

11

Preparing the Camera Copy

So, now you have been through all the stages of designing and laying out the pages of your document, combining the text and graphics and making them look good on screen. As an academic exercise that would be fine, but it lacks follow-through: what you really want to do is print out something that can be duplicated as many times as you need. This chapter explores the different ways in which you can take a document file and end up with *camera copy*, which is what the hard-copy original used for duplication is called.

When it comes to printing out the final version that will be used for duplication you have three basic choices: to use the printer attached to your Archimedes, to save the DTP document to disk for sending to someone else with an Archimedes and a better printer, or to save it to disk as a PostScript file and send it to someone with a high-quality imagesetting machine.

First we shall see how you can do it yourself, and then how you can pass it on to someone else to do (not quite as straightforward, but this avenue opens up the possibility of professional-quality printing). Lastly there are a few words on colour printing.

Types of Printer

In the broadest sense there are two distinct types of printer: one sort prints the page strip by strip as the information is sent by the computer (these are the dot matrix, inkjet and bubblejet types) and the other assembles the information as a page beforehand and prints out the whole page at one time (laser printers are the only real example of this type). Generically, these two kinds are referred to as *band printers* and *page printers* in view of their different ways of putting a printed page together.

The process by which the computer transfers each page of the document to the printer happens in two stages. The first is done by the DTP software itself: it holds in computer memory an electronic representation of the page that is understood only by the DTP software. This internal version is what the software has been using all along to generate the picture of the page on screen, but in reality, of course, it looks nothing like that in memory: what you have been seeing is only a translation of this internal representation into a form suitable for putting on the screen. In effect, the DTP program has been 'printing' to the screen all the while you have been designing the document. In a similar sort of way the software sends a picture of the page to the printer – but how can it know what sort of printer is attached to the computer?

In fact it doesn't, nor does it need to. With the Archimedes your DTP software can happily ignore which type of printer is connected to your computer, because it doesn't talk to it directly. Instead there is a range of programs called *printer drivers*, each for a specific printer type or for a single printer, which take the page image produced by the software and translate it into a set of commands which the printer can understand. All you have to do is make sure that you have loaded the right sort of printer driver before you want to print.

Several printer drivers have been provided by Acorn for the commonest types of printer, and other suppliers have produced drivers for specific printers. We shall look in more detail at how to use them in a later section.

Before examining the differences between printer types, let us consider for a moment what all printers have in common: regardless of their type, they all work by transferring a set of dots to the page. DTP work makes no use of any of the built-in fonts or effects of your printer; instead, everything is printed as a graphic image by switching to the printer's graphic mode. For non-colour printers (colour ones are a breed apart and have a separate, if brief, section to themselves later) these dots are all in the ink colour, normally black, and the gaps between them are the colour of the paper, normally white, so that any grey tints or half-tone pictures aren't printed in grey ink but as a set of small regularly-spaced black dots. This was touched on at the end of chapter 1 and doesn't really need expansion here.

The size of the smallest dot that a printer can physically make determines the ultimate fineness of detail that it is capable of printing. However, that is not necessarily the same as the actual *resolution* at which the image will be printed, for two reasons. Firstly, to some extent it depends on how the printer driver is set up: you can usually choose from several resolutions, based on the different graphic modes available from your printer. Secondly, it doesn't matter how closely together the dots are placed if each dot is large: if the smallest dot your printer can produce is a circle 1/90 of an inch in diameter, trying to print at 180 d.p.i. (dots per inch – sorry, but this printing terminology still talks of inches, not centimetres) won't

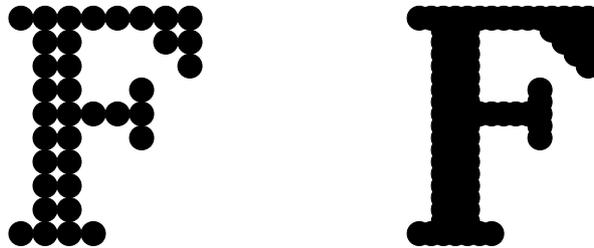


Figure 11.1 The difference between dot size and resolution: on the left the dots are spaced by exactly their diameters; on the right they are spaced by half their diameters

achieve any better definition than printing at 90 d.p.i. You will get a denser image, it is true, but you won't actually be able to see more detail. Figure 11.1 explains this a little more graphically. The right-hand image is twice the 'resolution' of that on the left because the dots are spaced half the distance apart, but all you achieve is a darker image with a smoother outline; you can't see any more detail. Note that if the image is being built up line by line it is physically impossible to create a dot that is horizontally separated from the one before by only half its diameter, unless the printer goes over each line twice – and band printers don't normally do that.

We shall see more of this in the next section, which examines how the various sorts of printer work and also what they are good at, and not so good at.

Band Printers

Building up the image of a page a strip at a time makes band printers intrinsically slower than page printers, as the printer head has to move physically to cover the entire page area, and this limits the speed of transfer of the data from the computer to the printer. Another drawback is that successive strips may not match up precisely, giving a striped appearance to the finished page. This is likely to be particularly noticeable with dark solids, where the amount of ink on the paper can cause it to stretch slightly.

On the positive side, however, band printers are considerably cheaper than page printers and the quality achievable at the high end can be almost indistinguishable from laser printed output.

Dot matrix. Ever popular, reliable, relatively cheap and capable of moderately good results: that just about sums up dot matrix printers. Their operating principle is simple if basic. A print head, containing a number of captive wire rods or pins arranged in one or more vertical columns, moves sideways across the page, and as it does so the pins are fired in sequence towards the paper. The image is made as the

pins strike an inked ribbon that lies between them and the paper. The ink itself is oil-based and relies on being able to sink into the paper rather than drying; if you think about it that is logical, because otherwise the ribbon would dry out rather fast, even when not in use.

