

## USB Scanner and Printer on Test

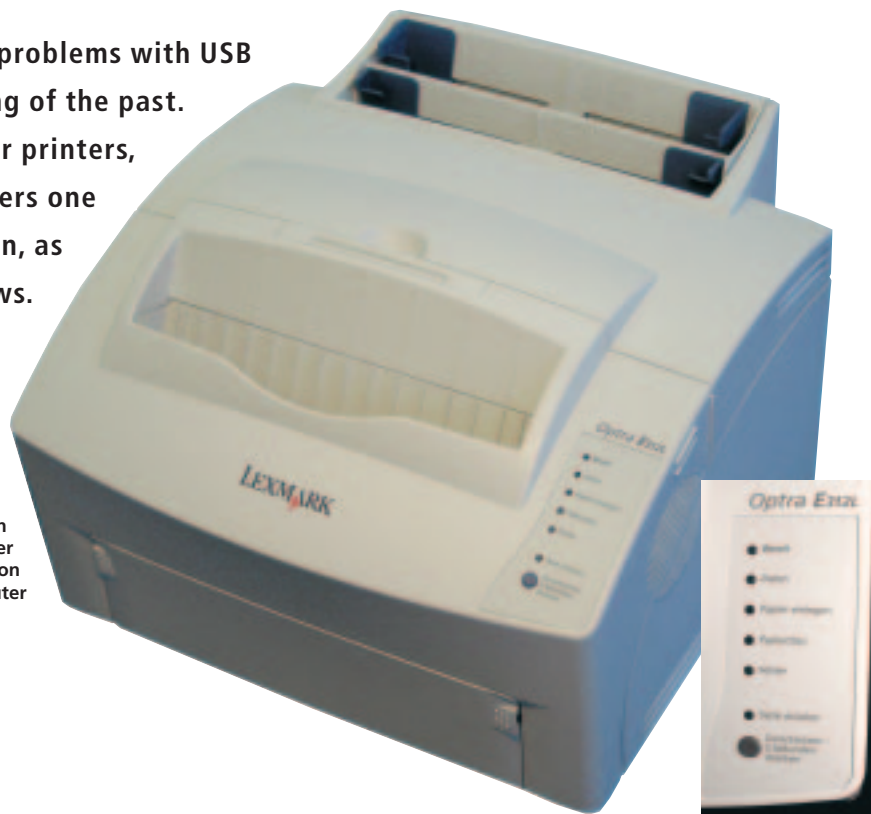
# WORDS AND PICTURES

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Thanks to kernel 2.4, problems with USB devices should now be a thing of the past.

This is also largely true for printers, but in the case of USB scanners one has to use discrimination, as our combined test shows.

Absolutely SOHO-compatible: But the Lexmark Optra E312 can only produce 10 pages per minute in combination with a fast computer



Without a Postscript expansion module the HP DeskJet 1220C cannot quite fulfil its potential

The time has finally come: 2.4.0 is here! Of course, we also took this into account in our test: All devices were tested with both series 2.2 and with the series 2.4.

Let's get one thing out of the way right from the start:

If one considers only USB, then the printer test was a hundred percent successful. Each printer was recognised immediately, and data could be sent to each printer. Unfortunately, creating this data was not always simple, and the necessary filters did not always deliver a perfect print image (only the Optra M410

required no special filters). In the case of colour printing it was always necessary to experiment with

various filters and settings, and the differences in quality of the results could be enormous. With black/white, though, the print image was satisfactory right from the start on all the models tested. The inkjet printers all have two cartridges: a black/white and a 3-colour, which in some devices can be swapped for a photo cartridge (6 colours).

## Canon BJC-2100

The BJC-2100 is the cheapest model from Canon. Just like the Epson, it has no on/off switch, but it does at least have a button for ejecting paper (with subsequent resetting of the printer). There is also a sensor indicating that the flap to the printer unit is open. So inserting cartridges is no problem. The



first sample print with *Ghostscript* worked straight off: then the cartridges were cleaned in just under half a minute. After that the printer produced 2 pages per minute. Subsequent print jobs also started without the cleaning procedure, immediately after the start of the transfer. Documents in colour were printed handsomely, although some major weaknesses came to light during the colour transitions: The contrast when changing from the colour to the black/white cartridges is incalculable. For a printer driver, *bjc-2000* from Gimp-Print is recommended, although this only produces sufficiently good results on the paper setting "Glossy Photo Paper".

