

Fixed Multiformating (FMF)

Overview

Fixed Multiformating™ (FMF)™ provides an easy to use method for placing multiple images on a single page using preset layouts.

Description

FMF divides a page into equal sized cells and places one image in each cell. The layout of the cells are user selectable by specifying a Logical Device. Layouts can range from a simple 1 by 1 (one image per page) to 9 by 9 (81 images per page) and any combination between.

Images received by an FMF Device are scaled to fit the size of the cell and placed on the page starting with the cell in the upper-left corner. Subsequent images are placed in cells following the rule: left-to-right then top-to-bottom.

FTP, LPR and the Parallel Port can be used to transfer images to FMF Devices. Images are separated by *username* to keep all images received from a user together on the same page. This allows multiple users to access the same FMF Device. The illustration below, shows image placement for a 2 by 3 layout.

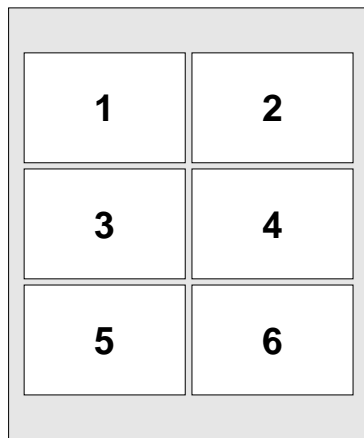


Figure 1: Image Placement Order for 2 by 3 FMF

Images are processed in the order they are received. When an image is completely received by the printer, it is placed in a queue for the appropriate FMF Device. Once the image is queued, the printer treats it like any other image. Gamma, Contrast, TCR, MCM, and scaling method apply to FMF Devices the same as the other Logical Devices. FMF will

print the page when all cells on the page have been filled. If too many images are received for one page, additional pages are output.

Logical Devices

FMF uses Logical Devices to control the layout of images. Logical Devices 11-99 select preset layouts which allow the user to specify the number of cells across the page and the number of cells down the page. The first digit of the Logical Device specifies the number of cells across the page. The second digit specifies the number of cells down the page.

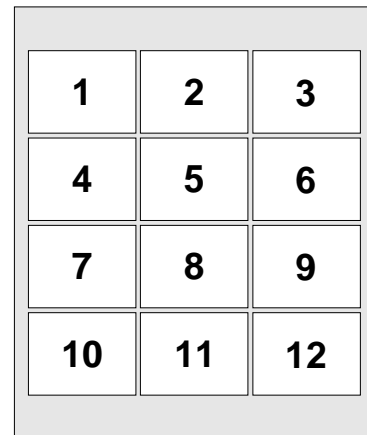


Figure 2: Logical Device 34 Orientation

FMF uses a built-in rule when orienting the cells on the page. The rule determines if portrait or landscape orientation of the cells on the page is used. FMF will orient the cells so the

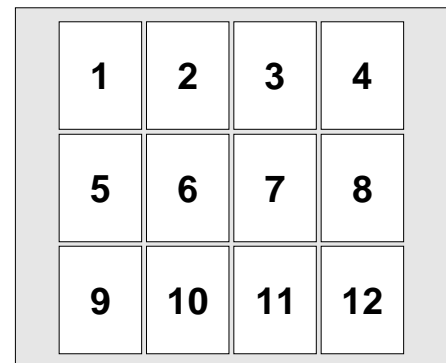


Figure 3: Logical Device 43 Orientation

side of the matrix with the greater number of cells, is placed along the longest edge of the paper. If the number of cells on both sides of the matrix is the same, then portrait orientation is used.

A simpler explanation of this rule is:

- ◆ If the first digit of the Logical Device \leq second digit, portrait orientation is used.
- ◆ If the first digit of the Logical Device $>$ second digit, landscape orientation is used.

The illustrations 2 and 3 demonstrate how Logical Devices 34 and 43 differ on page orientation. The rules regarding portrait and landscape cell orientation are designed to make FMF easier to use. Users can override the rules by issuing FMF Control Commands.