You can therefore see that the quality of the image depends on several factors: (1) the thickness of the wire from which the pins are made (the thicker the wire, the larger the dot size); (2) the vertical spacing of the pins in their vertical row(s) (the closer they are, the greater the ultimate resolution, subject to the dot size); (3) the amount of ink on the ribbon (if there is too much it splatters on the paper and ruins the image); (4) the weave of the ribbon (a thick ribbon will spread the impact of each pin, giving a large dot with a smudgy edge); and (5) the absorbency of the paper (if it is too absorbent the ink will spread slightly, enlarging the dot size; conversely, if it is too shiny the ink won't spread, but it will smear because it doesn't dry).

If you want to have a tint area on your page, remember that the lightest tint available is determined partly by the size of the pin and partly by these factors; a given tint on screen will always look darker printed out by dot matrix than by, say, a laser printer because of the larger dot size of the former. This also means that tints approaching black will become indistinguishable from black on a dot matrix printer sooner than on a laser printer because of the greater tendency to 'fill in' at the edges of each dot.

Dot matrix printers, relying as they do on hitting the paper surface repeatedly and often, tend to be noisy and slow (taking perhaps five to ten minutes to print an A4 page), but they are cheap: a simple nine-pin printer costs little more than £100. These have nine pins in one vertical column and are the slowest because they need to print each line three times, moving the paper up a fraction each time, to stop the ragged edges between dots from showing.

With advancing technology it has been possible for manufacturers to fit more pins made of finer wire inside the print head, placing them in more than one column and staggering them slightly, so that by firing them almost simultaneously the vertical gap between dots is eliminated. This cuts out the need for printing a line in multiple passes of the print head, but obviously makes the printer more expensive, from about £250 upwards for a 24-pin model. There was a movement towards 48-pin printers, but these didn't catch on.

Dot matrix printers are usually designed to print on paper that is as wide as A4 but no more: these are the so-called 80-column printers. If you want to use narrower paper this isn't a problem, but to get a printer (136-column) that can use wider paper such as A3, or A4 in landscape format, costs quite a lot more.

The most common paper used for general work, fanfold computer paper, may not be



appropriate for originating high-quality camera copy. Fairly ordinary photocopier paper will usually give a good result, but if you want to print many pages you should look into whether you can get a cut-sheet feeder for your printer, which lets you load up a batch of sheets and feeds them through the mechanism one at a time. You can then go away and have lunch while your document is printing.

This class of printer is quite cheap to run, as the consumables are fairly inexpensive. All you really have to buy are new ribbons from time to time; as well as the maker's own brand of ribbon you can often obtain 'compatible' ribbons from a variety of suppliers for less outlay, although it is worth buying only one or two at first because not all are of very good quality. I have had ribbons that stretched badly and dragged on the paper surface, or that frayed and became unusable, after only a few pages of printing – this was clearly a false economy. You might also want to check whether using ribbons other than those made by the manufacturer will invalidate your guarantee.

In fact, even the expense of new ribbons can be avoided as long as you don't mind getting your fingers dirty: you can now get, quite cheaply, cans of special ink for re-inking a well-used ribbon. Just pry off the cover of the cartridge with care and spray the ribbon inside, then let it dry out for a day. At one time I used to advocate re-inking with stamp-pad ink, and although it worked for me for a long time without a problem, if you are unlucky you can clog the printer head badly – and a replacement can cost half as much as a new printer. So, use only the sort of ink that is designed for the job, because it contains lubricants to prevent clogging. In case you can't find a supplier for yourself, try Re-Ink from Caspell Computer (see Appendix 2).

One drawback of dot matrix printers is that in high-density printing, where the pins are striking the paper several times in almost the same place, the resulting image is particularly prone to unevenness caused by the paper's stretching. Another problem is that as the ribbon runs out of ink it doesn't do so evenly across its width, so that in solid areas of print there can be pale stripes. A brand new ribbon tends to have slightly more than the optimal amount of ink on it, causing everything printed with it to be slightly too heavy; in contrast, once the ink starts to be used up, the image may still look all right to the eye but under the critical scrutiny of the camera it can appear grey at the edges and might give a ragged or grainy result.

Inkjet. This type of printer works in a similar way to the dot matrix variety, but instead of coming from a ribbon being struck by pins, the ink is squirted in tiny blobs directly at the paper from a set of tiny nozzles in the printer head. Because there is no blurring effect of a ribbon, and because the nozzles can be placed closer to each other than pins can, the sharpness of the printed image can approach that of a laser printer, and the resolution is about the same. As there is no reliance on impact of metal on paper, inkjet printers are very much quieter than dot matrix (almost

silent, in fact) and can operate more quickly. Not having the moving parts of the dot matrix, inkjet printers are also inherently more reliable. Although the current family of inkjet printers use a moving printer head, in future a better system seems likely to develop, using a stationary row of nozzles stretching the full width of the paper.

Unlike dot matrix printers, inkjet printers don't suffer from a gradual decrease in print quality as the ink is used up: the print stays dark and even, almost until the reservoir runs completely dry. The quality depends to some extent on the paper used: very absorbent paper will spread each dot, so degrading the image. The cost per page of inkjet printing is rather more than its dot matrix counterpart (something like 3–4p per page, as opposed to 1–2p per page).

Bubblejet. A more recent development by Canon is the bubblejet type of printer, which works in a similar way to the inkjet except that the ink is 'fired' by heating, causing the expansion of a bubble, rather than being squirted. Bubblejet printers have all the advantages of inkjet ones, plus three others: they can be very much smaller (the BJ-10e will print on A4 paper, yet is only A4-sized, about 2 inches thick and weighs less than 2kg), they are cheaper, and the resolution goes up to 360 d.p.i. There is also a model (the BJ-130e) that prints on paper up to A2 in size, making it suitable for printing posters.

Page Printers

The page printer is the last word in print quality for machines that you are likely to couple to your Archimedes. As already mentioned, the only example of this type is the laser printer. The original design uses a laser as a light source and a spinning mirror to scan the image onto an electrostatically charged revolving drum; wherever the light falls, that minute portion of the drum loses its charge. As the result of this the parts of the drum corresponding to dark areas of the page stay charged and can pick up small particles of black powder (the *toner*) as they pass by. Paper is then pressed against the drum as it revolves, so the toner is transferred to the paper; finally the image is fixed to the paper by passing it under a heating element (the *fuser*). Much of this is a development of photocopier technology.

