

DigiImage

Image Processing for Fluid Dynamics

# DigiFile User Guide

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## 1 Introduction

The purpose of the DigiFile utility is to convert **Dig/mage** image files and PostScript between the variety of different file formats used by **Dig/mage** and other programs and printers. In particular, DigiFile can convert images to and from Windows .BMP bit map files, PaintJet XL and PaintJet XL300 printer files, LaserJet (PCL4 or PCL5) files and PostScript files (both greyscale and colour). DigiFile can use **Dig/mage** windows files, **Dig/mage** compressed images or Windows .BMP files as the input image. DigiFile can also convert and print PostScript between the three forms (.PS - normal; .EPS - encapsulated and .DPS - data only) produced by **Dig/mage** and alter the layout of plots *etc.* In most cases DigiFile is the preferred method of sending a PostScript or image file to a printer.



## 2 PostScript printer

This section deals with features of DigiFile designed specifically to support PostScript output. In general PostScript is the preferred method of obtaining hardcopy output.

If you do not have a PostScript printer, or have a non-PostScript colour printer you wish to use, it may be possible to print the PostScript on this device using GhostScript, a Freeware application emulating PostScript and capable of driving a range of printers as well as providing on-screen rendering of PostScript files. This may be obtained from a wide variety of sources, including <ftp://ftp.cs.wisc.edu/ghost/aladdin/>. The helper application GSView, a GhostView clone, is also Freeware and obtainable from <ftp://ftp.cs.wisc.edu/ghost/rjl/>. GSView provides a much friendlier interface for interactive viewing of PostScript files. Both applications are also available over the world wide web at <http://www.cs.wisc.edu/~ghost/>.

### 2.1 TYPES OF POSTSCRIPT

There are two common forms of PostScript files: printable PostScript and encapsulated PostScript. By convention these are normally given the extensions `.PS` and `.EPS` respectively. As the name suggests, a printable PostScript (`.PS`) file will be printed if you send it to a suitable PostScript printer. It contains everything required to produce the final page or pages of text and/or graphics. In contrast, if you send an encapsulated PostScript (`.EPS`) file to the same printer, you should not get anything out of it. Encapsulated PostScript is intended as a method of importing the text or graphics it describes into another document or application. The `.EPS` file is responsible for *drawing* its contents in the printer's memory, but the document containing it is responsible for printing it where it wants and at the size it requires.

Ultimately the encapsulated (`.EPS`) form is more flexible and more useful. As a result we would recommend that you use it in preference to the `.PS` form. To enable you to print a Digi/mage `.EPS` file directly without importing it into some other application, the DigiFile utility offers the ability to convert the file to a `.PS` and send it directly to the printer. Note that Digi/mage can also convert `.PS` files (provided they were created by Digi/mage version 1.4 or later) into `.EPS` files.

Digi/mage also handles a third, nonstandard form of PostScript: Data only PostScript, `.DPS`. A `.DPS` file contains only the data required for the plotting and not the normal prolog of procedures. The main purpose of this form is to provide a more compact representation of the plot. With some document systems it is possible to include the prologue once and only once, no matter how many plots are used in the document. Unfortunately with others the prolog must be included with every plot. In the former case the `.DPS` form may be used to save a considerable amount of space and speed up printing, while in the latter case the `.EPS` form must be used. DigiFile is able to convert it to either the `.PS` or `.EPS` forms. It is not, however, possible to convert `.PS` or `.EPS` into `.DPS`.

Which type of PostScript is produced by the output of DigiPlot and DigiFile will normally be determined by the extension given to the output file. Printable PostScript is produced if `.PS` is specified, encapsulated PostScript is generated with the `.EPS` extension and data only PostScript with the `.DPS` extension. If no extension is specified, the type of PostScript is determined by the setting in `[;P Printers]` in `CONFIGUR.EXE`. The appropriate extension

will be added automatically. Any other extension will also produce PostScript of the default type (but using the specified extension).

The features of DigiFile specific to handling and creating PostScript files are outlined in the following three sections. Further details on how to create PostScript may be found in the DigiPlot documentation.

## 2.2 CONVERTING POSTSCRIPT FILES

DigiFile may be used to convert PostScript files generated by **Dig/mage** (version 1.4 or later) between their encapsulated (.EPS) and printable (.PS) forms. Data only PostScript (.DPS) can also be converted to .PS or .EPS, but not vice versa. The command line to convert a file is

```
C:..> DIGIFILE postscript_file /FP [output_file] [/PT tray]
```

where the file will be sent to `output_file`. The type (.PS or .EPS) of the resulting file is determined by the extension specified. If no `output_file` is specified, then the file is converted to its .PS form and sent to the printer.

