
How To Choose A Scanner

Scanners can turn paper docs into electronic ones, or scan that photo you need for the Web site. But scanners come in many different flavours - analyse your users' requirements alongside the variables before making your decision.

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As more and more users start to make use of graphics in presentations, publications and on Web pages, a scanner is becoming an essential item of office equipment. In addition, many users are starting to take advantage of OCR software in order to convert paper documents into electronic, editable form. It's not surprising that scanners are becoming more popular, but it can often be a difficult task deciding which model is most suitable for a particular application.

Resolution

The resolution of a scanner determines its ability to digitise an image, and is defined as the number of dots per inch (dpi) measured both vertically and horizontally. Note that the resolution is not always symmetrical - generally the scanning mechanism will be capable of finer resolution horizontally than vertically. Thus you are likely to see resolutions quoted by manufacturers as, say, 400 by 800 dpi, or 600 by 1200 dpi. This asymmetry is not a problem as it is compensated for by the scanner firmware during the scanning process.

There are two types of resolution usually associated with scanners: the optical resolution which is governed by the hardware, and the interpolated resolution which relies on firmware algorithms to enhance a scanner's ability to digitise an image by "filling in the blanks" between actual pixels. Such interpolation can boost a scanner's resolution to 9600 dpi, which can be used to capture very fine detail from small original images. Whilst interpolation can be useful it is best to ignore it and just concentrate on the optical resolution to establish a scanner's true ability to capture an accurate image; in general, the higher the optical resolution available the better.

The vast majority of scanners use Charged Coupled Devices (CCDs), but recently scanners featuring Contact Image Sensor (CIS) technology have become popular. The main difference between the two is that CCD-based scanners use a separate ADC to translate the sensor data into binary information, whereas the CIS-equipped scanner has onboard logic to perform this task. Consequently, CIS scanners tend to be smaller, lighter and slightly cheaper than their CCD-based counterparts.

Colour Depth

Closely linked to resolution is the scanner's ability to identify different colours or shades of grey. This is known as colour depth or bit depth, and is dependent on the sensitivity of the sensor and the capacity of the associated analogue-to-digital converter (ADC) being used. Colour depth is quoted as either 24-bit, 30-bit or 36-bit. Most modern scanners provide a minimum of 24-bit colour depth (sometimes referred to as True Colour), which means that they are capable of assigning one of 16.8 million values to a colour. This is fine for most purposes, but when it comes to scanning monochrome images or greyscale documents then 24 bits is usually not enough. A greyscale image is provided in a single channel that usually has the same input value range as each of the colour channels, which is why scanner specifications will say 24-bit colour 8-bit grey, 30-bit colour 10-bit grey, or 36-bit colour 12-bit grey - and just like resolution the higher the better.

Interface

Early scanners tended to utilise proprietary interfaces which often caused problems. Nowadays most scanners come with industry-standard interfaces such as SCSI, USB or parallel port. Of these, SCSI undoubtedly provides the best performance and should be the preferred choice for any high-volume scanning operations. USB is becoming increasingly popular, and its plug and play nature makes it ideal for first-time users. Parallel port interfaces, which frequently provide some form of pass-through connection, are generally the domain of the SoHo user, where price is generally a major issue. Whilst they work reasonably well they can be rather slow at transferring data, therefore if there is a straight choice between USB and parallel port options on a particular model always opt for the former.

As with other peripherals such as printers there are plenty of different styles and models of scanner to choose from, and each has its own particular benefits and drawbacks.

Handheld Scanners

At one time, small handheld scanners were extremely popular as they were cheap (usually less than US\$75) and relatively simple. However, the handheld scanner is not particularly accurate, usually has a maximum resolution of 600 dpi and can be quite difficult to use. Their main drawback is the limited scanning area and, whilst they are handy for scanning small images and narrow columns of text, when it comes to scanning large documents you frequently have to "stitch" separate scans together in order to get a complete large image. Therefore it is not surprising that handheld scanners are becoming rare, and many manufacturers have stopped production of such models.