The nomenclature 'laser printer' is already inaccurate because some recent models don't use a laser and a spinning mirror at all, but a halogen lamp and a row of liquid crystal shutters (LCSs). The advantage of this type is that it has fewer moving parts and is therefore less likely to go wrong; it is also more resistant to being bumped (though you should always treat any laser printer with great respect).

The output from a laser printer is clear and sharp because the ink is dry and consists of very fine particles: there is no spreading caused by absorption into the paper or by splattering. The resolution depends on the machine as well as the setting of the printer driver but it can go as high as 600 × 600 d.p.i., which is close to the professional quality obtainable from *very* expensive equipment. The main place where you can tell the difference (without taking a magnifying glass to it) is in the

quality of half-tones and tint areas. The dot size from a laser printer is noticeably coarser. Resolutions greater than 600 d.p.i. are theoretically feasible on a laser printer (the next step would be 1200 d.p.i.) but are impracticable because beyond 600 d.p.i. the size of the toner particles themselves is a limiting factor.

For our purposes, laser printers take A4 as their largest paper size: one reason for this is that a page of A4 graphics at 300 d.p.i. requires about 1Mb of memory. Although perfectly good results can be obtained with standard photocopier paper, special paper for use with laser printers does exist, and this is said to give a cleaner image; I have not been able to establish whether this is merely a clever marketing ploy to sell you more expensive paper.

The only real drawback of laser printers is the price of the consumables. New toner (which isn't cheap) has to be added from time to time, and various parts inside have a limited lifetime (fair enough, it may be quite a few thousand copies, but spending £60–100 at a time on replacing a part that is isn't actually broken, merely wearing out, is a painful experience). Overall, you should think in terms of a running cost of 4–5p a sheet.

Three types of laser printer are available: Laserjet compatible, PostScript compatible and direct drive. Of these the last is very much in the ascendancy on the Archimedes.

Laserjet Compatible. These represented, until the advent of the direct drive printers, the most cost-effective option for high-end printing with an Archimedes because they were the same machines as you could get for many other computers, and they therefore benefited from the ability of dealers to purchase them in bulk. As a result, their prices have been falling below £1500 and their specifications have been improving all the time. Like the band printers, they can operate using their own built-in fonts, or they can (for DTP work) be used in graphics mode.

Each page has to be built up completely in the printer's own memory before it can be printed, so make sure that if you get one of these it doesn't have only the standard 512K of memory inside it: upgrade it to 1Mb by adding another 512K. The whole bit-image composing the data for the page has to pass from the Archimedes to the printer via the parallel port, which makes the printing process slower than the printer's rated speed (although subsequent copies of the same page are printed at full speed – four, six or even eight pages a minute – once in the printer's memory).

PostScript Compatible. The main distinguishing feature of a PostScript compatible printer is that it contains its own built-in computer to interpret commands sent from the host computer (in our case, an Archimedes) and convert them into the actual page image before printing. Fonts are held in the printer's memory as outline data (does that sound familiar?), so it isn't necessary to send the printer the actual bit-

image information for each letter, just what font it is in, at what size and at what orientation. As you might expect, adding this computing power to a printer makes it much faster for printing text (but, alas, quite a lot slower for sprites) and also, until the advent of cheaper 'PostScript-compatible' printers, considerably more expensive (over £2500). Nowadays there is a good choice of compatibles at about £1500.

There are two things that you should consider before buying a PostScript printer for your Archimedes. The first is that every time you want to add a new font to your system you have to buy *two* versions: one is the outline font for the Archimedes to use to show the words on screen, and the other is the PostScript version for use by the printer. The second is that a PostScript printer needs lots of memory inside it, so you pay for memory twice: once in your Archimedes and once in the printer.

The third factor is Computer Concepts' program *ShowPage*, which is a PostScript interpreter for the Archimedes that makes the computer do the donkey work of converting the PostScript commands into an image of the page ready for sending to any printer that can be served by a printer driver (yes, you can even use a nine-pin dot matrix printer as a PostScript device if you feel you have to). Because *ShowPage* uses the Archimedes outline fonts you don't have to concern yourself with getting PostScript fonts. So, there seems little point now in going for a PostScript (or compatible) printer unless you have more than one type of computer and want to share it between them.

There is a section a little later about PostScript as a language, its importance as a means of arranging for someone else to print your documents, and some of the practicalities involved.

Direct Drive. Both of the two types of laser printer just described were developed for computers other than the Archimedes and are therefore of general applicability. However, it has quite reasonably been asked why one should pay for memory in a printer when the Archimedes has plenty of it (remember that the original PC design allowed for only 640K of memory), and also why a printer should be made semi-intelligent by putting a computer on board when the Archimedes has a processor that is far superior to any printer's. Out of this thinking came the direct drive printer: a basically 'dumb' printer attached to a clever expansion board in the computer. Two companies have taken up the challenge and produced direct drive printers: Computer Concepts (again, with their Laser Direct) and Calligraph (with ArcLaser).

The way it works is that the printer driver, instead of sending the stream of bits representing the page straight to the printer, builds up an image of the page in memory and, when it is complete, sends it down a high-speed data link to the printer as fast as the image can be transferred to the revolving drum. In addition, the software can compress the image as it is produced, reducing the memory taken up by

each page as it is being generated; even so, you need at least 2Mb of memory in your Archimedes to use either of these printers (unless you have 1Mb and a hard disk, in which case you can print to a file – more about this later).

The data transfer to the printer happens in the background, which means that while the printer is working, the computer can be building up the next page in memory. If you are printing more than one copy of each page, and have enough memory, you could have several pages in a queue, waiting to be printed, but not stopping you from going back to the DTP program to carry on working with your document once the last page has been generated and compressed in memory. The ArcLaser printer can also print over an Econet system, making it useful for educational establishments or small businesses, where computers are likely to outnumber printers.