The optional `/PT tray` switch may be used to specify the paper tray from which the media will be taken in the printer. Details are given in the table below.

Switch	Effect
<code>/FP [output_file]</code>	This switch may be used to direct the PostScript to a specified file rather than sending it directly to the printer.
<code>/PT tray</code>	<p>If included, then this switch will select a specific source for the paper. Valid values of <code>tray</code> are:</p> <p>0      Manual feed            1      “Upper” tray            2      “Lower” tray</p> <p>Note that on some PostScript printers the upper and lower trays may be reversed. Once included, it is not possible for DigiFile to remove the paper tray selection from the PostScript file.</p>

## 2.3 CHANGING THE LAYOUT OF POSTSCRIPT FILES

The layout (how many sub-plots per page) of a **Dig/mage** PostScript file may be changed using DigiFile. To enhance this ability, it is also possible to concatenate two or more PostScript files. The command line for this is

```
C:..> DIGIFILE postscript_file /FP output_file /N plot_format [/A]
```

The `/N plot_format` switch has the same effect as its counterpart in DigiPlot, *viz.*

<u>plot_format</u>	<u>Description</u>
0	One plot per page, portrait
1	One plot per page, landscape (default)
2	Two plots per page, portrait
3	Three plots per page, portrait

4	Four plots per page, landscape
10	As for 0 but with space for alternate <i>x</i> and <i>y</i> axes
11	As for 1 but with space for alternate <i>x</i> and <i>y</i> axes
12	As for 2 but with space for alternate <i>x</i> and <i>y</i> axes
13	As for 3 but with space for alternate <i>x</i> and <i>y</i> axes
14	As for 4 but with space for alternate <i>x</i> and <i>y</i> axes

If the `output_file` already exists, then the new `postscript_file` may be appended to it by including the `/A` switch. If the `/A` switch is not specified, any previous `output_file` will be overwritten. It is not possible to send the PostScript directly to the printer if the `/A` switch is specified.

Note the `/PT` switch is also available when changing the layout. It is not, however, possible for DigiFile to subsequently remove the effect of this switch.

## 2.4 SPLITTING POSTSCRIPT FILES

Sometimes it is desirable to split a PostScript file containing more than one plot to recover the individual plots. This can be achieved with

```
C:..> DIGIFILE postscript_file /FP output_file /E page [/N
      plot_format]
```

where `page` is the page/plot number to be extracted. The `/N plot_format` switch may be used in conjunction with `/E page` to reformat the plot at the same time. Note this will only work for PostScript files created by *Dig/mage* version 1.4 or later.

## 2.5 OTHER CHANGES TO POSTSCRIPT FILES

DigiFile may also be used to alter other aspects of an existing PostScript file. A complete list of the options (including those given in the sections above) is given in the table below.

Switch	Effect
<code>/FP [output_file]</code>	This switch may be used to direct the PostScript to a specified file rather than sending it directly to the printer.

<p>/C colour_model</p>	<p>This switch specifies how colour and greyscale information will be printed. The default colour_model is specified by the [ ;P Printers ] option in the configuration utility CONFIGUR.EXE. If you are using a Level 1 PostScript printer, then only colour_models 0 and 1 are available. For a Level 2 colour PostScript printer the basic response to the different colour models is:</p> <p>0                      Colour information not used. DigiPlot lines are rendered as dashed line types while images are rendered as greyscale.</p> <p>1                      DigiPlot lines are rendered as greyscale as are images.</p> <p>2                      DigiPlot lines and images rendered as colour.</p> <p>3                      Images rendered as colours and lines as dashes.</p> <p>10                     As for /C 0, but remaps the intensity using the active lookup table as specified by /O. DigiFile will send the result to the greyscale printer, although will be printed in colour if sent directly to a colour printer.</p> <p>11                     As for /C 1, but remaps the intensity using the active lookup table as specified by /O. DigiFile will send the result to the greyscale printer, although will be printed in colour if sent directly to a colour printer.</p> <p>With a Level 2 greyscale printer, the colour information will be rendered using the equivalent intensity.</p>
<p>/PT tray</p>	<p>If included, then this switch will select a specific source for the paper. Valid values of tray are:</p> <p>0            Manual feed  1            "Upper" tray  2            "Lower" tray  10          Transparency tray</p> <p>Note that on some PostScript printers the upper and lower trays may be reversed.</p> <p>Many newer printers prefer to use media-type selection in place of paper tray specification. For such printers, it may be necessary to use /PT 10 to select transparent media.</p>
<p>/N plot_format</p>	<p>Specifies the format of the plots. The valid values of plot_format are:</p> <p>0            One plot per page, portrait  1            One plot per page, landscape (default)  2            Two plots per page, portrait  3            Three plots per page, portrait  4            Four plots per page, landscape  10          As for 0 but with space for alternate x and y axes  11          As for 1 but with space for alternate x and y axes  12          As for 2 but with space for alternate x and y axes  13          As for 3 but with space for alternate x and y axes  14          As for 4 but with space for alternate x and y axes</p> <p>Note that this switch does not affect the appearance of the plot on the screen.</p>
<p>/E page</p>	<p>Extract the specified page from the source file.</p>

