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This file, devices.doc, gives more detailed documentation about
certain specific devices for which Ghostscript can produce output.

For an overview of Ghostscript and a list of the documentation files, see
README.

Devices for which this file currently contains documentation:
      SPARCprinter
      HP DeskJet 500C & 550C
      HP PaintJet, XL, and XL300
      DEC LJ250
      Apple Dot Matrix Printer (and Imagewriter)

------------------------- The SPARCprinter -------------------------

This section was written by Martin Schulte.

Introduction

The SPARCprinter is is connected to SPARCStation via a special SBUS card's
video inferface, the picture is composed on the host and only a bitmap is
send to the printer unit.

Together with a SPARCprinter, you always buy (as far as I know) software
that enables you to do postscript-printing on your SPARCPrinter.

So, the need for a Ghostscript-Interface to the SPARCPrinter seems low,
but on the other hand some Postscript drawings are not correctly printed
with SUN's software: on some pages occured a thin vertical line of rubbish
(reproducable), on some Mathematica drawings the text at the axes wasn't
rotated.

I tried all of these with Ghostscript and always got the expected results.

However, replacing proprietary software should never be a bad idea.

The problem is that there has yet been no effort to make the SPARCPrinter-
driver behave like a BSD output-filter, I made my tests using the script

mentioned under Installation.

Installation

Add sparc.dev to DEVICE_DEVS and compile ghostscript as described in
make.doc.

Afterwards, you can use the following script (the way of handling standard
input versus filename-arguments doesn't look very clever, has anyone a
better idea ?) to print if you substitute <GSPATH> by the place where you
installed the ghostscript binary:

```
outcmd1='/vol/local/lib/troff2/psxlate -r'
outcmd2='<GSPATH> -I/home/schulte/gs252 -sDEVICE=sparc -sOUTPUTFILE=/dev/lpvi0 -'

if [ $# -eq 0 ]
then
  $outcmd1 | $outcmd2
else
  cat $* | $outcmd1 | $outcmd2
fi
```

Problems

Since /dev/lpvi can only be opened for exclusive use, another job having
opened it (engine_ctl_sparc or another ghostscript as the most probable
canidates) will cause to stop ghostscript with "Error: /invalidfileaccess
in --.outputpage--"

In case of common printer problems like out of paper, a warning describing
the reason will be printed to stdout, the driver will try to access again
and again each five seconds.

Due to a problem with the device-driver (in the kernel) the reason of
printer failure is not always correctly reported to program. This is the
case at least if you open the top cover (Error in the display: E5). Look
to the display at the printer if a "Printer problem with unknown reason"
is reported.

Fatal errors will cause the print-job to be terminated.

----------------------------- End --------------------------------

------------------- H-P color inkjet printers ---------------------
(DeskJet 500C, DeskJet 550C, PaintJet, PaintJet XL, PaintJet XL300
and the DEC LJ250 which can operate in a Paintjet-compatiblme mode)

This section was written by George Cameron.

Information and tips on usage for the drivers contained in gdevcdj.c
===

OVERVIEW:

There are 6 generic drivers contained in the source module:

     1 - cdj500:   HP DeskJet 500C

```
    2 - cdj550:      HP DeskJet 550C
    3 - pjxl300:     HP PaintJet XL300
    4 - pjtest:      HP PaintJet
    5 - pjxltest:    HP PaintJet XL
    6 - declj250:    DEC LJ250
```

 All of these drivers have 8-bit (monochrome), 16-bit and 24-bit
    (colour) and for the DJ 550C 32-bit, (colour, cmyk mode)
    options in addition to standard colour and mono drivers.
 It is also possible to set various printer-specific parameters
    from the gs command line, eg.

```
  gs -sDEVICE=cdeskjet -sBitsPerPixel=16 -dDepletion=1 -dShingling=2 tiger.ps
```

NB/ The old names cdeskjet, cdjcolor and cdjmono drivers have been retained;
    however, their functionality duplicates that available using the above
    drivers (and cdeskjet is identical to cdj500), ie. we can use:

```
    gs -sDEVICE=cdj500 -dBitsPerPixel=24 ...  for cdjcolor, and
    gs -sDEVICE=cdj500 -dBitsPerPixel=1  ...  for cdjmono
```


DEFAULT PAPER SIZE:

 If the preprocessor symbol A4 is defined, the default paper size is the
 European A4 size; otherwise it is the U.S. letter size (8.5"x11"). Other
 paper sizes (including A3 for the PaintJet XL and PaintJet XL300) may be
 specified on the command line as explained in the Ghostscript documentation.