So, the main benefits of the ‘standard’ direct drive printer are its speed and its relative cheapness (only about £1100 complete). However, that isn’t all: I hinted earlier that higher resolutions are also possible, and the Laser Direct HiRes (also from Computer Concepts) prints at up to 600 × 600 d.p.i. When it first became available it was an outstanding feat, especially in view of the fact that only a year or so earlier you could barely have bought the cheapest ordinary 300 d.p.i. laser printer for the same price (about £1600–1700), which was much slower. Thus does technology advance and amaze us all.

The principal drawback of a direct drive laser printer is that it can only be used with the computer type for which it was designed: you can’t buy a LaserDirect for your Archimedes and hope to connect it to a PC.

Printer Drivers

This section describes the different sorts of printer drivers, what main options they provide, and how to add a new printer to the range served by a driver.

The four standard printer drivers provided by Acorn are *PrinterDM*, *PrinterIx*, *PrinterLJ* and *PrinterPS*, which are for use with dot matrix, Integrex-type (inkjet), LaserJet-type (laser) and PostScript printers respectively. Each driver can cope with a range of printers because many share the same codes to produce the various graphic effects; for instance, the term ‘Epson-compatible’ applied to a nine-pin dot matrix printer often means that it supports the codes used by the Epson FX-80 and on a 24-pin printer the codes usually relate to the Epson LQ-850. Note the words ‘often’ and ‘usually’: complete compatibility can never be assumed.

Other suppliers sell drivers for specific printers or other ranges. Before buying a printer you should make sure that you can get a driver which will let you make the

fullest use of its facilities under RISC OS. Alternatively, if you feel adventurous you can try editing the data file from the nearest Acorn driver that tells it what codes to send; a way of doing this is described later.

The Printer Driver Menu. Loading a printer driver is done in the standard way: just double-click on the file icon and wait until the icon appears on the left side of the icon bar, alongside the disk drive icon(s). If you have one of the Acorn drivers you can then check which version you have by clicking Menu on the printer driver's icon on the icon bar and looking at the Info dialogue box, rather like that shown in Figure 11.2. The current Acorn printer drivers are version 2: if you have only version 1, ask your supplier for an upgrade.

The other menu options in Figure 11.2 fall into two groups: the top five let you tell

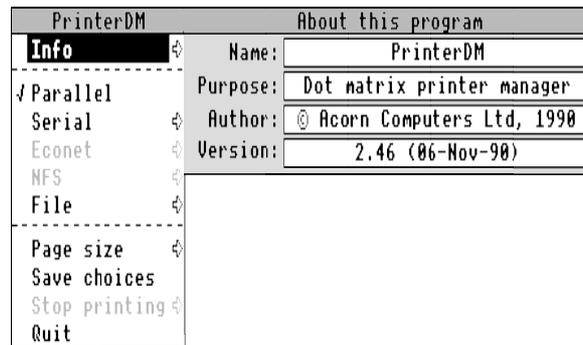


Figure 11.2 The printer driver menu

the driver what sort of printer is attached to your computer (the last one, File, we shall return to shortly) and the bottom four are miscellaneous items which are worth a brief mention.

The Page size option leads to the dialogue box shown in Figure 11.3, with which you can alter the physical paper and page size that you are using in your printer. As you can see from the numbered radio icons along the bottom, there are four separate settings you can use, each with its own name. Although you can alter any of them, the fourth, User, is specifically for you to customise to your own needs. The page height and width should be set to the physical size of the paper. The graphics margins figures, on the other hand, are there to inform applications such as DTP software or *Draw* how much of the page area to print and whereabouts on the page to place it. Anything outside the printable area will appear shaded grey on screen if you have chosen the 'Show print borders' option in whatever graphics application you are running. If you define a printable area larger than your printer can cope with

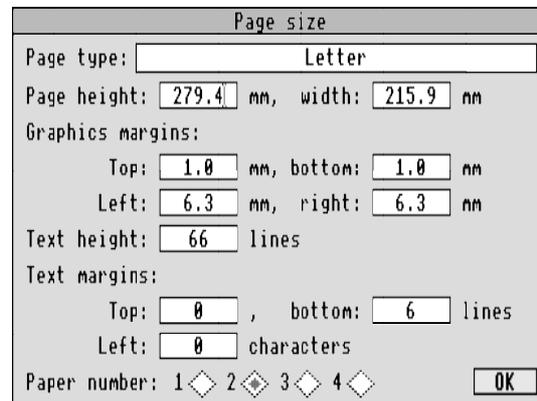


Figure 11.3 Setting up the page size for your printer

(especially widthways), then expect to be disappointed. The text options I leave for you to discover; they don't affect DTP work. Don't forget to click on OK to confirm the changes.

Once you have set up your printer type, your preferred page sizes and other options (see below), clicking on 'Save choices' stores the information on disk so that the printer driver will always start up with these settings.

Printer Options. Clicking Select on the icon on the icon bar brings up a dialogue box such as that shown in Figure 11.4, which fairly obviously comes from the *PrinterDM* driver and shows the setting for my Panasonic KX-P1124, which is a 24-pin printer. You can change the printer type in this sort of dialogue box by clicking Select on the name shown; this chooses each of the preset printer types in turn, eventually cycling back to the beginning. Clicking Adjust cycles in the other direction, which is useful if you go past the one you want. The same type of printer will probably appear several times during the cycle, offering different resolutions. If you want to print something out in a rough and ready way, use the coarsest draft

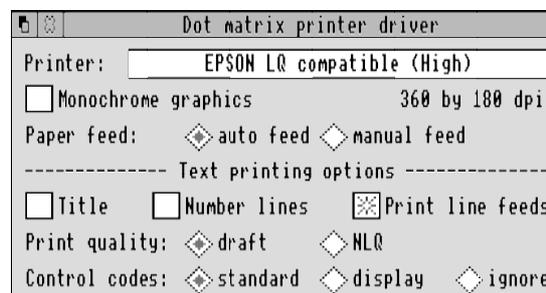


Figure 11.4 A printer driver dialogue box

option available (60×60 d.p.i. is a good bet); at this resolution you may not be able to read small text too well, but you should be able to check that things are in the right places.

