cling to legacy interfaces such as parallel and SCSI, USB (universal serial bus) has become a near ubiquitous connection standard thanks to its plug-and-play ease of use, and its ability to easily daisychain with other products. Ironically, USB was designed for low-bandwidth peripherals rather than scanners and, if you regularly work with large documents at high resolutions, faster protocols such as FireWire or USB 2.0 are a necessity.

Home users and beginners

If all you're initially intending to do is to scan a few family photos, it's still quite easy to be tempted by unnecessarily high technical specifications. While optical resolution and bit depth are important, at the consumer level they are often sensibly sacrificed in favour of useful bundled software and usability enhancements. That said, nowadays even a sub-£100 scanner should boast a resolution of at least 600dpi, which is more than enough for same-scale screen display and inkjet printing.

It's ease of use, though, that really determines the value of consumer scanners. One-touch scanning, allowing you to OCR, fax or copy the document by pressing a single button, is becoming commonplace in budget models. Microtek's and Epson's consumer scanners even offer a 'scan-to-web' button, coupled with internet space for hosting photos online, which takes much of the work out of sharing photos.

Sensibly, some manufacturers have recognised that home desk space is often at a premium. The Canon N670u, for example, is little bigger than a laptop and its CIS scanning engine draws a tiny amount of power, meaning it can be powered from the PC without the need for an extra power cable.

However, sub-£100 scanners won't appeal to everyone. Don't expect the colour accuracy or speed of more expensive devices. Inexpensive scanners almost always use a USB connection, so scan times can be sluggish. The limited optical resolution also means you're unlikely to find transparency or film adapters of any quality in this price range.

Given the low price of consumer scanners, the quality of the bundled software can make a significant contribution to its value: the Epson

↗ Sheet-fed scanners have a smaller footprint than other devices, but often render lower-quality results

Perfection 1650 Photo scores highly by including a full copy of Adobe Photoshop Elements, which retails for around £70.

Business and experienced users

Scanners targeted at businesses differ from consumer models largely by offering higher resolution support, better software and faster interfaces, including SCSI and USB 2.0.

SCSI, an option with the HP 7400C and the Epson G10000+, might not be a friendly protocol for consumers, but its speed advantage over USB means it remains a valid choice for businesses. A better future-proof choice would be the Canon D1250U2F, which boasts USB 2.0

Scanning software

As well as the basic scanning interface, scanners invariably include a bundle of simple OCR (optical character recognition), photo-editing and management software. This software is often a cut-down or superseded version of the program on current retail release. For example, many scanners bundle OmniPage Pro 9.0, two versions behind the current commercial release of the program, or Adobe Photoshop Elements, a slightly feature-light version of the now outdated Photoshop 6.0. ScanSoft's PaperPort Deluxe 7.0, an excellent scan management program that ships with the Visioneer scanner, also lags a version behind the current release.

But if the bundled software is never quite fully up to date, it's often good enough for basic and intermediate tasks. As far as OCR goes, we'd opt for OmniPage Pro 9.0 over TextBridge or the cut-down version of Abbyy FineReader, which is bundled with many office scanners.

It's only as your scanning needs become more demanding you'll come up against the limitations of bundled software. Adobe Photoshop LE is an excellent application for basic photo manipulation, but it can't deal with 48bit input. If you need to edit in high bit depths you'll need to invest in a application that can cope, such as the full version of Photoshop or Corel PhotoPaint.

Improving the quality of your scanner's software doesn't have to cost the earth. Most OCR developers offer upgrade deals and you might find similar offers on the graphics front: ScanSoft, the developers of TextBridge Pro, OmniPage, OmniForm and PaperPort, offer upgrades from bundled software and Adobe offers an upgrade from Photoshop LE to Elements.

- Adobe Photoshop 7.0 **020 8606 4000; www.adobe.com.**
- Corel PhotoPaint **0800 581 028; www.corel.co.uk.**
- ScanSoft OmniPage Pro **0870 870 8085; www.scansoft.co.uk.**

