



the colour of money

Which inkjet drains your wallet fastest?

Inkjet photo printers offer you high-quality prints from your digital camera, with the flexibility to print what you want, when you want it.

Doing your own prints is reasonably affordable, too, but this isn't its main advantage. An A4, high-quality glossy print from an inkjet will cost between \$5 and \$8, while a single print of the same size from a photo lab or online digital print house will cost between \$10 and \$12 dollars. But most photo labs offer significant discounts the more prints you do, so that if you are doing volumes of 20 or more the price often drops right down to \$5 or so.

In fact, just like a packet of chocolate biscuits never lasts more than a few hours, having the ability to print when the urge takes you means you can all too quickly drain your ink cartridge, empty your photo paper packets, and bottom out your wallet. So, in choosing which of our trial models is best, we tested their economy as well as their speed, features and the quality of the prints they produced. And in an ongoing experiment, we'll be testing the longevity of the prints by setting up samples in different environmental conditions for six months.

How we tested

To test economy we gave our printers a real-world task. We ran each one dry doing A4, borderless photo prints at best quality settings on high-quality, glossy photo paper. With a fresh set of cartridges in each printer, we ran multiple copies of our print until either the printer wouldn't let us do any more (due to the ink running out) or we saw a noticeable drop in print quality due to low ink.

The cost-per-print figures we arrived at (see "Calculating costs", page 65) are therefore a worst-case scenario, as they include the cost of a full set of ink cartridges. With all our test models, some inks ran out much faster than others, meaning that you will not be replacing a full set of cartridges in order to resume printing. The more prints you make, the more the cost-per-print will come down. We also didn't factor in the cost of the printer in the cost-per-page figure, and obviously this is a substantial cost you don't incur when going to a photo lab. Even so, the budget models here are great value for money, offering, in some cases, excellent prints from a \$400 printer.

By Bruce Buckman

Running on empty

We tested two models each from HP, Epson and Canon: one budget model and one high end. The budget models have less inks than the high-end models, which in theory means they will not produce photo prints of as high a standard. The quality of the photo print comes down to several key factors: the resolution (how many drops of ink make up the print); the size of the ink droplets (which has come down to one or two picolitres with some of these models); the number of colours used, which affects the printer's ability to reproduce the colours of the original photograph; and the type of ink used.

In our tests we printed our A4, borderless print at each printer's best quality photo settings, using the vendor's own

high-quality photo paper. Our three budget models were the HP Photosmart 7760, the Canon PIXMA ip3000 and the Epson R310.

HP PS7760

The HP PS7760 uses two cartridges, with each cartridge containing three inks. For standard, plain-paper printing you normally use one large-capacity black cartridge and the tri-colour cartridge (which contains cyan, magenta and yellow). This combination also does a reasonable job of photo prints, too. But for better photo prints you take out the black cartridge and insert a photo cartridge, which contains light cyan, light magenta and black, to create a six-ink configuration. HP also offers a photo grey cartridge,

QUALITY, SPEED AND ECONOMY

WHILE ALL THESE inkjet photo printers offer good prints, the Epson R310 and Canon ip8500 offer the best combination of features at the budget and high end of the range.

	Price	Cartridges	Photo print quality	A4 print speed ¹	Cost per A4 print ²
Canon PIXMA ip3000 Canon, ☎ 09-489 0300; www.canon.co.nz	\$279	C, M, Y, Bk	Very Good	3:14	\$4.53
Canon PIXMA ip8500 Canon, ☎ 09-489 0300; www.canon.co.nz	\$799	C, M, Y, Bk, Photo C, Photo M, R, G	Excellent	2:19	\$7.45
Epson Stylus Photo R310 Epson, ☎ 09-366 6855; www.epson.co.nz	\$399	C, M, Y, Bk, Light C, Light M	Excellent	5:25	\$4.55
Epson Stylus Photo R800 Epson, ☎ 09-366 6855; www.epson.co.nz	\$799	Photo Bk, Matte Bk, C, M, Y, B, R, Gloss Optimiser	Excellent	5:29	\$5.04
HP Photosmart 7760 HP ☎ 0800 733 547; www.hp.co.nz	\$349	Tri-colour, Photo or Photo Grey	Very Good	6:09	\$8.73
HP Photosmart 8450 HP ☎ 0800 733 547; www.hp.co.nz	\$699	Tri-colour, Photo, Photo Grey	Excellent	5:59	\$8.41

¹Print speed is for an A4 borderless print, printed landscape at best quality settings. Time includes time to spool print job.