The 'Monochrome graphics' option speeds up the printing process by preventing colours from being shown as anything other than black or white – this causes sprites to end up looking rather like Figure 1.7(a) and may make single-colour items such as words disappear altogether.

All the options in the dialogue box are described quite clearly in the !Help file in each printer driver's application directory (to find it, hold down Shift as you double-click on the application's file icon), including the new 'fancy print' option which was introduced with version 2 of the software. This is a fairly simple way of controlling the printer output by inserting codes for effects such as underlining, bold or italic into the text, which the printer driver interprets and uses to turn the effects on and off at the printer.

Incidentally, here is a simple tip about putting Escape codes, ASCII 27, into an *Edit* text file; you will need to know how to do this because the 'fancy print' codes use it quite a lot and *Edit* won't let you put them in directly. Just use an unwanted character such as ␣ (Shift-£) wherever you need an Escape character, and when you have finished the text, press Home to go back to the beginning and then F4 (to call up the 'Find text' dialogue box) to search for all instances of ␣ and replace them with ASCII 27. You will need to click on the 'Magic characters' icon to select this facility before typing \c[(standing for Ctrl-[, just as Ctrl-A is ASCII 1, Ctrl-B is ASCII 2, and so on) in the 'Replace with' box. Once you set the search in motion, all the ␣ characters will change to [1b], which is the hexadecimal representation of [27].

Each printer driver consists of two portions: the application (think of it as a control program that lets you choose between various options) and the printer module (the part that actually does the work by intercepting the instructions from whatever program that wants to print something, and converting them into a stream of data that the printer can understand). This means that once you have set up the driver to suit your printer you can free some memory by getting rid of the application itself: just choose the Quit option from its icon-bar menu. Even though the icon disappears from the icon bar the printer module remains behind and will continue to work quite happily.

Customising the Printer Data. If you have a printer that almost, but not quite, works with one of the Acorn drivers, you could have a go at customising the printer data file to include the codes for your printer. Assuming that you have a printer manual that you can understand and which lists the codes, all you have to do is load the file PrDataSrc (it will be in the printer driver's application directory) into *Edit*,

where you will find a set of entries, some longer and some shorter, but all based on this sort of structure:

```

; 240 by 216dpi
printer_name:    EPSON FX compatible (High)
printer_number:  5
text_alias:     -1

pxres:          240                ; dots per inch
pyres:          216
pxres_half-tone: 240/8
pyres_half-tone: 216/8

dump_depth:     24                ; 8 pin printer, doubly interlaced
line_prologue:  "<27>Z"            ; select appropriate mode
line_epilogue:  "<27>A<0><13><27>2<27>J<22>"
                ; move down (8*3-2)/216 inch

interlace:      2
line_interlace: "<27>A<0><13><27>2<27>J<1>"
                ; move down 1/216 inch: note accuracy not guaranteed on this.
job_epilogue:   "<27>@"

```

By following the notes in the file (which, it must be admitted, took me several readings to understand) you can alter an existing printer description or write a completely new one. If you do the latter, remember to make it the last description, giving it the next number for *printer_number* and changing the lines at the beginning that tell the software how many printers are described in the file. When you have finished you must compress the data by running the program PrSquasher.

Something else you can do is to remove all irrelevant printer descriptions in the PrDataSrc file, change the information about the number of printers listed and renumber the remaining entries starting at 1: this makes starting the printer driver application faster by cutting down the amount of data it has to read. Try it on a backup copy first, though, in case you make a mess of it; keep an unaltered copy safe anyway because you may want to change your printer at some future time.

Printing to File

One slightly annoying thing about the printer drivers is that they take over the whole of your computer's processor time – in other words, while you are printing to (say) a dot matrix printer you can do nothing but wait until the job is finished. On a multi-tasking machine like the Archimedes this seems a shame. Although it isn't possible to get round this completely, you can at least speed it up a little by printing the document to a file and then printing from the file to your printer. This is quicker

because sending information to a disk (especially a hard disk) is usually faster than sending the same amount of data to a band printer, and printing the file from disk *can* then be done in the background, letting you get on with something else.

Printing to file is as easy as printing to a printer: simply call up the driver's menu and click Adjust on the File option. At this point you haven't defined a file name, so the message under the printer driver's icon changes to 'To null:', meaning that any printing you do now will simply be sent to a *printer sink*, a non-printer that swallows up all the output and does nothing with it. This has its uses, but not for us here. If you now slide the pointer along the arrow by File a writable icon will appear into which you can type the file name for your printout after you have first deleted the word 'null:' that appears there (use Ctrl-U). You can give a complete file name such as 'ADFS::Special\$.DTP.printout' or 'SCSI::SCSIDisc5.Docs.printout', or a short one such as '\$.printout' or 'printout'.

Once you have entered a valid file name and pressed Return or clicked Select, if you then catalogue your disk you will find a new file on it of length 0 bytes and of type Printout. If you now print your document, all the data that would have gone to your printer will be directed to the file. To print it out, just choose your printer type from the driver's menu again and drag the file to the printer icon: if all is well your printer will spring into action, *and* you should now be able to do other work while printing is going on.

One word of warning: a document in printout form occupies a lot of disk space. For instance, at 180×180 d.p.i. a dot-matrix page of A4 makes a file 238K long; for a laser printer page at 300×300 d.p.i. this gets close to a megabyte and is clearly too big for a floppy disk (though the compression option in Laser Direct cuts the size down to perhaps 100K, which is more manageable; but printing time isn't much of a problem anyway). You must therefore make sure that your document won't overflow the disk space available: if printing to floppies, use empty ones and print only a page or two on each.

Another benefit of printing to a file is when you have a DTP document or page that you have set up once and will need to print out unchanged from time to time: you don't have to load the DTP software, just the printer driver and print from the file each time you need it. In fact, you can use this as a means of passing round DTP documents to other Archimedes users, even if they don't have any DTP software, as long as they have the same sort of printer and a driver that is set up in exactly the same way.

This leads us to consider the last sort of printer driver, by means of which you can 'share' your documents in such a way as to get professional-quality printing.