/A	Appends the image to the <code>output_file</code> if the latter already exists.
/U [section] use_file	<p>Adds some or all of the specified PostScript file <code>use_file</code> to the output. The file is added just before the <code>%%EndPageSetup</code> statement for each page in the output. If the optional <code>section</code> is given, then only the section of <code>use_file</code> starting from the line beginning after <code>.section</code> (e.g. <code>.10</code>), and finishing before the next line starting with a dot, will be added to the output. For more information, refer to the documentation for the <code>GraphicsPrependFile</code> subroutine. If <code>section</code> is not specified, then the entire file is added.</p> <p>Up to ten files or sections within a file may be added in this way using ten occurrences of the <code>/U</code> switch.</p> <p>A typical use of this option is to change the rendering of scalar fields by <code>Trk2DVel</code> from greyscale to cross-hatch patterns by including the file <code>Patterns.PS</code> with this switch. Refer to section 2.6 for details.</p>
/# nCopies	Specifies the number of copies of the image to be printed

## 2.6 CHANGING APPEARANCE

In addition to the methods described in the preceding sections, the appearance of the PostScript output may be altered retrospectively by utilising the `/U use_file` option in DigiFile. This option inserts the specified `use_file` at the start of the PostScript describing each page. The contents of the `use_file` may be used to override the standard *Dig/mage* procedures defined in the `Header.PS` and `GraphVDU.PS` prologue files, or even redefine standard PostScript procedures. For DigiPlot output the same net effect may be achieved through `w` or `WF` plot instructions, but in a manner which is less convenient for most users.

Development of `use_files` requires a reasonable working knowledge of PostScript. From time-to-time specialised `use_files` will be released with *Dig/mage*. A list of these files is given below:

Switch	Description
<code>/u Patterns.PS</code>	Renders images and grey-scale fills as cross hatched patterns. This has been applied to both images and the scalar field produced by <code>Trk2DVel</code> gridded velocity fields.
<code>/u 10 Use_Titl.PS</code>	Suppresses main graph titles.
<code>/u 20 Use_Titl.PS</code>	Suppresses all graph text.
<code>/u 10 Use_Scal.PS</code>	Suppress scales for velocity and scalar field.
<code>/u 20 Use_Scal.PS</code>	Reposition scale for scalar field within frame in top left quadrant.

## 2.7 CONVERTING IMAGES TO POSTSCRIPT

DigiFile may also be used to convert an image file to PostScript and either send it to a printer or a file. The command line for this is

```
C:..> DIGIFILE image_file /FP [output_file] [/W iw0 iw1 jw0 jw1]
      [/NB bit_planes] [/C colour_model] [/G]
      [/O output_lut] [/T title] [/D [buffer]]
      [/PT tray] [/N plot_layout] [/A]
```

As with the PaintJet version, if the `output_file` is not specified, the PostScript image will be sent down the parallel printer port to the PostScript printer (if any) connected to it. If the printer is connected to a serial port or a remote computer, then you will need to use DigiFile to create a temporary PostScript file which will then need to be transferred to the printer using some appropriate (system dependent) method.

If the `output_file` has a `.EPS` extension, then the output file will be written as encapsulated PostScript. Similarly if `output_file` has a `.DPS` extension, then data only PostScript will be created.

The remaining options have some differences to those for the PaintJet version and are detailed below:

Switch	Effect								
<code>/W iw0 iw1 jw0 jw1</code>	This switch may be used to reduce the size of the window to be dumped to the printer. If not present, then the entire window contained in the file will be used. If the image file itself were saved as a window, then the top left corner of the image is loaded to coordinates 0,0 (not the original position of the window) and so the new sub-window coordinates should be relative to this.								
<code>/NB bit_planes</code>	This switch sets the number of bit planes to be rendered on the printer. If not specified, then DigiFile will default to all eight bit planes. The number of bit planes is restricted by PostScript to 1, 2, 4 or 8.								
<code>/C colour_model</code>	<p>This switch specifies how colour and greyscale information will be printed. The default <code>colour_model</code> is specified by the [<code>;P Printers</code>] option in the configuration utility <code>CONFIGUR.EXE</code>. If you are using a Level 1 PostScript printer, then only <code>colour_models</code> 0 and 1 are available. For a Level 2 colour PostScript printer the basic response to the different colour models is:</p> <table border="0"> <tr> <td style="padding-right: 20px;">0</td> <td>Colour information not used. DigiPlot lines are rendered as dashed line types while images are rendered as greyscale.</td> </tr> <tr> <td>1</td> <td>DigiPlot lines are rendered as greyscale as are images.</td> </tr> <tr> <td>2</td> <td>DigiPlot lines and images rendered as colour.</td> </tr> <tr> <td>3</td> <td>Images rendered as colours and lines as dashes.</td> </tr> </table> <p>With a Level 2 greyscale printer, the colour information will be rendered using the equivalent intensity.</p>	0	Colour information not used. DigiPlot lines are rendered as dashed line types while images are rendered as greyscale.	1	DigiPlot lines are rendered as greyscale as are images.	2	DigiPlot lines and images rendered as colour.	3	Images rendered as colours and lines as dashes.
0	Colour information not used. DigiPlot lines are rendered as dashed line types while images are rendered as greyscale.								
1	DigiPlot lines are rendered as greyscale as are images.								
2	DigiPlot lines and images rendered as colour.								
3	Images rendered as colours and lines as dashes.								
<code>/G</code>	If neither <code>/C 0</code> is utilised, then the intensities will be used directly to determine the grey level in the PostScript. However, if <code>/G</code> specified, the intensities will be used to determine the red, green and blue components of the false colour associated with each pixel. These components will then be combined to give a grey level determined from $0.30red + 0.59green + 0.11blue$ . This gives an equivalent intensity for a colour image, enabling nominally full coloured images to be rendered appropriately in the grey-scale PostScript.								
<code>/O output_lut</code>	Specifies the output look up table to be used for rendering the image if either the <code>/C</code> or <code>/G</code> switches is specified.								

/T title	<p>Specify title for plot. The text included after the /T switch up until the end of the line or the next / character is printed out below the screen dump. The title may include character formatting using the following codes:</p> <p>&amp;R        Switch to Roman font (default)  &amp;I        Switch to Italic font  &amp;G        Switch to Greek font  &amp;N or &amp;- Switch to normal size (default)  &amp;H or &amp;^ Switch to superscript  &amp;L or &amp;_ Switch to subscript  &amp;S        Switch to small size  &amp;A        Switch to normal weight (default)  &amp;B        Switch to bold  &amp;&amp;        The ampersand (&amp;) symbol.</p>
/D [buffer]	<p>If the /D switch is included by itself, then the image, once loaded, will be displayed on the computer monitor. If <code>buffer</code> is also included, then the image will be displayed on the frame grabber monitor using the specified buffer number. Note that this last option is the only one for which DigiFile requires the frame grabber card to be installed.</p>
/PT tray	<p>If included, then this switch will select a specific source for the paper. Valid values of <code>tray</code> are:</p> <p>0        Manual feed  1        “Upper” tray  2        “Lower” tray</p> <p>Note that on some PostScript printers the upper and lower trays may be reversed.</p>
/N plot_format	<p>Specifies the format of the plots. The valid values of <code>plot_format</code> are:</p> <p>0        One plot per page, portrait  1        One plot per page, landscape (default)  2        Two plots per page, portrait  3        Three plots per page, portrait  4        Four plots per page, landscape  10       As for 0 but with space for alternate <i>x</i> and <i>y</i> axes  11       As for 1 but with space for alternate <i>x</i> and <i>y</i> axes  12       As for 2 but with space for alternate <i>x</i> and <i>y</i> axes  13       As for 3 but with space for alternate <i>x</i> and <i>y</i> axes  14       As for 4 but with space for alternate <i>x</i> and <i>y</i> axes</p> <p>Note that this switch does not affect the appearance of the plot on the screen.</p>
/A	<p>Appends the image to the <code>output_file</code> if the latter already exists.</p>
/# nCopies	<p>Specifies the number of copies of the image to be printed</p>

Often a more realistic looking image may be produced by bypassing the grey scale rendering used by PostScript. Refer to the end of section 4 on LaserJet printers for more details.