Sheetfed Scanners

A better alternative to the handheld scanner is the sheetfed scanner. These devices are designed to scan individual sheets of paper automatically in much the same way as a fax machine. Their main advantage is that they have a small footprint, but this is frequently negated by the need to output the scanned paper directly onto the desktop. Some models avoid this problem by featuring an output bin that stores the scanned pages vertically. Whilst sheetfed scanners are ideal where space is restricted, their drawbacks include limited input capacity (frequently 20 pages maximum), relatively low resolution (maximum usually 600 dpi), and problems scanning very small documents (eg, business cards).

The most popular model of sheetfed scanner is the Visioneer Strobe Pro, which offers a USB interface and retails for around US\$200. Other sheetfed scanners include the Avison 100C, which uses a parallel port connection (approximately US\$250), HP Color Sheetfed Scanner 5S with parallel port interface (around US\$99), and the DOCUMAN 1200C from Tamarack Technologies Inc, also utilising a parallel port interface (retailing at around US\$150).

Photo Scanners

If your users only need to scan existing photographs then you might wish to consider a dedicated photo scanner such as the Kodak Snapshot Photo Scanner (less than US\$60). These small-footprint scanners are specially designed for easy operation and can make the task of scanning photos very quick and easy. Most models utilise a parallel port connection and they are generally restricted to handling photos no more than 5 by 7 inches (12.5 x 18 cm).

Film Scanners

For more specialist scanning of photographic originals such as slides or negatives you need to consider film scanners. In order to successfully scan negatives, slides or transparencies, light needs to pass directly through the media rather than simply being reflected back off the scanner cover as with conventional scanners. Therefore film scanners are designed with a strong light source to produce optimum results. In addition, because film scanners are designed to focus on a small area, they tend to feature very high-resolution optics, making them rather expensive.

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Some typical film scanners that you might consider are the HP PhotoSmart S20 Photo Scanner, which uses a USB interface and retails for around US\$500, or the Nikon Coolscan III (LS-30), which has a SCSI connection and costs approximately US\$700. The HP PhotoSmart has the advantage that it can scan photographs as well as 35mm slides or negatives, whilst the Nikon Coolscan can handle both 35mm film and the new Advance Photo System (APS) film format.

Flatbed Scanners

Flatbed scanners are by far the most popular type of scanner used today. They are extremely flexible and versatile, and consequently are suitable for a wide variety of tasks. There is a huge range of models to choose from, with prices starting from as low as US\$50 and going right up to US\$50,000 for the most sophisticated products. Most flatbed scanners offer a choice of interfacing, with USB starting to supersede parallel port connections; however, high-speed flatbed scanners tend to use SCSI only and may come with a SCSI card bundled. Note that if the user needs to scan thick documents such as books or magazines then you should check that the scanner lid can be removed to accommodate such material.

Low End

There is a great deal of competition at the low end of the flatbed scanner market - there are numerous models available to choose from. Optical resolution should be at least 600 x 1200, although 300 x 600 might be acceptable for publishing graphics on a Web site. Colour depth should be a minimum of 24-bit, although most models will offer 30-bit as standard, and some might even provide 36-bit.

A typical model in this range is the Acer Scanner 620 Series, which is available with either parallel port or USB connectivity, and features 600 x 1200 optical resolution, 36-bit colour depth, and is priced between US\$59 to US\$95 depending on interface. Another option could be the ScanMaker 3600 USB from Microtek, which offers 600 x 1200 optical resolution, and a patented Dual Optimisation Technology (DOT) feature which provides 42-bit colour depth. Expect to pay around US\$80 for this model.

Mid Range

Further up the range of flatbed scanners you should expect to find optical resolutions from 1200 x 1200 to 1600 x 1600. Colour depth is likely to be at least 36-bit, and some models feature transparency adapters as standard. Typical of the models in this range are the Epson Expression 1600 (from around US\$700),

Scanner Type Summary Table

Type	Plus Points	Minus Points	Usage
Handheld scanners	Small, cheap, portable	Low resolution, difficult to use, inaccurate	OK for small quick scanning jobs, mainly used for scanning newspaper-type columns
Sheetfed scanners	Small footprint, generally reliable, fairly low cost	Medium-quality resolution, limited input sheet capacity, document feed not always reliable	Ideal when desk space is limited, frequently used in combination with a printer and modem as a fax machine replacement
Photo scanners	Compact design, generally high resolution, reasonably priced	Restricted maximum photo size, can be rather slow, limited uses	Only tend to be useful for scanning existing snapshots
Film scanners	Small footprint, very high resolution, usually capable of scanning negatives	Can be expensive, limited uses, may not handle all film formats	These are rather specialist in nature and ideal for photographers
Flatbed scanners	Flexible and versatile, easy to use, generally reasonably priced	Optional extras can be expensive, fairly large footprint, bundled software not always the best available	Flatbed scanners are usually the best all-round option for the majority of scanning operations
Multi-function devices	Compact and easy to use, good range of features, flexible operation	Can be expensive to buy, plenty to go wrong, all your eggs in one basket	Multi-function devices are best where space is at a premium or when printing or copying is an additional requirement