## Epson Stylus Color 580

The plastic housing of the Epson Stylus Color 580 has not a single button or knob nor even any status indicators such as LCDs or LEDs. It was also an adventurous undertaking to insert the ink cartridges: For Windows there is presumably an appropriate software tool, but with Linux the only option is to take the plug out of the mains during initialisation, in order to get the print head, which is going crazy, into an appropriate position to install the ink containers. After that, the hunt for drivers begins, and strikes lucky on the Epson homepage: Here there is a reference to *xw\_tools* - a commercial product, for which you have to pay extra. Not a nice stroke for Epson to pull, because when a printer costs around £60, 15 Euros is a relatively large sum. But sadly there is no alternative: it is just a GDI printer, with which it is not even possible to print out ordinary ASCII text. With *xw\_tools* normal document printing is quite passable. But a colour print out at a resolution of 720 dpi takes about 18 minutes. Every other printer in the test was considerably quicker here. Images take even longer. The printer always pushes the paper through the printer at the same rate. The *compress* option does speed up the print procedure somewhat, but at 15 minutes it's never going to break any records.

The biggest problem with this is the main memory usage of *xw\_print*, the actual filters. Thus, this program needs a whole 204MB of memory for one page at 720 dpi, as the complete page first has to be constructed in the memory and is only then sent to the printer. With too little memory and a big swap partition the printing of a ten-page document becomes a full evening's work. Which is why the Epson Stylus Color 580 is not recommended for the normal user.

### Filter for Epson Stylus Color 580

```
#!/bin/bash
TMPFILE=`mktemp /tmp/epson.XXXXXX`
cat > $TMPFILE
gs -sDEVICE=ppmraw -q -dNOPAUSE -dBATCH -r720 -sOutputFile=- $TMPFILE |
/usr/local/bin/xw_print -usbEps -dev epsC580 -density 720 -compress
```

## Lexmark Z52

The current top model from Lexmark was the best device in the test. With the driver supplied by the manufacturer, the printer was recognised immediately at start-up and the photo print-out is unequalled. The *tgz* packet includes an *rpm* file together with the obligatory README with a brief description of the install procedure and the software. After a simple

```
rpm -i lexmarkz52-1.0-1.i386.rpm
```

the necessary files are then found in the directory */usr/local/lexmark/z52*. The settings can be saved in */var/spool/lexmark/z52.conf* or in the home directory of the user, as required (*~/.lexmark/z52.conf*). Installation of the *rpm* packet has to be done with the X-server running, because then the configuration program (*/usr/local/lexmark/z52/lexmarkz52*) is also started automatically. This makes it easy to calibrate the printer and produce a test page. Settings relating to size and type of paper are also possible at this point. As "Input filter" you must specify */usr/local/lexmark/z52/z52.sh*, and then off you go. As long as you are only printing black/white, the Lexmark Z52 barely differs from the other devices. But when it comes to colour and photo printing a clear difference in quality becomes apparent. The near-photo quality achieved is spoilt only by rare and yet also rather cute white horizontal stripes. The colour stability matches the original like no



HP Deskjet 840: Optimum photo printing only if the images are manually pre-processed



Linux always makes friends fastest with a real Postscript printer - here with the Lexmark Optra M410

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## USB PRINTER



**Only partly Linux compatible:**  
The driver software of the  
Epson Stylus Color 580  
gobbles up too much memory



other printer  
in our test. For this  
reasons, it is easy to get over  
the fact that speed of black/white  
printing lies in the lower average range (approx. 1  
min/page). The binary-only driver runs as user-space  
program and therefore has no effect on system  
stability. But anyone who does not trust the closed-  
source product can use Gimp-Print as an alternative,  
although this does not quite match the quality of  
the manufacturer's driver.