### 3 PaintJet printer

For printing an image file to a HP PaintJet XL, HP PaintJet XL300, HP DeskJet 1200C or HP DeskJet 1600C (not PostScript mode) ink jet printer, then

```
C:..> DIGIFILE image_file /FJ [output_file] [/NF] [/O output_lut]
      [/X width] [/Y height] [/M margin]
      [/W iw0 iw1 jw0 jw1] [/NB bit_planes]
      [/R render_type] [/G gamma] [/T title]
      [/D [buffer]] [/PT tray]
```

The /FJ switch is used to indicate that the image file is being converted for printing on a HP PaintJet series ink jet printer. If the optional `output_file` is not given, then the output will be written to the printer connected to the parallel port. If `output_file` is specified, then the output will be written to the file indicated. This file may subsequently be printed using `COPY /B output_file LPT1` (or whichever other port is required). Note that the switches may be present in any order. The other (optional) switches have the following effects:

Switch	Effect
/NF	If present, this switch suppresses the form feed which will normally be issued at the end of the plot. This will then enable a second or third image to be dumped onto the same page.
/O output_lut	This switch specifies the output look up table to be used for the screen dump. If the switch is not specified, then DigiFile will use the output look up table in use at the time the image was saved by <i>DigiImage</i> .
/X width	If present, this switch specifies the width of the plot in mm. If this switch is not present but /Y is, then the width will be chosen automatically to maintain the aspect ratio. If neither /X or /Y are present, then the default will depend on how the image was saved. If the image was saved by [ <code>;DP Dump the screen to PaintJet printer file</code> ], then the width will be whatever was specified at that time. If the image were saved using the [ <code>;K: Save and restore buffer</code> ] menu, then the default width is 180 mm.
/Y height	If present, this switch specifies the height of the plot in mm. If this switch is not present but /X is, then the height will be chosen automatically to maintain the aspect ratio. If neither /X or /Y are present, then the default width is selected in the manner outlined for /X above and the height selected to maintain the aspect ratio.
/M margin	If present, this switch sets the left-hand margin, in mm, for the plot. If not present, then the default will depend on how the image was saved. If the image was saved by [ <code>;DP Dump the screen to PaintJet printer file</code> ], then the left margin will be whatever was specified at that time. If the image were saved using the [ <code>;K: Save and restore buffer</code> ] menu, then the margin is set to 200mm-width.
/W iw0 iw1 jw0 jw1	This switch may be used to reduce the size of the window to be dumped to the printer. If not present, then the entire window contained in the file will be used. If the image file itself were saved as a window, then the top left corner of the image is loaded to coordinates 0,0 (not the original position of the window) and so the new sub-window coordinates should be relative to this.

/NB bit_planes	This switch sets the number of bit planes (1 to 8) to be rendered on the printer. If not present, then the default will depend on how the image was saved. If the image was saved by [ <i>;DP Dump the screen to PaintJet printer file</i> ], then the number of bit planes specified at that time will be used. If the image were saved using the [ <i>;K: Save and restore buffer</i> ] menu, then the default is eight bit planes.
/R render_type	If not included, DigiFile will use the Error diffusion (E) algorithm for producing the various colours and grey levels, or that specified by [ <i>;DP Dump the screen to PaintJet printer file</i> ] if the image were saved using this option. The rendering options are: E      Error diffusion O      Ordered dithering C      Clustered dithering S      Snap to primaries (black, white, red, green, blue, yellow, magenta, cyan)
/G gamma	Specifies gamma correction to characterise nonlinearity between apparent colour/intensity and true colour/intensity. Default value (if /G not specified) is 1.5, or that specified by [ <i>;DP Dump the screen to PaintJet printer file</i> ] if the image were saved using this option..
/T title	Specify title for plot. The text included after the /T switch up until the end of the line or the next / character is printed out above the screen dump. If the image were saved using [ <i>;DP Dump the screen to PaintJet printer file</i> ], then the title specified at this point will be used as the default. The default for [ <i>;K: Save and restore buffer</i> ] is no title.
/D [buffer]	If the /D switch is included by itself, then the image, once loaded, will be displayed on the computer monitor. If <i>buffer</i> is also included, then the image will be displayed on the frame grabber monitor using the specified buffer number. Note that this last option is the only one for which DigiFile requires the frame grabber card to be installed.
/PT tray	If included, then this switch will select a specific source for the paper. Valid values of <i>tray</i> are: 0      Manual feed 1      Default tray

## 4 LaserJet printer

Images may be rendered as a grey scale on an HP LaserJet III or later printer or compatible printer. The rendering process uses an error diffusion algorithm to produce the required grey levels from the intensities. This algorithm is similar to that used by the PaintJet XL, XL300 and DeskJet 1200C when the /R E error diffusion option is chosen. For the LaserJet the command takes the form

```
C:..> DIGIFILE image_file /FL [output_file] [/NF] [/O output_lut]
      [/X width] [/Y height] [/M margin]
      [/W iw0 iw1 jw0 jw1] [/G gamma] [/T title]
      [/D [buffer]] [/PT tray]
```