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Features comparison

Product	Telephone	Website	Price (ex VAT)	Warranty	Type	Maximum scanning area	Interface connection	Scanning element	Optical resolution (dots per inch)		Software interpolated resolution (dots per inch)	One-touch scanning	Networkable	Transparency adapter	Bit depth	Dimensions (width x depth x height)	Automatic document feeder	Bundled software
Beginner scanners																		
Canon CanoScan N670U	0800 616 417	www.canon.co.uk	£59	1-year	Flatbed	A4 (216x297mm)	USB 1.1	CIS	600x1,200dpi		9,600dpi	Scan, copy, email	No	No	48	256x383x34mm	No	ArcSoft PhotoStudio 2000 & PhotoBase, ScanSoft OmniPage Pro 9.0
Epson Perfection 1650 Photo	0800 220 546	www.epson.co.uk	£152	1-year	Flatbed	A4 (216x297mm)	USB 1.1	CCD	1,600x3,200dpi		12,800dpi	Scan, copy, email, scan to web	No	Yes	48	276x450x93mm	No	ArcSoft PhotoImpression 3.0, Adobe Photoshop Elements, Presto OCR
Microtek ScanMaker 3800	01327 844 880	www.microtekeurope.com	£68	2-year	Flatbed	A4 (216x297mm)	USB 1.1	CCD	600x1,200dpi		9,600dpi	Scan, copy, email, PDF/OCR, scan to web	No	Optional	48	288x435x80mm	No	Adobe PhotoDeluxe, Abbyy FineReader Sprint OCR, Ulead PhotoExplorer
Business scanners																		
Canon CanoScan D1250U2F	0800 616 417	www.canon.co.uk	£144	1-year	Flatbed	A4 (216x297mm)	USB 1.1, USB 2.0	CCD	1,200x2,400dpi		9,600dpi	Scan, copy, email	No	Yes	48	257x460x61mm	No	ArcSoft PhotoBase, Canon PhotoRecord, ScanGear, OmniPage Pro, Photoshop Elements
Epson GT-10000+ Pro	0800 220 546	www.epson.co.uk	£890	1-year	Flatbed	A3 (297x432mm)	SCSI, optional FireWire	CCD	600x2,400dpi		9,600dpi	No	Yes	No	36	656x458x176mm	Optional	TextBridge Pro 8.0, Adobe PhotoDeluxe BE, NewSoft Page Manager 4.2
HP 7400c	0870 574 4747	www.hp.com/uk	£275	1-year	Flatbed	216x356mm	USB 1.1, SCSI	CCD	2,400x2,400dpi		unlimited	Email, fax, copy, file, OCR	No	Yes	48	311x575x115mm	Optional	Corel Print Office 2000, ScanSoft OmniForm 4.0, CardIris 2.0, Boomerang Internet DesignShop Gold 2000 & WebShop
Microtek ScanMaker 5600	01327 844 880	www.microtekeurope.com	£169	2-year	Flatbed	A4 (216x297mm)	USB 1.1	CCD	2,400x4,800dpi		65,535dpi	Scan, copy, email, OCR, scan to web	No	Optional	48	290x500x115mm	Optional	ScanWizard 5.0, Adobe Photoshop Elements, Abbyy FineReader Sprint OCR 5.0, Ulead PhotoExplorer
Umax Avision DSG10CF	01344 871 329	www.umax.co.uk	£299	1-year	Flatbed	351x216mm	Bi-directional parallel	CCD	600x600dpi		9,600dpi	Copy, text	No	No	36	356x457x91mm	Optional	MGI PhotoSuite, PaperCom Document Manager, TextBridge OCR
Visioneer OneTouch 8920 USB	0870 774 4480	www.visioneer-europe.com	£128	1-year	Flatbed	A4 (216x297mm)	USB 1.1	CCD	1,200x4,800dpi		4,800dpi	Scan, copy, fax, OCR, email, custom	No	Yes	48	297x424x102mm	Optional	PaperPort Deluxe, Photoshop Elements, TextBridge Pro 9.0
Visioneer Strobe Pro	0870 774 4480	www.visioneer-europe.com	£170	1-year	Sheetfed	A4 (216x297mm)	Serial, USB 1.1, parallel	CCD	300x600dpi		2,400dpi	No	No	No	30	51x64x285mm	No	PaperPort scanner suite, PaperPort Deluxe
High-end business and graphics scanners																		
Canon CanoScan D2400UF	0800 616 417	www.canon.co.uk	£280	1-year	Flatbed	A4 (216x297mm)	USB 1.1	CCD	2,400x4,800dpi		9,600dpi	No	No	Yes	48	286x461x93mm	No	Adobe Photoshop 5.0 LE, ArcSoft PhotoBase, ScanSoft OmniPage Pro, PhotoRecord, ImageBrowser
Epson Expression 1680	0800 220 546	www.epson.co.uk	£649	1-year	Flatbed	A4 (216x297mm)	USB 1.1, SCSI	CCD	1,600x3,200dpi		12,800dpi	No	No	Optional	48	332x562x133mm	Optional	Adobe Photoshop LE, Xerox TextBridge Classic, Presto PageManager, SilverFast Ai5 with IT8
Microtek ScanMaker 5700	01327 844 880	www.microtekeurope.com	£340	2-year	Flatbed	A4 (216x297mm)	FireWire, USB 1.1	CCD	1,200x2,400dpi		9,600dpi	Scan, copy, email, OCR, web	Yes	Yes	42	500x290x114mm	No	Adobe Photoshop Elements, SilverFast Ai

as well as standard USB. Although you can't expect huge speed gains (see the boxout *Scanning interfaces),* the Canon includes a USB 2.0 card and works with slower USB connections. As such, it represents good value.