FMF Control Commands

There are three control commands recognized by Fixed Multiformating which enhance the flexibility of this feature. These commands are sent to the printer as files containing simple ASCII text. Any text editor can be used to create a file containing a command. Only one command will be accepted per file. If multiple commands are required, they must each be in a separate file. Commands may be sent as uppercase or lowercase.

PRINT Command

PRINT

The **PRINT** command will force the printer to output the contents of the current page and reset for a new page of images. This command is useful if there are not enough images to fill an entire page. Unused cells will be left blank. If a **PRINT** command is sent after a page has just printed, no output will be generated. This is important because a **PRINT** command can be sent at the end of any FMF sequence without generating redundant output.

SETUP Command

```

SETUP { LANDSCAPE | PORTRAIT }
{ COPIES # }
{ GAP # }
{ MARGIN # }
{ BACKGROUND or COLOR rr/gg/bb }
{ CELL rr/gg/bb }
{ EMPTY rr/gg/bb }
{ SCALE Scale_method }
{ ASPECT X_aspect Y_aspect }

```

SETUP will define the characteristics for a given FMF Device. It allows the user to control many aspects of the FMF session by specifying parameters which apply to the current FMF Device only.

The **LANDSCAPE** and **PORTRAIT** parameters will override the default orientation of the cells on the page and allow the user to specify the orientation.

COPIES is a parameter that defines the number of copies to be printed for each multiformatted page that is generated. The **COPIES** parameter is needed because information from LPR and FTP specifying the number of copies to print of an image is not propagated through to FMF. A numeric value from **1** to **99** must be specified after the **COPIES** parameter. If this parameter is not specified, 1 copy is assumed.

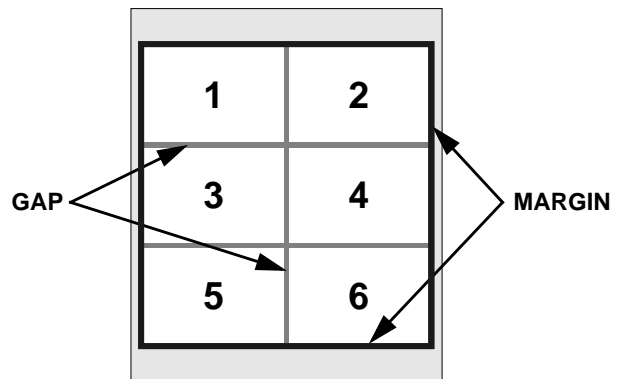


Figure 4: Identification of GAP and MARGIN regions

GAP is a parameter that defines the size of the space between images. A numeric value from **0** to **999** which specifies the number of pixels that separate images, must appear after the **GAP** parameter. If this parameter is not used, a default value of 3 is used. The gap color is the specified by the **BACKGROUND** (or **COLOR**) parameter.

MARGIN is a parameter that defines the size of the space around the outer edge of the FMF image. A numeric value from **0** to **999** specifies the number of pixels that form the border of the final FMF image. This value must appear after the **MARGIN** parameter. If this parameter is not used, a default value of 5 is used. The margin color is the specified by the **BACKGROUND** (or **COLOR**) parameter.

The **CELL** parameter defines the color to set any unused portion inside an image cell. Cell colors are specified as **rr/gg/bb** where **rr**, **gg**, and **bb** are 2 digit hexadecimal values from **00** to **FF** which represent red, green, and blue respectively. If no cell color is specified, white is used (**FF/FF/FF**).

The **EMPTY** parameter specifies the color to use for any empty cells. Empty cells occur when a **PRINT** command is issued before all cells are filled, and also when an image conversion fails. Image conversion can fail in situations when an unsupported or invalid image format is received, or when image data is corrupted. The **EMPTY** color is specified in the same manner as the cell color