Who Cares About PostScript?

Well, if you want to do any high-quality printing on someone else's machine, you should. PostScript is a language developed by Adobe Systems Inc. that is used for describing a page in terms of the objects on it rather than as a set of dots. The two main benefits of PostScript are (1) it is an industry standard and (2) it is independent of the output device (that is, it describes the page in a way that is the same regardless of what sort of printer will be used to produce the final output).

To print to PostScript on an Archimedes you use the *PrinterPS* application, which behaves in the same way as any other printer driver. If you have a PostScript printer attached to your computer you can send the output to it direct, but the most common way of communicating with a PostScript device is via a *PostScript file*. Such files are in plain text which can be loaded into *Edit* and altered, which means that if you know what you are doing you can program in PostScript in much the same way as in any other language. Mostly, though, you can leave things to the driver.

Fonts. I have already mentioned one of the drawbacks of PostScript printing, which is that PostScript fonts are different from Acorn ones. Not only that, but they have different names, so there has to be a way of telling the printer how it should deal with the fonts you used on your Archimedes. *PrinterPS* does this by adding a translation table to the start of the PostScript file, but it can only do so if it has been told which fonts will be needed. Take a look at the PSprolog file in the !PrinterPS application directory, by loading *Edit* and double-clicking on the file icon. If your document contains only the standard Acorn fonts (Trinity, Homerton, Corpus, NewHall and Selwyn) you won't have to worry about making any changes because they are included in the file, but if you have added any others to your !Fonts directory (except, as it happens, Pembroke, which is also included) you will have to add them to the translation table too. This involves knowing the exact PostScript name for each new font; for that you should ask the company that supplied it. If you get anything wrong in the PSprolog file the resulting PostScript file may be unusable, so be careful.

Happily there is an alternative: Computer Concepts have produced the Impression Business Supplement containing an application called *Expression-PS*. Among other things, this provides an easy way of matching up Acorn and PostScript font names, and defining in the PostScript file only those you have actually used in the document.

From this short discourse you will now see the importance of PostScript compatibility of the fonts you use on the Archimedes: if you want to send a document for professional-quality printing you have to use a PostScript file, and if any of the

Acorn fonts have no PostScript equivalent all you will get is error messages from the printer. Another drawback of a non-compatible font is that even if you manage to work out the PostScript equivalent name, if the widths and sizes of the letters in one aren't *exactly* the same as their counterparts in the other, the resulting output won't match the printout you made from your computer: it could get messy and will certainly lose you the benefit of going for higher quality. That is why some Acorn fonts cost more than others: the dearer ones have been specially crafted to the precise PostScript specifications. (As I have designed a PostScript-compatible font for the Archimedes, I know exactly how time-consuming and difficult it is – don't begrudge font suppliers their premium!)

Laser or Imagesetter? A number of bureaux now exist specifically for printing from Archimedes DTP documents, and this is certainly a feasible route, even though they only offer laser printer output, not phototypeset quality. When it comes to laser printing you have a choice of resolutions, which will affect the fineness of the detail that can be printed. At 300 d.p.i. the jagged edges of letters are just visible if you look closely; at 600 d.p.i. the edges are smooth to the naked eye and even under slight magnification, so for most purposes this could well be all you need. The only place where a laser printer may let you down is in the quality of half-tones if you are really finicky (advertising is an area where standards are quite exacting). For most purposes laser printers provide excellent quality at very reasonable cost.

If you must have professional-quality printing, you need to use an expensive machine called an *imagesetter* (like a typesetter, but it sets graphics as well), which produces output at a typical resolution of 1270 d.p.i. A PostScript laser printer is expensive enough, but the only place you are likely to find an imagesetter – they are prohibitively expensive – is in an *imagesetting bureau*, a firm dedicated to providing this sort of service to all and sundry from many computing backgrounds. Because imagesetting bureaux have been around for a while to cope with 'standard' computers, they are happiest with PostScript output; as the Archimedes is a newcomer to the DTP scene there are very few that can read Archimedes disks, and even fewer that can make use of output from DTP programs on the Archimedes. Just in case you may be lucky and find someone who is Archimedes-compatible, I recommend that you ask around (look in the Yellow Pages under Typesetters) before using the PostScript route, but don't get your hopes up too high. Getting the file onto a disk format that the printer can handle isn't a problem, just an extra step – see later.

There are two types of output medium from an imagesetter: a print (a *bromide*) or a film. Bromide is essentially photographic paper, and has the advantage that the material is comparatively cheap and can readily be manipulated if anything needs adjustment; its disadvantage, however, is that it has to be photographed again before

it can be printed by *offset litho* (see the next chapter for what this has to do with anything).

Film is a clear medium (it is, after all, photographic film), but it is a lot bigger than what you or I use in a camera, and it can be produced in positive or negative form. Film is more expensive than bromide as an output medium, but as long as you are absolutely certain that the document is correct and that you will want it printed by offset litho, you can go direct to film because that cuts out the intermediate step of photographing the bromide. Film is less convenient, though, if any adjustments need to be made to the image before duplication in quantity.

If you intend to use a bureau to prepare the camera copy for your document you could, in theory at least, do DTP without having a printer connected to your Archimedes at all, but this is most inadvisable: you should always try out your pages in some sort of draft form first, before committing yourself to paying expensive bureau prices for high-quality printouts.

Getting your PostScript File to the Bureau. While you are shopping around for a bureau, the first questions to ask (after a hopeful ‘Can you work from Archimedes disks?’) are ‘Can you work from PostScript files?’ and ‘Can you read 3½-inch MS-DOS disks?’ If the answer to either of these is No, move on to the next name until you meet with success. All you have to do now is prepare a PostScript file of your document on an MS-DOS disk. (Actually, some bureaux can accept files by modem, but I have a deep-rooted objection to sending precious data, which I have just spent ages getting perfect, down a noisy telephone line; maybe I’m just overly squeamish.)