which as the model number implies has a 1600 x 1600 optical resolution. The thing that sets the Expression apart from the competition is that it is available with an optional IEEE-1394 high-speed interface, although you can expect to pay over US\$1200 for this version. Also note that, unless you intend to connect the Epson Expression to an iMac, you will probably need to purchase Epson's IEEE-1394 FireWire Scanner Interface Card.

Alternatively in this performance range you might consider the HP ScanJet 6350C, which offers 1200 x 1200 optical resolution, 36-bit colour depth and includes a 25-page Automatic Document Feeder (ADF) as standard.

High End

At the high end of the scanner range optical resolution tends to take a back seat in favour of scanning speed. This is especially true when document scanners are utilised in a workgroup environment, where optimum throughput is frequently the ultimate goal.

Once again there are plenty of products to choose from. Some models you might wish to consider are the 1000 FB from Bell & Howell, which uses a SCSI-2 interface, provides a maximum optical resolution of 400 dpi and can scan up to 45 pages a minute (expect to pay around US\$3,500). Faster still is the 8125DPlus, which offers the same resolution but can scan up to 125 pages per minute; however, this model is not cheap and could easily cost US\$30,000. For ultimate performance you could consider the SCAMAX5000 from German company InoTec, which is claimed to be able to scan documents at a rate of 390 pages per minute. Unfortunately the price is likely to be in excess of US\$45,000.

Further Information

All the major scanner manufacturers have Web sites offering details of their various scanner products. Here is a list of the manufacturers mentioned above, along with several other useful sites.

www.twshowcase.com/
www.visioneer.com/
www.avision.com.tw/english/av-english/frame-products.htm
www.scanjet.hp.com/products/
www.acerperipherals.com/
www.microtekusa.com/
www.epson.com/
www.bellhowell.imagingcomponents.com/
www.scamax.com/index.html
www.artecusa.com/
www.fujitsu.com/
www.kodak.com/
www.mustek.com/
www.nikon.com/
www.olivision.com/
www.pie-scan.com/
panasonic.com/office/scanner/-scan.html
www.polaroid.com/products/-digital_imaging/scanners/
www.plustekusa.com/
www.primaxamerica.com/
www.relisis.com/
www.ricoh-usa.com/index.htm
www.scanport.com/product_-_scanners_index.html
www.umax.com/
www.xerox.com/scan/

Optional Extras

As mentioned previously, some scanners have a range of optional extras which make them more suitable for particular tasks. For example, many flatbed scanners can be used to scan slides or negatives by means of an optional transparency adapter. Alternatively, some models feature a slide-out drawer for scanning negatives or slides, and these generally give better results as there is no glass between the original and the sensor. The other popular add-on for flatbed scanners is an ADF, which is useful if you need to scan a lot of separate documents. Generally you can expect to pay between US\$100 and US\$350 for an ADF.

Multi-Function Devices

As well as standalone scanners, many users are attracted to the idea of multi-function devices which incorporate a scanner along with a printer. The printing system can be either laser- or inkjet-based, and these units are especially useful in the SoHo environment where space may be at a premium. However, as with many combination devices, they do not always equal the performance and capabilities of single-function devices, and whilst these multi-function devices are undoubtedly useful it is often better to buy a separate scanner to use with your existing printer.

Conclusion

Choosing the right scanner is pretty much a question of determining the user requirements for image source type (paper, slide, or negative), resolution, colour depth, paper handling (ADF), and interface. Provided that you take these requirements into consideration then selecting the appropriate solution should pose no difficulties. Most manufacturers offer a comprehensive range, from low-cost personal scanners right up to large, heavy-duty models suitable for high-volume scanning applications.

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