The /FL switch is used to indicate that the image file is being converted for printing on a HP LaserJet series laser printer or DeskJet series ink jet printer. If the optional `output_file` is not given, then the output will be written to the printer connected to the port specified in the *Dig/mage* configuration file. If `output_file` is specified, then the output will be written to the file indicated. This file may subsequently be printed using `COPY /B output_file LPT1` (or whichever other port is required). Note that the switches may be present in any order. The other (optional) switches have the following effects:

Switch	Effect
/NF	If present, this switch suppresses the form feed which will normally be issued at the end of the plot. This will then enable a second or third image to be dumped onto the same page.
/O output_lut	If not present, then the intensities will be used directly to determine the grey level in the LaserJet image. If included, the intensities will be used to determine the red, green and blue components of the false colour associated with each pixel. These components will then be combined to give a grey level determined from $0.30red + 0.59green + 0.11blue$ . This gives an equivalent intensity for a colour image, enabling nominally full coloured images to be rendered appropriately in the grey-scale LaserJet image.
/X width	If present, this switch specifies the width of the plot in mm. If this switch is not present but /Y is, then the width will be chosen automatically to maintain the aspect ratio. If neither /X or /Y are present, then the default will depend on how the image was saved. If the image was saved by [ <code>;DP Dump the screen to PaintJet printer file</code> ], then the width will be whatever was specified at that time. If the image were saved using the [ <code>;K: Save and restore buffer</code> ] menu, then the default width is 180 mm.
/Y height	If present, this switch specifies the height of the plot in mm. If this switch is not present but /X is, then the height will be chosen automatically to maintain the aspect ratio. If neither /X or /Y are present, then the default width is selected in the manner outlined for /X above and the height selected to maintain the aspect ratio.
/M margin	If present, this switch sets the left-hand margin, in mm, for the plot. If not present, then the default will depend on how the image was saved. If the image was saved by [ <code>;DP Dump the screen to PaintJet printer file</code> ], then the left margin will be whatever was specified at that time. If the image were saved using the [ <code>;K: Save and restore buffer</code> ] menu, then the margin is set to 200mm-width.

/W iw0 iw1 jw0 jw1	This switch may be used to reduce the size of the window to be dumped to the printer. If not present, then the entire window contained in the file will be used. If the image file itself were saved as a window, then the top left corner of the image is loaded to coordinates 0,0 (not the original position of the window) and so the new sub-window coordinates should be relative to this.
/G gamma	Specifies gamma correction to characterise nonlinearity between apparent colour/intensity and true colour/intensity. Default value (if /G not specified) is 1.5, or that specified by [ ;DP Dump the screen to PaintJet printer file ] if the image were saved using this option..
/T title	Specify title for plot. The text included after the /T switch up until the end of the line or the next / character is printed out above the screen dump. If the image were saved using [ ;DP Dump the screen to PaintJet printer file ], then the title specified at this point will be used as the default. The default for [ ;K: Save and restore buffer ] is no title.
/D [buffer]	If the /D switch is included by itself, then the image, once loaded, will be displayed on the computer monitor. If <code>buffer</code> is also included, then the image will be displayed on the frame grabber monitor using the specified buffer number. Note that this last option is the only one for which DigiFile requires the frame grabber card to be installed.
/PT tray	If included, then this switch will select a specific source for the paper. Valid values of <code>tray</code> are: 0        Manual feed 1        Default tray

If you have the option of printing on a LaserJet or a PostScript compatible printer, then which is better will depend both on the resolution of the printer and the type of images being printed. For the same printer resolution, an image rendered using the LaserJet option will be produced faster and often appear *better* than one rendered using PostScript. The reason for this lies in the different methods of producing an apparent grey level. With PostScript, each pixel is represented as accurately as possible *for that pixel*. In contrast, with the LaserJet, **Dig/image** tries to represent the grey level *in the region* around the pixel accurately. While the same form of *error diffusion* (also known as frequency modulation) algorithm could be implemented in PostScript, the much larger file size and slower printing make this less useful. Note that some implementations of PostScript will use such an algorithm by default even though it represents a departure from standard PostScript.

Many modern PostScript printers offer the ability to switch automatically between PostScript and PCL5. On such printers you can send either type of image without any further effort.