First, the PostScript file itself: load up the *PrinterPS* driver and supply a suitable file name in the menu, for the output to be directed to. Remember to give a full and valid file name – you can always check the disk after pressing Return, to make sure that the file has been created (even though it will be empty at this point). As PostScript files tend to take up a lot of space you should use a disk with as much free space on it as possible, and preferably an empty floppy disk or a special directory on a hard disk. Then just print the document as normal from your DTP program and wait.

The only problem you are likely to face is a lack of disk space: if you run out of room, try printing a few pages at a time or, if you have really complex pages with sprites on, print the pages one by one. If any of the PostScript files ends up more than 720K long you will have difficulties later on, so keep them simple.

Next you have to create a 720K MS-DOS format disk; to do this you need (1) access to a PC, or (2) to run the PC emulator on your Archimedes (if you are using the older non-windowing version, don’t forget to save everything before running it as it takes over the whole computer), or (3) a program such as *PC-Access* from Minerva

Software or *MultiFS* from Arxe Systems. Once you have formatted the disk you simply have to transfer the PostScript files to it from the Archimedes disk; you can do this with *PC-Access* or *MultiFS*, or with a program called *PCDir* (on Careware disk 7 from Norwich Computer Services). Just open the directory display for each of the disks (remembering to use the appropriate drive icons on the icon bar) and drag the PostScript files from one to the other. One more thing: *label your disks!*

When sending your disks to the bureau, don't assume that they will know what you want by magic. Tell them at least the following: that the disks contain PostScript files; the names of the files; how many pages each of them represents; what size the pages are; whether any of them contain complicated illustrations (i.e. derived from sprites) that might take a long time to output; whether you want bromide or film.

Other Alternatives. *ShowPage* is a fascinating application that can turn any printer attached to an Archimedes into a PostScript printer. It is fairly expensive (about the same price as *Impression 2*), but it has three particularly strong points: (1) it is a lot cheaper than a PostScript printer (if you already have a laser printer you don't need PostScript for extra quality, but remember that *you* could now become a PostScript bureau), (2) it uses the Acorn fonts, not PostScript ones, so there is no problem about font compatibility, and (3) you can use it to draw PostScript documents to screen from programs you write yourself, so it is an excellent way of learning the PostScript language.

Lastly, you may know of someone else with an Archimedes and a better printer than yours. Fine: just send them your disk and a polite request (or payment, or all three). Sending your document, just as it is, on disk for someone else to print out means that the recipient must also have the DTP program that you used. This could limit the usefulness of this method, but some enterprising types have set themselves up with an Archimedes, a laser printer and all the DTP packages around and are acting as bureaux. If, on the other hand, you simply know someone who has a laser printer but not the DTP software, don't even think of sending a copy of yours: not only is it illegal, but it may not work anyway. The same applies to any fonts you have used that your contact doesn't have: copyright exists in fonts as much as in software, and some fonts are traceable back to their original purchaser. You have been warned.

Colour Work

Colour is for the seriously wealthy. At least, that is the received wisdom on the matter, and there is more than a grain of accuracy about it: duplicating in more than one colour adds new dimensions of cost to the process. Here I shall look briefly at the ways in which you can prepare camera copy suitable for duplication in more than one colour. There is no special section in the next chapter on multicolour work

because once you have prepared the camera copy the actual duplication side is the same as for single colour.

Four-colour Work. The first piece of advice may seem contrary to intuition: if you have a colour printer attached to your computer, *don't use it for preparing camera copy*. If that sounds weird, the reason is fairly straightforward: each piece of film that a *print house* (I am using this term to distinguish a firm that does duplication in quantity – usually just called a printer – from the printer that you attach to a computer) makes will be in black and white. It doesn't matter what colour it will eventually be reproduced in (that is the function of the printing ink), the sort of camera used in a print house produces only black and white film. This means that the cheapest artwork to work with also has to be in black and white. If it is in colour, the print house (or someone else) must use a *scanner* to separate the colours into four components, called the *process colours*: cyan (a bright blue), magenta (a bright red), yellow, and black (also called the *key* colour). This separation process is horribly expensive – and all it ends up with is four pieces of film, each in black and white!

So the best way of approaching colour is to make the separations yourself and arrange for each to be printed at the best quality in black and white. Fortunately, *Impression* now supports colour separations via the Business Supplement: again, *Expression-PS* is the means. It takes an *Impression* document and creates four PostScript files, one for each colour, which can then be printed out at the bureau in the usual way. Two important points: (1) you should find a way of identifying which of the output pieces of film (I recommend that you don't use bromide for four-colour work; it is not only a false economy, it isn't even an economy at all) should be duplicated in which colour, and (2) it is vital that you discuss with your print house whether positive or negative film will be needed, because some use one and some the other; *Expression-PS* lets you specify which form the output will be suitable for. Another thing to check with the print house is whether a reverse image will be needed (because the process of transferring the image from the film to the printing plate (see the next chapter for what these are) is a *contact print* method, which means that the photographic emulsion has to be on the back of the film, not the front as in normal photography): if so, you should use the 'reverse' option in the *Impression* 'Print setup' dialogue box before printing to the PostScript files.

Registration Marks. As well as telling the print house which colour is which, you need to make sure that the images will be exactly superimposed on each other during the duplication process. This is called *registration*: poorly registered four-colour work looks blurred and confused, and to avoid this all artwork for duplication in more than one colour carries *registration marks* so that the pieces of film, and hence the printing plates, can be accurately aligned. The traditional registration mark looks like a larger version of the 'rifle sight' shown alongside, but you 

don't have to go to the trouble of putting one of these in each colour on every page (which would be tedious and possibly inaccurate) because *Impression* allows you to print *crop marks* automatically on every page, outside the page area, as shown in Figure 11.5. These are quite sufficient to allow the colours to be registered. Unfortunately there is a slight complication in that for, say, an A4 page the crop marks have to be printed outside the normal printed area available to the printer driver. Not to worry: *Expression-PS* provides page sizes larger than usual (A4Extra and A3Extra) that give a half-inch margin all round, which is enough to allow the crop marks to be added by the software.