As with consumer scanners, a good software bundle is important, although only a few are tailored for business users. The HP 7400C's bundle includes useful web retailing software and a forms creation tool alongside more predictable graphics applications.

Sooner or later, most businesses will make use of a scanner's OCR capabilities. Some business scanners are built for this: for example, the Visioneer 8920 and Strobe Pro scan monochrome documents remarkably quickly, although the Strobe's recognition rates lag behind the others. If you're doing a lot of OCR work, it might be worth looking at a scanner that offers an ADF (automatic document feeder) option. This automates the translation of paper to text, but it is unsuitable for quality photo-scanning.

It isn't written in stone that business scanners have to be flatbeds, and you might actually find it more convenient to use another format. For ad-hoc scanning of small portions of text, handheld scanners can be useful, although their limited resolution has meant a steep decline in popularity over the past few years.

For small offices with little space to spare, consider an MFD (multifunction device) that combines printer, scanner and fax machine. Another method is employed by the Umax Avision, which allows you to scan and print documents to an existing printer without the need for a PC. It does require a parallel interface, though, as USB isn't capable of linking two devices without a host PC present.

Sheetfed scanners, such as the Strobe Pro, which drag flat paper through a static scanning mechanism, have a tiny footprint, but we were disappointed with the quality of the colours scans and the reliability of

↑ Decent scanning of transparencies is almost exclusively the domain of high-end business and graphics devices, as it requires very high optical resolutions

OCR scanning. It isn't a surprising drawback; as a rule, MFDs and sheetfed scanners don't offer the same scan quality as standard flatbeds, while still charging a premium for the convenience they offer.

Although networking features remain rare – only Epson includes a software networking option in the G10000+ – they are worth considering in a larger network. Smaller networks can get round the issue by dedicating a single PC to scanning duties and sharing it over the network.

High-end business and graphics

Received wisdom has it that dedicated high-end drum scanners are the only sensible options for producing commercial standard scanner output, but desktop devices can supply excellent results and are more than capable of full-colour print output. We've seen both magazines and coffee table books put together with the help of sub-£500 desktop scanners.

Naturally, for the best results you should start by looking for excellent resolution and bit depth – check that the scanner can also export at high bit depths – and if you're scanning transparencies, good dynamic range.

Scanning at high resolution and bit depth increases the importance of speed, so you'll notice a significant speed boost with a FireWire-, SCSI- or USB 2.0- equipped interface. For heavy-duty scanning, USB simply won't cut it.

The higher bit depth also means that transparency and 35mm scanning becomes genuinely useful, rather than the gimmick it is on budget machines.

The Canon 2400UF produces the best results from negatives and transparencies, thanks to its patented Fare (film automatic retouching and enhancement) correction technology, which removes dust and scratches from negatives superbly. The only drawback is speed: with this option on, it can take nearly 20 minutes to complete a single transparency scan.

The bundled graphics software will almost certainly have to be replaced with something more powerful, but don't disregard the bundled software altogether: the Microtek 5700 and Epson Expression both feature SilverFast AI, an excellent image adjustment tool that gives you a high degree of control over your scans.

Verdict

For the home user, our choice of scanner would be the Canon N670U. This may not be the best model – it isn't the fastest, and the Epson Perfection edges it out on photo quality – however, for a home user it is the perfect choice. It's a piece of cake to use and draws a tiny amount of electricity, so there's no need for additional cables. It also takes up hardly any space on the desk – ideal.

If you're a business user, we recommend the HP 7400C. The Visioneer OneTouch is an excellent office all-rounder for the small office on a budget but, for more demanding tasks, it's hard to see past the HP's combination of single-button ease of use, excellent resolution, speed, bundled software and extensibility options.

Finally, for high-end business and graphics users, our overall favourite choice is the Microtek 5700. Its bundled FireWire option gives it the performance edge over rival USB devices. Transparency scans weren't as good as those produced by the Canon 2400, but the Microtek supplied excellent reflective results, particularly when enhanced by the decent bundled image enhancement software. ■

Read all about our Best Buy and Recommended flatbed scanners in our chart on page 138