²See "Calculating costs" page 65 for a breakdown of costs.

which contains black and two shades of grey. This is technically designed for producing better monochrome prints, but with some colour photos it may give a better result than the standard photo cartridge. We tested the Photosmart 7760 with both the photo and the photo grey cartridges.

The HP turned in a mediocre result in the rundown test — just 24 prints when using the photo and tri-colour cartridges and 20 using the photo grey and tri-colour cartridges. In both cases the photo cartridges ran out before the tri-colour cartridge. The HP printer driver warns when ink is running low but does not stop you printing when the ink runs out. We printed until we noticed a drop in image quality (banding and changes in colour). Based on the results from the printers equipped with individual ink cartridges, it seems likely that when you trash an “empty” cartridge from

the HP there will be ink remaining in at least one of the colours. The HP, like all the printers in this test, used mostly the cyan and magenta inks (or light cyan and light magenta if equipped), followed by yellow and black.

CANON IP3000

The Canon ip3000 uses four individual cartridges — black, cyan, magenta and yellow. The Canon printer driver warned that ink was out in one of the cartridges at the 40-page point, but it let us continue printing if we chose. We resumed printing and the printer produced another seven prints with no loss in quality before the ink-out message came up again. Again, we kept printing and got another three prints before banding appeared in the image and we stopped, for a total of 50 A4 borderless prints. Even though the ink-out message warns that you could damage the printer by continuing to print, as

Summary

Fast print speed and good print quality matched to good economy. Includes the ability to print on printable CDs and the clever design lets the printer fold up into a clean box when not in use. Good software suite.

The fastest printer and with excellent print quality. Not as economical to run as its cheaper sibling. Includes the ability to print on printable CDs and a good software suite.

Great print quality and excellent economy. Includes card readers and ability to use as a standalone printer. You also get the ability to print on printable CDs and a good software suite.

Excellent print quality although you may need to tweak with driver settings to maximise quality. Also has excellent economy, ability to print on printable CDs and a good software suite.

Good print quality. Card readers, colour LCD and on-printer controls for image adjustment mean it can be used standalone and has a good software suite. But economy and print speed let it down.

Excellent print quality combined with card readers, colour LCD and on-printer image adjustment make it a good standalone print station. But economy and print speed let it down.

long as you stop when the quality begins to degrade you are unlikely to cause any damage. We exhausted the cyan and magenta cartridges, while the yellow was left a bit less than half full.



HP Photosmart 7760

EPSON R310

The Epson Stylus Photo R310 has six ink cartridges; black, cyan, magenta, yellow, light cyan and light magenta. The R310 printed an impressive 55 A4 borderless prints before the first cartridge ran dry. In the Epson's case you cannot continue printing in the ink-out state and must either replace the cartridge or cancel the job. The light cyan and light magenta cartridges were drained first, followed by the yellow and then black.

HP PS8450

Our high-end printers were the HP Photosmart 8450, the Epson Photo Stylus R800 and the Canon PIXMA ip8500. The Photosmart 8450 uses three ink cartridges. Like other HP models, one of these cartridges can be a black ink for economical office printing but for photo work it comes equipped with tri-colour, photo and photo grey cartridges. Both the black and tri-colour cartridges are also available in high-volume models; in our case the tri-colour cartridge was high-volume. In the rundown test the Photosmart 8450 managed 24 prints before we noticed banding, with the photo grey cartridge being the first to run out.



Canon PIXMA ip3000

CANON IP8500

The Canon ip8500 comes with eight ink cartridges; cyan, magenta, yellow, black, photo cyan, photo magenta, red and green. The additional red and green inks

help expand the printer's colour range and as such they are likely to run out less quickly than the standard inks, as they are used to flesh out the colour range in areas that cyan, magenta, yellow and black alone cannot reproduce well. In the rundown test the photo cyan and photo magenta inks were the first to run out. Like Canon's low-end ip3000, the printer gives ink-out warnings fairly early but lets you continue printing; we ended up with 40 A4 borderless prints before there was a drop in quality.

EPSON R800

Epson's Stylus Photo R800 also has eight cartridges. One is a dedicated matte black, used for when printing on matte paper, and another is a gloss optimiser rather than a colour. The other inks are cyan, magenta, yellow, black, red and blue. Like the red and green inks in the ip8500, the red and blue inks here are used to extend the colour range. Unlike the other printers, the R800 uses pigment-based rather than dye-based inks. Traditionally, pigment-based inks have had superior longevity compared to dye-based inks but an inferior colour range. Epson's UltraChrome inks have improved the colour-range issue to the point where they can now compete with dye-based inks while offering longer life. One other issue with pigment-based inks has been that they do not work well with glossy paper: when holding a print on an angle, a sheen or "bronzing" effect is noticeable. The gloss optimiser in the R800 is designed to counter this effect and appears to be effective at doing so.