### Lexmark Optra E312L

The Optra E312L is the cheapest Lexmark laser  
printer. For this reason, it is also supplied with the  
economy measures common to this class:  
Horizontal paper trays, no menus and just two

controls: A  
button for Reset and  
an On/Off switch. The latter  
commendably really does isolate the printer from  
the mains. The quality of the text printout is  
subjectively very good. Although the printer unit  
can only come up with 600x600 dpi, the electronics  
can also process 1200x1200 dpi, although with a  
pure grey there were some slight irregularities  
visible. As print filter it is best to use *ljet4* from  
Ghostview: The printer speaks PCL 6. The speed is  
perfectly adequate for use at home and in small  
offices. At a measured rate of six pages per minute  
even large documents are child's play and the paper  
out tray is big enough for over 100 sheets with no  
problem, which means the printer can certainly be  
left for 20 minutes to print unsupervised. The  
manufacturer's specifications give ten pages per  
minute, which could well be correct. For this speed,  
though, a 700MHz computer is recommended in  
terms of coping with the requirements of the  
software printer filter.

### Printing under Linux/Unix

*Printing under Linux/Unix is firmly linked with Postscript. This "programming language" was developed in the mid-80s by Adobe and has become a standard in the professional print domain. This language provides a wide variety of commands such as the positioning of letters and the drawing of simple geometrical bodies. Postscript printers always have a powerful and specially-cultivated processor, in order to be able to process the drawing commands quickly to be ready for printing. Hence it is usually enough merely to send a professional printer a Postscript file. The only printer in our test which can directly process Postscript is the Lexmark Optra M410. Under Linux/Unix, basically, every program which wants to print produces Postscript code. In an ideal case this is simply sent to the printer port. But since the printer manufacturers want to save money, it is becoming rarer for them to equip their printers with intrinsic intelligence and they are transferring the Postscript interpretation and thereby the creation of the actual print image into the computer itself. With the Epson for example this interpretation takes up to one minute per page (and that is with a 1GHz processor). The processor integrated in the Optra M410 on the other hand manages ten pages per minute. For conversion there are several different printer filters; the two main free open-source projects in this domain are Gimp-Print and Ghostscript. Both can create a large number of different printer dialects. In this article, though, there are still two more printer filters to look into: *xw\_tools* and the *Z52* driver from Lexmark. A rough guideline as to which filter should be used for which printer can be found at [Linux-printing](#).*

## Lexmark Optra M410

This device behaves as one would expect of a Postscript printer: A simple test using

```
cat myfile.ps >/dev/usb/lp0
```

immediately brought the required document to light - no setting and optimisation of print filters necessary. Here the print unit matches the manufacturer's specifications: 10 pages per minute are completely realistic. The printed image is immaculate. It is only the grey shades at 1200 dpi which are not always one hundred per cent homogenous. The device we tested had a 16MB expansion, as the result of which most text documents are completed for the spooler very shortly after the print command, although the printer carried on printing merrily for several minutes. (For a better estimate: A one-page Latex document usually needs no more than 50KB). All options of the printer can be changed directly via an LCD menu on the device. The only minus point: With big print jobs (more than 50 pages) the outputs stack up poorly so that following pages get creased or others are pushed out of the stack.

## HP DeskJet 840C

The DeskJet 840C (incidentally of the same construction as the 843C) is one of the cheapest colour inkjet printers from Hewlett Packard. For about £70 you get a printer which produces good print-outs under Linux, too, at up to 600 dpi. As ever, the choice of driver is crucial. For text (meaning: solid colours only) the *cdj670* driver from Ghostscript is suitable, for photos it's better to use the *cdj970*. But when it comes to photo print-outs there is still some manual labour to be done: a bit

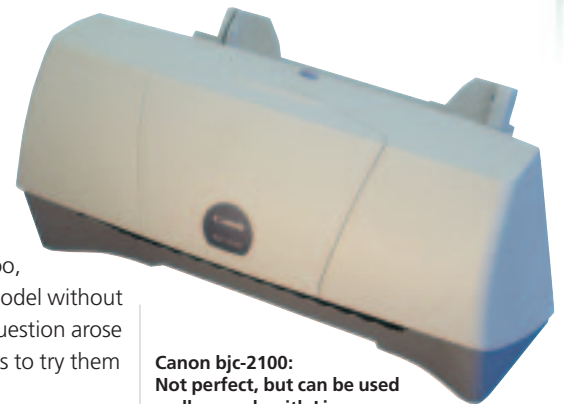


For the Lexmark Z52 the manufacturer has a Linux driver up his sleeve, hence the brilliant print image is convincing

more cyan and a little more contrast make the result come very close to the desired image. Printing out via Gimp-Print incidentally goes beyond good and evil. In addition the printer has an external power supply as well as its own feed for envelopes, where the change-over can only be done on the device itself for hardware reasons.