## 5 Windows .BMP files

The /FW switch is used to indicate that DigiFile is to convert the image to a Windows .BMP image file. The relevant command line is

```
C:..> DIGIFILE image_file /FW output_file [/O output_lut]
      [/X width] [/Y height] [/W iw0 iw1 jw0 jw1]
      [/NB bit_planes] [/D [buffer]]
```

The first thing to note is that the `output_file` **must** be specified for this variant. If it is not, an error message will be generated. The other switches have the following effects:

Switch	Effect
/O output_lut	This switch specifies the output look up table to be used for Windows .BMP file. If the switch is not specified, then DigiFile will prompt the user to select an appropriate table.
/X width	If present, this switch specifies the width of the .BMP file in pixels. If this switch is not present but /Y is, then the width will be chosen automatically to maintain the aspect ratio. If neither /X nor /Y are present, then the width and height are chosen such that the image will fit into a 800x600 pixel window, maintaining the aspect ratio.
/Y height	If present, this switch specifies the height of the .BMP file in pixels. If this switch is not present but /X is, then the height will be chosen automatically to maintain the aspect ratio. If neither /X or /Y are present, then the width and height are chosen such that the image will fit into a 800x600 pixel window, maintaining the aspect ratio.
/W iw0 iw1 jw0 jw1	This switch may be used to reduce the size of the source window to be converted to the .BMP file. If not present, then the entire source image will be used. If the source image file itself were saved as a window, then the top left corner of the image is loaded to coordinates 0,0 (not the original position of the window) and so the new sub-window coordinates should be relative to this.
/NB bit_planes	This switch sets the number of bit planes (4 or 8) to be included in the .BMP file. If not specified, then DigiFile will default to all eight bit planes.
/D [buffer]	If the /D switch is included by itself, then the image, once loaded, will be displayed on the computer monitor. If <code>buffer</code> is also included, then the image will be displayed on the frame grabber monitor using the specified buffer number. Note that this last option is the only one for which DigiFile requires the frame grabber card to be installed.



## 6 GIF Files for World Wide Web and Other Applications

The /FG switch is used to indicate that DigiFile is to convert the image to GIF file format (.GIF) for use with the World Wide Web or other applications. The GIF format is a compressed format using LZW compression to reduce the size of the image file. Some images will compress well, while others will be only marginally smaller than the raw format.

```
C:..> DIGIFILE image_file /FG output_file [/O output_lut]
      [/X width] [/Y height] [/W iw0 iw1 jw0 jw1]
      [/NB bit_planes] [/D [buffer]]
```

The first thing to note is that the `output_file` **must** be specified for this variant. If it is not, an error message will be generated. The other switches have following effect:

Switch	Effect
/O output_lut	This switch specifies the output look up table to be used for Windows .BMP file. If the switch is not specified, then DigiFile will prompt the user to select an appropriate table.
/X width	If present, this switch specifies the width of the .BMP file in pixels. If this switch is not present but /Y is, then the width will be chosen automatically to maintain the aspect ratio. If neither /X nor /Y are present, then the width and height are chosen such that the image will fit into a 800x600 pixel window, maintaining the aspect ratio.
/Y height	If present, this switch specifies the height of the .BMP file in pixels. If this switch is not present but /X is, then the height will be chosen automatically to maintain the aspect ratio. If neither /X or /Y are present, then the width and height are chosen such that the image will fit into a 800x600 pixel window, maintaining the aspect ratio.
/W iw0 iw1 jw0 jw1	This switch may be used to reduce the size of the source window to be converted to the .BMP file. If not present, then the entire source image will be used. If the source image file itself were saved as a window, then the top left corner of the image is loaded to coordinates 0,0 (not the original position of the window) and so the new sub-window coordinates should be relative to this.
/NB bit_planes	This switch sets the number of bit planes (4 or 8) to be included in the .BMP file. If not specified, then DigiFile will default to all eight bit planes.
/D [buffer]	If the /D switch is included by itself, then the image, once loaded, will be displayed on the computer monitor. If <code>buffer</code> is also included, then the image will be displayed on the frame grabber monitor using the specified buffer number. Note that this last option is the only one for which DigiFile requires the frame grabber card to be installed.



## 7 DigImage Raw Files

The *Dig/mage* raw file format is the simplest possible file format. The first two bytes give the height of the image (in pixels), and the third and fourth byte the width (again in pixels). The image is then stored with one byte per pixel in the next *width\*height* pixels, ordered by row. The file may also contain some additional (optional) information after the end of the image (refer to the Development System documentation for `SaveWindowFromBuffer(...)`).

The command line for this variant of DigiFile is

```
C:..> DIGIFILE image_file /FR output_file [/O output_lut]
      [/W iw0 iw1 jw0 jw1] [/D [buffer]]
```

The `output_file` must be specified. The other command line switches have the following effect:

Switch	Effect
/O output_lut	This switch specifies the output look up table to be stored with the raw image file. If not specified, then the output look up table for the input image will be used.
/W iw0 iw1 jw0 jw1	This switch may be used to reduce the size of the source window to be converted to the raw output file. If not present, then the entire source image will be used. If the source image file itself were saved as a window, then the top left corner of the image is loaded to coordinates 0,0 (not the original position of the window) and so the new sub-window coordinates should be relative to this.
/D [buffer]	If the /D switch is included by itself, then the image, once loaded, will be displayed on the computer monitor. If <code>buffer</code> is also included, then the image will be displayed on the frame grabber monitor using the specified buffer number. Note that this last option is the only one for which DigiFile requires the frame grabber card to be installed.