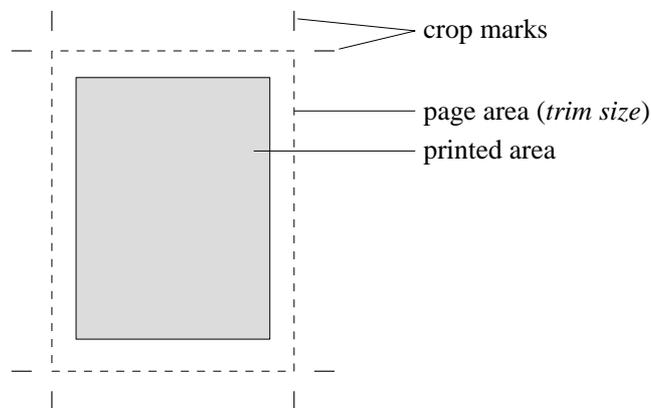


Figure 11.5 *Crop marks in relation to the page size*

The real purpose of crop marks is to tell the print house what size to cut the paper down to when the job has finally been duplicated, which is why the term *trim size* is applied to the final page size. The next chapter gives a little more detail on this.

Spot Colour. If all the foregoing on four-colour duplication has put you off the prospect of colour, don't despair: not all colour work is so complicated. If you want an area or some text to end up in one or more different colours from the main body of the work, you can use *spot colour*, which can be any colour you like as long as the print house can mix it from the inks.

There are two ways of approaching spot colour: the naïve way (my way) and the flashy way. With the former you can print the separations yourself; the latter uses PostScript output.

For naïve spot colour all you have to do is prepare your document with the colours in mind. Each page should contain everything for all the colours (in black or in tints of black), but assembled in such a way that you can isolate the elements for each colour so that you can print them out separately. The simplest way is to use different

frames for the bits to be reproduced in the different colours, and then to mask out or delete everything you want *not* to appear in each colour before printing each separation. Be sure to save the original first.

Alternatively, and even more simple-mindedly, you can print out several copies of the whole document and paste white paper over different areas to mask out unwanted colours.

The more intellectually satisfying route to spot colour uses *Impression's* CMYK colour options and *Expression-PS* for producing colour separations as for four-colour work. The meaning of the letters CMYK may be clearer to you if I mention that they stand for the names of the four process colours (cyan, magenta, yellow and key). I ignored this option completely in describing Figure 6.6, but it lets you choose colours in terms of the inks that print houses use to print four-colour work. They are therefore convenient for you to use in defining spot colours because *Expression-PS* can make PostScript separations into the different process colours – remember that the eventual colours in the duplicated document depend on the colours of ink used, not what PostScript says they are: the film for each colour is in black and white.

Suppose that you want to print all headings in green, and the print house has a suitable green ink. All you have to do is define a heading style that not only specifies the typography and layout of the heading but also its colour on the CMYK colour picker, as shown in Figure 11.6: if you use 100% cyan and 0% for all the others, *Expression-PS* will pick the headings out only on the cyan separation and not at all on the others. The print house can then use green ink in duplicating from the film or bromide (it is all right to use bromide for spot colour because it isn't as exacting as four-colour). You can also define rules and backgrounds using the same colour picker option. In this way you can have up to three spot colours plus black, and even use tints of each colour by specifying tints of single CMYK colours at less than 100% (but tints of the yellow separation must be used *only* for light ink colours).

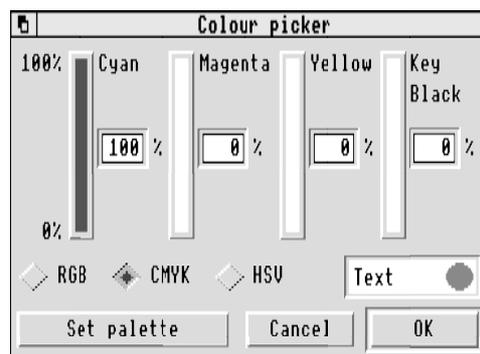


Figure 11.6 *Impression's* colour picker in CMYK mode, with cyan at 100%

Whichever approach you choose for making separations for spot colour, don't forget to put registration marks or crop marks on each original, so that the images can be lined up. Lastly, remember to tell the print house which separation represents which colour, and confirm the colour of inks available.

Some Hints on Doing it Yourself

Overhead Projection. One sort of 'camera copy' may not need duplication, and that is the overhead projector transparency. If you have access to an inkjet printer you can print on acetate sheets instead of paper (but avoid smudging), or with a laser printer you can print on special photocopiable clear sheets (Schwan Stabilo 7250 is suitable: **don't** use ordinary acetate or you will ruin the fuser roller). Alternatively, you can print as normal on paper and transfer the image to the photocopiable clear sheets with a photocopier.

The Best Image. So that the final duplicated version has the best chance of high quality you should give the preparation of your camera copy special attention to make it as crisp and clean as possible. If using a dot matrix printer, put in a fresh ribbon. For all types of page printer, give the area round the printer head a spring clean. Try out different paper types: inkjet printers in particular work best with slightly shiny paper – ask your supplier.

Big can be Beautiful. Even the humble nine-pin dot matrix can yield high-quality results if you print out at larger than final size and ask the print house to reduce it before duplication. The slight irregularities in the edges of letters and lines are made smaller by reduction, smoothing the appearance remarkably. Even half-tones can be improved up to a point by this method, although it is a bit risky unless you are sure that the duplication method will be able to cope with the smaller dot sizes after reduction.

If you are using *Ovation* or *Impression* the print options include a facility to print at an enlarged size, so you can do all your DTP work at the proper size and only enlarge as you print (ready for reduction again). *Acorn DTP* can only print at 100% size, so you have to work from the start on a document larger than life and print it out at that size.

The normal size of paper you will have for printing on will be A4, so that is the largest original you can prepare. Therefore, if you want to use this enlargement–reduction technique it must be for final page sizes smaller than A4. How about A5? That is easy: design at A5 (unless you are using *Acorn DTP*), print at 141% size and ask the print house to reduce it to 71%. For an enlargement factor of x , the corresponding reduction factor is $1/x$. Thank goodness for calculators.