## HP DeskJet 1220C

We did actually ask HP for a DeskJet 1220C/PS. The correct packing came too, but unfortunately it contained only a model without the Postscript-Interpreter. And so the question arose as to which filter to use: the answer was to try them



Canon bjc-2100: Not perfect, but can be used well enough with Linux

### The printers in overview

Printer	Connection types	print time/page	approx. price
Epson Stylus Color 580	USB	15Min	£60
Canon BJC-2100	USB/Parallel	30Sec	£55
Lexmark Optra M410	USB/Parallel	6Sec	£450
Lexmark Optra E312L	USB/Parallel	9Sec	£270
Lexmark Z52	USB/Parallel	60 Sec	£110
HP DeskJet 840C	USB/Parallel	30 Sec	£70
HP DeskJet 1220C	USB/Parallel	40 Sec	£275

### Gimp-Print

*Gimp-Print is a relatively new software project. It is just 13 months old. But there is a very active team behind it. The popularity of the image processing program Gimp on all platforms is another reason for this: lots of people look at this software and write proper bug reports as and when required. Gimp does not even have to be installed for this because Gimp-Print also optionally works with Ghostscript and now with CUPS too. As one might guess from its genesis, this program is primarily used for printing out graphics and photos. In the test the print quality with Gimp-Print was normally even better than with the Ghostview drivers.*

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USB PRINTER

all in sequence. In the case of black/white printing, one can't really go wrong. Practically every DeskJet driver works here (for example the *cdj880*).



Nor were there any problems with monochrome areas. Unfortunately, with photos it's not so simple: after long experimentation we ended up with the *cdj1600* driver (from Ghostscript). The images are rather dark when reproduced. This can be changed, though, either directly on the image or, better, with Ghostscript parameters. On the other hand Gimp-Print lacks colour. The image loses brilliance, which can be partly corrected by changing the print parameters (more cyan, less yellow). The A3 format on the other hand causes no problems whatsoever.

As with all inkjet printers, the lack of a mains switch is something to criticise. The power switch is only "soft". One delightful aspect of the 1220C was something we only noticed right at the end: The printhead is fitted with a blue lamp, which shines through the transparent cover. Unfortunately this is not activated under Linux. Only the self-cleaning print head brings enlightenment.



Scanners

For Linux there is really only one solution for scanning: SANE (Scanner Access Now Easy). The latest version (1.0.4) is split into two packets: Sane front ends and Sane back ends, where the very name shows that here only the user interface (the front end) has been separated from the actual "driver" (the back end). To test a configuration, first of all only the back end is necessary, which is addressed using the program *Scanimage*. SANE now supports over 100 scanners, including some USB models, too. The websites below mention that the Epson USB scanner is supposed to work best with Linux. Unfortunately it was impossible for Epson to send



Nice scanners, but unfortunately not currently Linux-compatible: Umax Astra 2100U, HP ScanJet 3300C and HP Photosmart S20

us a test model before the end of the test so we will have to leave this claim as it stands, without comment. The ones which turned up for the test were: Agfa Snapscan 1212U, HP ScanJet 3300C, HP ScannJet 6300C and Umax Astra 2100U Umax. We did actually ask the last-named manufacturer for a model 1200U, because this end-of-line model is the only Umax-USB scanner, which will do its duty with Linux – unfortunately Umax is no longer publishing any specifications on the current devices. Agfa is, incidentally, no better in this respect: The driver for the Snapscan is based on reverse engineering. Unfortunately there are two versions of this scanner, which are both sold under the type designation Snapscan 1212U. So the inevitable happened. We had our hands on the wrong device. So obviously it was not possible for us to wheedle anything out of the scanner. Anyone who already has this scanner model to call his own, can download the driver and try it out.

Hewlett Packard

We did in fact have several models from HP. The Scanjet 3300C was, contrary to claims, not compatible with the Avison model, and the Photosmart S20 also made no effort to read in images. And so we come now to the only USB scanner which worked in our test: the Scanjet 6300C. The device, which is not exactly cheap (approx. £235) managed a resolution of up to 1200 dpi (hardware: 2400x1200), at 36 bit colour depth. The five buttons on the front of the housing could unfortunately not be used via USB. The option "Front Button Wait" may be present, but it does not start the scanner process as expected.