## 8 DigImage Compressed Files

The *Dig/mage* compressed file format is an adaptive run-length encoded format. for each bit plane of the image. This format is much more efficient in terms of disk space, but less efficient in terms of speed than the other formats. Details of the format may be found in the Development System documentation for `SaveCompressedBuffer(...)`.

The command line for this variant of DigiFile is

```
C:..> DIGIFILE image_file /FC output_file [/O output_lut]
        [/W iw0 iw1 jw0 jw1] [/NB bit_planes]
        [/D [buffer]]
```

The `output_file` must be specified. The other command line switches have the following effect:

Switch	Effect
/O output_lut	This switch specifies the output look up table to be stored with the raw image file. If not specified, then the output look up table for the input image will be used.
/W iw0 iw1 jw0 jw1	This switch may be used to reduce the size of the source window to be converted to the raw output file. If not present, then the entire source image will be used. If the source image file itself were saved as a window, then the top left corner of the image is loaded to coordinates 0,0 (not the original position of the window) and so the new sub-window coordinates should be relative to this.
/NB bit_planes	This switch sets the number of bit planes (1 to 8) to be included in the compressed file. If not specified, then DigiFile will default to all eight bit planes.
/D [buffer]	If the /D switch is included by itself, then the image, once loaded, will be displayed on the computer monitor. If <code>buffer</code> is also included, then the image will be displayed on the frame grabber monitor using the specified buffer number. Note that this last option is the only one for which DigiFile requires the frame grabber card to be installed.



## 9 Saving images for later conversion by DigiFile

Typically an image file will be saved from within *Dig/mage* using [*;KS* Save buffer to file], [*;KW* Write window to file] or [*;KC* Save Windows .BMP bit map]. These three options all store the output look up table currently in use in addition to the intensity structure of the image concerned. Typically [*;KS* ...] should be used with the optional compression when saving entire buffers if the image is to be stored for a period of time. While uncompressed images may be read or written much faster than compressed images, they require much more space. If only a section of a buffer need be saved the [*;KW* ...] has the ability to save a window within a buffer. Windows are saved in an uncompressed form. Unless the window is relatively small, it may require more space than a compressed version of an entire buffer.

Images should normally be saved with [*;KC* Save Windows .BMP bit map] only when transferring an image to a Windows program.

A fourth method for saving a buffer as an image file is [*;DP* Dump the screen to PaintJet printer file]. This option saves the buffer in the same manner as [*;KW* Write window to file] but additionally prompts for and saves information about the size at which the image is to be rendered on a PaintJet (or LaserJet) printer, the image title and details of the rendering procedure (PaintJet only). While this final method is specifically intended for use with a PaintJet or LaserJet printer (as is emphasised by the default file extension .JET), images saved in this way may be treated in the same manner as any other type of image file supported by *Dig/mage*.

The format of the DigiFile command line depends on the form of output required from DigiFile. We shall discuss first output suitable for the colour PaintJet printers.



## 10 Converting text to PostScript

An additional feature of DigiFile is the ability to convert a text or other file containing pure ASCII data into a PostScript file suitable for printing this information on a PostScript printer. This conversion process includes the pagination and inclusion of running a header and footer. To convert a file, the command line is

```
C:..> DIGIFILE text_file /FT [output_file] [/T title] [/PT tray]
      [/N text_format] [/# nCopies]
```

The input `text_file` is converted to PostScript and, if the optional `output_file` is not specified, it is sent to the greyscale printer specified by `CONFIGUR.EXE`. Full details of the switches are given below.

Switch	Effect
/FT [output_file]	This switch causes DigiFile to treat the input file as a text file. This text file will be paginated and converted to PostScript. The PostScript will be sent to the specified <code>output_file</code> , or, if non specified, it will be sent direct to the greyscale printer specified in <code>CONFIGUR.EXE</code> . Note that only printable PostScript will be produced, regardless of the extension given to the <code>output_file</code> .
/T title	Adds the specified title to the running heading. If this switch is not specified, the directory in which the <code>text_file</code> is found is used as the running heading.
/PT tray	If included, then this switch will select a specific source for the paper. Valid values of <code>tray</code> are: 0       Manual feed 1       "Upper" tray 2       "Lower" tray  Note that on some PostScript printers the upper and lower trays may be reversed.
/N text_format	Specifies the format of the text file. The valid values of <code>text_format</code> are: 0       62 lines, 80 columns 1       82 lines, 105 columns (default)
/# nCopies	Specifies the number of copies of the image to be printed



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