DEFAULT BITS-PER-PIXEL:

 If the preprocessor symbol BITSPERPIXEL is defined as an integer (see below
 for the range of allowable values), this number will be used to define the
 default bits-per-pixel (ie. bit depth) for the generic drivers. If the
 symbol is not defined, the default is set to 24 bits per pixel. It is
 of course still possible to specify the value from the command line, as
 described below. Note also that the cdeskjet, cdjcolor and cdjmono
 drivers are unaffected by setting this symbol, as their default settings
 are predefined to be 1, 3 and 24 respectively.

DESKJET PHYSICAL LIMITS:

 Maximum printing width = 2400 dots = 8". The printer manuals say that the
 maximum recommended printing height on the page is 10.3", but since this
 is obviously not true for A4 paper, and I have been unable to detect any
 problems in printing longer page lengths, this would seem to be a rather
 artificial restriction.

 All Deskjets have 1/2" unprintable bottom margin, due to the mechanical
 arrangement used to grab the paper. Side margins are approximately 0.25"
 for US Letter paper, and 0.15" for A4.

COMMAND LINE PARAMETERS:

 Several printer 'properties' have been implemented for these printers.
 Those available so far are all integer quantities, and thus may be

specified as eg.

```
gs -dBitsPerPixel=32 -dShingling-1 ...
```

which sets the BitsPerPixel parameter to 32 and the Shingling parameter
to 1.

BITS-PER-PIXEL:

All of the drivers in gdevcdj.c accept a command line option to set the
BitsPerPixel property. This gives considerable flexibility in choosing
various trade-offs between speed/quality/colour etc. The valid numbers
are:

    1:    This is a standard Ghostscript monochrome driver, and uses
          black ink (by installing the separate mono cartridge in
          the case of the DeskJet 500C, or automatically for the
          other printers)

    3:    A standard Ghostscript colour driver, using internal
          dithering. This is fast to compute and to print, but
          the clustered dithering can lose some detail and
          colour fidelity.

    8:    An 'error-diffusion' monochrome driver which uses
          Floyd-Steinberg dithering to print greyscale images.
          The patterns are much more randomised than with the
          normal clustered dithering, but the data files can
          be much larger and somewhat slower to print.

    16:   This is a 'cheaper' version of the following (24-bit)
          driver, which generates a Floyd-Steinberg colour dithered
          output using the minimum amount of memory (this may be
          helpful when using IBM PC's when Ghostscript has not
          been compiled using a 32-bit 386-style compiler). The
          quality can be almost as good as the 24-bit version.

    24:   A high-quality colour driver using Floyd-Steinberg dithering
          for maximum detail and colour range. However it is very
          memory intensive and thus can be slow to compute (and it
          tends to produce rather larger raw data files, so they
          can also be slower to print).

    32:   This is for the DeskJet 550C only, which uses the black
          cartridge and the colour cartridge simultaneously (ie.
          CMYK printing). This printer can be both faster and give
          higher quality than the DeskJet 500C, because of the
          true black ink. (Note that the 24-bit mode also permits
          CMYK printing on this printer, and uses less memory. Any
          differences between 24-bit and 32-bit should be very small.)