Like its cheaper sibling, the R800 was an economical beast, churning out the same number of prints, 55, before the ink-out message prevented further printing.

Dollars and sense

The cheapest prints came from the two Epson printers and the Canon ip3000, while the most expensive prints came from the two HP printers, which were almost twice as expensive per print as the cheapest. The costs of consumables and the final cost per print resulting from the rundown test can be seen in the table on

page 65. As you do not need to replace all inks at the same time, the overall cost per page will reduce as you print more — for the purposes of this test we've included the full price of a fresh set of cartridges in the final figure. We also used the cost of the high-quality photo paper provided by the vendors. Most vendors offer a range of photo papers at different prices and you can save money by only using the top-drawer stuff for final prints. And unless you really need an A4 print, you can also save yourself money by printing 4 x 6-inch prints instead — an A4 print is only slightly smaller than four 4 x 6-inch prints so for a rough guide you can multiply the rundown results for each printer by four to see how many 4 x 6-inch prints each will offer.

The ink setup of the HP printers puts them at a definite disadvantage compared with the separate ink cartridge models. With the HP printers, you will almost certainly be wasting some ink with each empty cartridge you replace, and, as they are not the most economical of printers to start with, that cost will add up. Again, you can alleviate this by doing prints using a black cartridge in place of the photo cartridge, which will be more economical. Reserve the photo cartridge or photo grey cartridge for when you want the best quality.

Good looking

All the printers produced good looking prints. A fine art or photo enthusiast would possibly spot differences between the models, but the average user will be harder pressed to make a call. Our favourite budget prints — and some of the best prints overall — came from the Epson R310, which at default settings handled detail in shadow areas much better than the four-ink Canon ip3000 or the six-ink HP7760. With the more expensive printers, the results were closer. Possibly because of its pigment-based inks, the Epson R800 produced quite warm, but not overly vibrant prints by default on glossy paper, but a bit of tweaking with the colour options available from the printer driver soon saw it producing more vibrant images. Like the Epson R310, it also did an excellent job of

shadow detail, but both the Canon ip8500 and HP PS8450 also did well here.

But the differences in the prints are a fine distinction for the average user to make. We put our test prints in front of three *PC World* editors to see if they could come up with a winner in a blind test and the results were contradictory. All expressed a slight preference for the vibrant colours and higher contrast found in the Canon prints but picked the print from the four-colour ip3000 ahead of that from the eight-colour ip8500. Ultimately, even when there are objective differences in output quality, individual tastes are highly subjective. Do you need the few extra points in image quality? That's a judgement call only you can make.

Speed fiends?

How much you value the speed of your photo printer will depend on the kind of printing you are doing. If you intend to sit there running off 40 prints and watching every one come out, the Canon printers are obvious stars. The PIXMA ip8500 was the stand-out champ, turning out a best quality, landscape A4 borderless print in just 2 minutes 19 seconds. Our speeds include the spool time from the PC to the printer, as it's a factor you'll deal with in real life. Spool time will vary depending on the image, its size and format, the PC and the connection to the printer. Our test image was a 4MB, 6 megapixel JPEG file.

The Canon ip3000 was the next fastest, with a time of 3 minutes 14 seconds. Then came the Epson printers at 5:25 for the R310 and 5:29 for the R800,



Epson Stylus Photo R310



HP Photosmart 8450

while the HP printers came in at 5:59 for the Photosmart 8450 and 6:09 for the Photosmart 7760. The print driver for the HP printers has an option to print at maximum dpi which takes substantially longer (10:26 for the PS7760, for example) but as we found it impossible to detect any difference in print quality we went with the standard best quality setting.

Features and frills

There's more to a photo printer than just speed, quality and economy. Each printer comes with a software suite for your printing needs and each offers some features beyond simple photo printing.

Of the models here, the Epson R310 and both the HP printers come equipped with card readers, which can be used to print images directly from your camera's memory card using the menus on the printer. All three can be used as standalone photo printers thanks to LCD screens that let you navigate print options and choose images to print from memory cards. The LCD on the R310 is monochrome

and does not display images; instead you choose them by image number or print out an index page first. However, you can add a colour LCD to the R310 for \$225. Both the HP PS7760 and PS8450 come with colour LCD screens that let you visually choose images to print and even perform basic editing tasks on them directly from the printer.