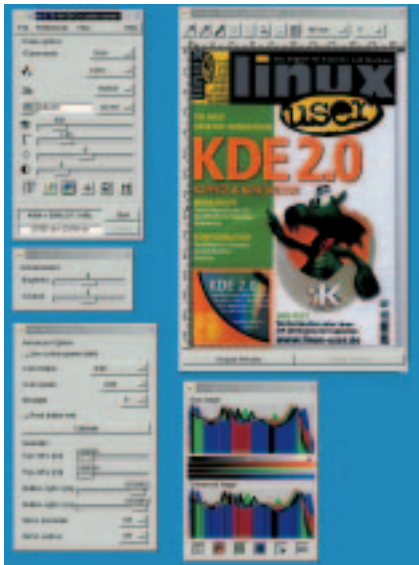
The initialisation of the scanner is done with a simple

```
insmod scanner
```

This module should by the way work with all scanners. Communication between scanner and computer via USB is standardised. But unfortunately not the format in which the data are transferred. Configuration of SANE is very simple: after installation (which is easiest using the distribution-specific utility program) all you have to do is add to the file *hp.conf* at */usr/local/etc/sane.d/* the following entry:

```
/dev/usbscanner option connect-device
```

Approximate scan rate of the 6300C			
Time/Sec	Mode	Resolution/dpi	Transfer volume/MB
15	B/W	300	1M
40	S/W	600	4.2M
160	S/W	1200	17M
40	Colour	300	25M
270	Colour	600	102M
>30 Min	Colour	12000	409M



To speed up the search procedure of SANE at the start, it is advisable to deselect all other drivers (back ends). This is done by simply writing a “#” before all the lines with the exception of “hp”. Then simply do a test:

```
:# scanimage -h
Usage: scanimage [OPTION]...
[...]
List of available devices:
hp:/dev/usbscanner
```

So the scanner has been recognised. Now you can start a scan with

```
scanimage > /home/test/out.pnm
```

The standard parameters are used for this (300 dpi, b/w). If you want a higher resolution, then simply apply the option `-resolution 600`. Obviously the process is easier to do using a graphic scan program, such as `xsane`, which can also if necessary be used as a Gimp plug-in. Scanned in images are then immediately available in the application and do not have to follow the explicit diversion via the hard disk.

## Printing wow, scanning yuck!

Either we had extremely bad luck when we prepared the test devices, or else the extremely low success rate does actually reflect the level of support of USB scanners. At the very least this clearly shows



The only functioning scanner in the test: the HP ScanJet 6300C

the industry's lack of interest with respect to Linux in this domain. On the other hand, the USB printers passed their tests with flying colours! All devices could be persuaded to produce pages, sometimes with very high quality and speed. In the next and last article of our USB test series we will be taking a close look at communications devices, such as ISDN modems and Ethernet adapters.

**[left]**  
Scanning under Linux made easy, thanks to `xscan`

**[middle]**  
`Gimp Print` is at present the only a true alternative to `Ghostscript` with certain printers

**[right]**  
Exemplary: `Lexmark` offers, in addition to good driver software, a setup program for the Z52.



Unfortunately there are two versions of the Agfa Snapscan 1212U and chance promptly sent us the one which is not supported

## URLS

`xw_tools` Homepage <http://xwtools.automatix.de/startE.htm>

Driver for the Lexmark Z52 [ftp://ftp.lexmark-europe.com/drivers/Printer/International\\_English/lexmarkz52-english\\_UK.tar.gz](ftp://ftp.lexmark-europe.com/drivers/Printer/International_English/lexmarkz52-english_UK.tar.gz)

`Ghostscript` Homepage <http://www.ghostscript.com/>

`Gimp-Print` <http://gimp-print.sourceforge.net/>

Which filter for which printer? <http://www.linux-printing.org/>

Scanner Access Now Easy (SANE) <http://panda.mostang.com/sane/>

Supported scanners <http://panda.mostang.com/sane/sane-backends.html>

Supported USB scanners <http://www.buzzard.org.uk/jonathan/scanners-usb.html>

Agfa Snapscan USB driver <http://hem.fyrlistorg.com/henrikj/snapscan/>

`xsane` - a front end for Sane <http://www.wolfsburg.de/~rauch/sane/sane-xsane.html>