DESKJET PROPERTIES:

The addional properties available for the DeskJets are:

```
        BlackCorrect    (int)   /* Colour correction to give
                                 * better blacks when using the DJ500C
```

```
                                * in colour mode, eg. the default of 4
                                * reduces the cyan component to 4/5
                                * Range accepted: 0 - 9 (0 = none) */
         Shingling   (int)    /* Interlaced, multi-pass printing
                                     * 0 = none, 1 = 50%, 2 = 25%, 2 is
                                * best & slowest */
         Depletion   (int)    /* 'Intelligent' dot-removal
                                   * 0 = none, 1 = 25%, 2 = 50%, 1 best
                                * for graphics?
                                * Use 0 for transparencies */


PAINTJET XL300/PAINTJET XL PROPERTIES:

         PrintQuality      (int)   /* Mechanical print quality
                                    * -1 = fast, 0 = normal, 1 = presentation
                                    * Fast mode reduces ink usage and uses
                                    * single-pass operation for some media
                                    * types. Presentation uses more ink and
                                    * max number of passes, ie. slowest
                                    * printing for highest quality */
         RenderType  (int)    /* 0 = driver does dithering
                                * 1 = snap to primaries
                                * 2 = snap black -> white, others to black
                                * 3 = ordered dither
                                * 4 = error diffusion
                                * 5 = monochrome ordered dither
                                * 6 = monochrome error diffusion
                                * 7 = cluster ordered dither
                                * 8 = monochrome cluster ordered dither
                                * 9 = user-defined dither (not supported)
                                * 10 = monochrome user-defined dither ns. */


PAINTJET PROPERTIES:

         No additional properties


GAMMA CORRECTION:

 One consequence of using Floyd-Steinberg dithering rather than Ghostscript's
 default clustered ordered dither is that it is much more obvious that the
 ink dots are rather larger on the page than their nominal 1/180" or 1/300"
 size (clustering the dots tends to minimise this effect). Thus it is often
 the case that the printed result is rather too dark. A simple empirical
 correction for this may be achieved by preceding the actual postscript
 file to be printed by a short file which effectively sets the gamma for
 the device, eg.

 gs ... gamma.ps colorpic.ps quit.ps

 where gamma.ps is

%!
{0.333 exp} dup dup currenttransfer setcolortransfer

 This example sets the gamma for r, g, and b to 3, which seems to work
 reasonably well in practice.
```

GENERAL TIPS:

 For all the above printers, the paper is critically important to the
 final results. Smoother, less fibrous paper is generally better (and
 suggested types are given in the printer manuals). In particular, the
 special ink-jet paper can make a big difference; the colours are
 brighter, but most importantly, there is almost no colour bleed, even
 with adjacent areas of very heavy inking. Similarly, the special coated
 transparencies also work well (and ordinary transparencies do not work
 at all!)

 The unix-lpr.sh provides one example of setting up a multi-option
 colour postscript lpr queue on Unix systems, and includes the ability
 to choose a range of different colour options and printer accounting
 and error logging.

CAVEAT EMPTOR!:

 It is not always easy for me to test all of these drivers, as the only
 colour printer I have here is the DeskJet 500C. I rely on others testing
 drivers for the additional machines and reporting their findings back to
 me.

----------------------------- End --------------------------------

------------------- Apple Dot Matrix Printer --------------------

This section was written by Mark Wedel.

 The Dot Matrix Driver (DMP) driver is a simple driver I wrote. It
could more more efficient, but it seems to print the images fine.

 The Dot Matrix Printer was a parallel predecessor to the Imagewriter
printer. As far as I know, the Imagewriter commands are a superset
to those of the Dot Matrix printer, so the driver should work fine at
generating output that can be printed on Imagewriters.

 A few notes (from the gdevadmp.c file):

 * To print out images, it sets the printer for unidirection printing
 * and 15 cpi (120 dpi). IT sets line feed to 1/9 of an inch (72 dpi).
 * When finished, it sets things back to bidirection print, 1/8" line
 * feeds, and 12 cpi. There does not appear to be a way to reset
 * things to initial values.
 *
 * This code does not set for 8 bit characters (which is required). It
 * also assumes that carriage return/newline is needed, and not just
 * carriage return. These are all switch settings on the DMP, and
 * I have configured them for 8 bit data and cr only.
 *
 * You can search for the strings Init and Reset (in devdemp.c) to find the
 * strings that set up the printer and clear things when finished, and change
 * them to meet your needs.
 *
 * Also, you need to make sure that the printer daemon (assuming unix)
 * doesn't change the data as it is being printed. I have set my
 * printcap file (sunos 4.1.1) with the string:
 * ms=pass8,-opost

```
 * and it works fine.

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### ------------------------------ End -------------------------------- ###
```