The Epson and Canon printers each come with an attachment and software for printing directly onto the surface of CD-Rs. (You need to buy special CD-Rs that have a printable surface.) This is a great option for personalising your picture collections.

All these printers allow direct printing from PictBridge compatible cameras. PictBridge is a standard that lets digital cameras talk to compatible printers and has become pretty much obligatory on all new cameras and photo printers. The Epson R310 also allows you to connect and print directly from some CD-R drives and Zip drives.

The Epson R800 provides both USB

HOW LONG IS LONG LIFE?

ALMOST EVERYONE WHO has printed photos from their inkjet has had the experience: you put your prints on the wall or in a picture frame on your desk, and then one day you look up and suddenly realise the lustre has gone. All prints fade, even the ones you get from a photo lab. But some prints fade faster than others.

Most inkjets produce prints using dye-based inks. Dye-based inks offer several advantages, including economy and the ability to produce a wider gamut of colours than pigment-based inks. But their major weakness is longevity. By comparison, inks based on pigments rather than dyes have a longer life span, but traditionally haven't been able to reproduce the same range of colours as dye-based inks.

Of the printers we tested, only the Epson R800 uses a type of pigment-based ink, although in fact Epson's UltraChrome inks are a complicated hybrid that combine both pigments and dye. The result is an ink that offers a good compromise between colour range and print life. Epson claims a lifetime of 100 years for its prints when stored under proper conditions.

According to Canon's Michael Mordich, it isn't just the UV light that causes your prints to fade. The atmosphere, including impurities in the air, also reacts with the inks and the paper they are on to cause fading. For this reason, he says, you'll often notice that a print left in a kitchen may fade faster than one placed elsewhere in the house. The bottom line? Treat your inkjet prints in the same way as any other photograph. Place them under glass where the sealed environment protects them, or in an album with proper, acid-free pages, rather than a cheap album with plastic sleeves.

To find out which of our printers can produce prints that go the distance, we've set up test samples from each in various locations; close to direct sunlight, away from windows, exposed and under glass. We'll report back in six months' time to see how they're faring.

and FireWire ports for connection to a computer, while the HP PS8450 comes with built-in Ethernet in addition to its USB port so it can be easily placed in a workgroup. All the other printers provide USB 2.0 ports for connecting to a PC.

The HP printers have integrated paper trays in the front that are separated into a lower and upper tray. The upper tray is smaller, used for 6 x 4-inch stock, while your A4 paper sits in the lower tray. You toggle between the two using a slider. The Canon printers also feature a paper tray at the front, adjustable to take paper up to A4 size. When you use it with A4 paper it sticks out the front like the trays on the HP printers but if you use it with smaller paper sizes, like 6 x 4-inch, it stays flush with the base of the printer. You can also use the standard sheet feeder at the top of the printer, which has a cover for when it is not in use. When the printer is not in use you can close the paper-out tray to create a perfectly clean profile.

Epson's R800 comes with roller attachments used to feed banner paper to the printer. This makes it possible to print panoramic pictures. Roll paper is available in various sizes and finishes.

Editors' choice

When choosing a photo printer, you must match its abilities to your needs. If you like to take snaps then get instant prints without worrying too much about enhancing your prints with image editing software, a photo printer that can be used standalone is a good option. Card readers, LCD screens and menu options, and PictBridge support all help you plug and print without the need to ever turn on your PC. Indeed, you can even have your printer located away from your PC if you wish. But wanting instant prints doesn't necessarily mean you don't care about quality. Our favourite budget printer here is the **Epson R310**. While it doesn't come (as standard) with a colour LCD for previewing images, it offers great six-ink prints, has multiple direct printing options and comes with the ability to print directly onto the surface of CDs or DVDs. And let's not forget it is the joint winner (with its big brother

the R800) in the economy stakes, so you'll be getting the most from your dollar each time you print. This set of features earns it our Editors' Choice for budget photo printers. If acting as a standalone printer isn't as important to you, the Canon PIXMA ip3000 is a good option. Its four-ink setup doesn't produce prints that can quite match the quality of the R310, but they are still very good. And it is a speedy little beast and reasonably economical, coming in not far behind the R310 and R800 in the rundown test. It also offers CD surface printing.

If you want to spend more money for a bit of extra image quality, your choices are based more on the features you want: the Epson R800, Canon ip8500 and HP PS8450 all offer excellent image quality. The Epson R800 offers great prints and economy, but with no card readers or LCD, it's obviously designed for someone who'll be doing image editing tasks and printing from their PC. The Canon ip8500 lacks standalone features, too, but is a blisteringly fast printer that doesn't sacrifice image quality in the process. But while the HP PS8450 offers a colour LCD and standalone functionality including card readers, it comes at the expense of economy, and it's not too fast either.