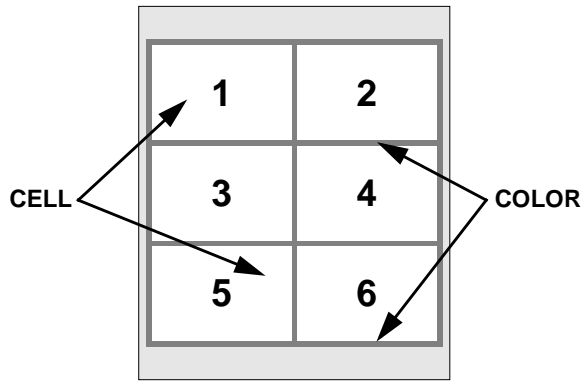


Figure 5: Identification of CELL and COLOR regions

The **BACKGROUND** (or, alternatively, the **COLOR**) parameter defines the background color which affect gaps and margins. Colors are specified as *rr/gg/bb* where *rr*, *gg*, and *bb* are 2 digit hexadecimal values from **00** to **FF** which represent red, green, and blue respectively. If no background is specified, black is used (00/00/00).

SCALE allows the scaling method to be specified. The printer supports 5 scaling techniques which can be selected using this parameter. *Scale_method* is a string which specifies the technique used to scale an image. Supported methods include: **BOX**, **BILINEAR**, **BICUBIC**, **MITCHELL**, and **LANCZOS**. If **SCALE** is not specified, the printer or user default method is used.

The **ASPECT** parameter can be used to scale the images by different amounts in the x- and y-directions to modify their aspect ratio. With aspect ratio modification, one direction of an image is reduced in size while the other direction is held the same. The aspect ratio factor is determined by *X_aspect* divided by *Y_aspect*. If the aspect ratio factor is less than 1.0 then the images are reduced in the x-direction in proportion to the factor. If the aspect ratio factor is greater than 1.0, then the heights of the images are reduced in proportion to the reciprocal of the aspect factor. Aspect ratio adjustment is performed on the images in the orientation in which they are received. Images with modified aspect ratios are still scaled to fit maximally in the cell.

CANCEL Command

CANCEL

The **CANCEL** command will clear all images being processed on a given FMF Device and reset the device so the next image will be treated as the first image. **CANCEL** will

only clear and reset the FMF Device for the user sending the command. It is recommended that a user send a **CANCEL** command to the printer before sending a sequence of images to be multiformatted. This will clear any partial jobs that may have been started on that particular FMF Device. Powering the printer off and on will clear all FMF Devices.

Simple FMF Example Session

The following example shows the simplest way to use FMF. Logical Device 22 (2 x 2) is used to print four images. No extra commands are needed.

Image File: **TIFF, 8-bit, greyscale (1024 x 512)**
Image will be scaled to fit 1st. cell.

Image File: **PCX, 8-bit, color (640 x 480)**
Image will be scaled to fit 2nd. cell.

Image File: **BMP, 24-bit, color (320 x 240)**
Image will be scaled to fit 3rd. cell.

Image File: **GIF, 8-bit, color (640 x 480)**
Image will be scaled to fit 4th. cell.

Complex FMF Example Session

The following example shows the sequences of files used to create a 2 x 3 FMF output (Logical Device 23) with 5 images. The 6th. cell is unused in this example.

Command File: **CANCEL**
Clear any FMF files for this user and device.

Command File: **SETUP LANDSCAPE MARGIN 2 GAP 2 BACKGROUND 80/80/80 SCALE BICUBIC COPIES 5**
Force portrait orientation, use 2 pixel wide lines to frame images and make the lines 50% grey in color. Use Bicubic Scaling and print 5 copies.

Image File: **Sun Raster, 8-bit, color (1152 x 900)**
Image will be scaled to fit 1st. cell.

Image File: **TIFF, 8-bit, greyscale (1024 x 512)**
Image will be scaled to fit 2nd. cell.

Image File: **PCX, 8-bit, color (1024 x 768)**
Image will be scaled to fit 3rd. cell.

Image File: **BMP, 24-bit, color (640 x 480)**
Image will be scaled to fit 4th. cell.

Image File: **GIF, 8-bit, color (640 x 480)**
Image will be scaled to fit 5th. cell.

Command File: **PRINT**
Print the current FMF image, the 6th. cell is left blank.

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