For us, the high-end choice comes down to the **Epson R800** and Canon ip8500. In the long term, the Epson's pigment-based inks may convey an advantage in print longevity (see "How long is long life?",



Canon PIXMA ip8500



Epson Stylus Photo R800

page 62). But in the short term it's hard to look past the R800's combination of excellent output quality and great economy, which earns it our high-end Editors' Choice. If you're less con-

cerned with eking out the most value from your dollar and you value print speed more highly, the Canon ip8500 is an excellent choice.

bruce@pcworld.co.nz

INKJET ALTERNATIVES

IF YOU'RE HAPPY with smaller 6 x 4-inch prints as opposed to A4 prints, there are alternatives to bulky inkjet photo printers.

Small dye-sublimation printers offer a great alternative to inkjets. Sony's \$399 DPPEX50 Digital Photo Printer, for example, offers standalone or PC-connected printing in a small package that takes up less space than the average inkjet. The DPPEX50 stands on its side, so you can slot it in just about anywhere. Its dye-sublimation process uses a small toner cartridge that lays down solid colour (cyan, magenta and yellow) in three separate passes via a heat transfer method, rather than the ink droplets of an inkjet printer. It also puts a protective coat on the finished print to protect it from handling, UV light and environmental conditions. You buy the toner cartridge and 4 x 6-inch paper as part of a single pack; the toner last roughly for the number of sheets of paper that come with the pack. Packs are available in 25 (\$30) and 75-sheet (\$79) kits.

The DPPEX50 has a built-in card reader for CompactFlash and MemoryStick cards. It also has a USB port for connecting PictBridge-compatible cameras and another for connecting to a PC. But if you want to run it away from your PC it also has an AV port so you can connect it to a TV. The TV screen then functions as your menu screen and lets you access the built-in editing features.

Kodak also uses the dye-sub process in its printer docking ports. The printer docks combine the function of a docking station and battery charger for Kodak cameras with a small, 4 x 6-inch capable dye-sub printer. While the printer docks are obviously designed as add-ons to the EasyShare camera range, the top-end \$449 Printer Dock Plus also comes with a built-in card reader for SD/MMC cards and a USB port that lets you attach a card reader so you can print from other card formats.

We've included prints from the Sony DPPEX50 alongside those from the inkjet printers in our print longevity test (see "How long is long life?", page 62).



**Sony DPPEX50
Digital Photo
Printer.**

Sony DPPEX50

Contact Sony, © 09-488 6188;

www.sony.co.nz

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**Kodak EasyShare Printer Dock
Plus**

Contact Kodak, © 0800 440 786;

www.kodak.com.au

CALCULATING COSTS

WHEN IT COMES to economy, not all photo printers are created equal. The cost-per-page we arrived at after doing our rundown test is admittedly a worst-case result, as it includes the cost of a full set of cartridges. But as you don't use up all the inks at once, your total cost per print will reduce as you print greater volumes. Even so it's clear that some printers are more frugal than others, with the two Epson printers and the entry-level Canon ip3000 proving good value for money.

PRINTER MODEL	Cost of full set of cartridges	Cost of paper used per set of cartridges	Cost of single sheet A4 ¹	No of prints per set of cartridges ²	Total cost of consumables used	Cost per A4 print
Canon PIXMA ip3000	\$104	\$120	\$2.40	50	\$226.40	\$4.53
Canon PIXMA ip8500	\$200	\$96	\$2.40	40	\$298.00	\$7.45
Epson Stylus Photo R310	\$138	\$110	\$2.00	55	\$250.00	\$4.55
Epson Stylus Photo R800	\$165	\$110	\$2.00	55	\$277.00	\$5.04
HP Photosmart 7760	\$165	\$43	\$1.80	24	\$209.55	\$8.73
HP Photosmart 8450	\$157	\$43	\$1.80	24	\$201.80	\$8.41

¹Paper costs are based on vendors' high-end glossy, A4 photo papers. All vendors offer cheaper alternatives.

²A4, borderless glossy photo prints done at best quality settings.

How we tested: To test how many prints you can expect from a full set of cartridges we installed a fresh set in each printer. We then printed our test image — a single image composed of four separate photos — on the vendors' own A4, high-quality photo paper. We printed borderless and at the best quality photo settings offered by the print driver. We continued printing until the first ink cartridge ran out or until image quality dropped due to low ink.