Developer Note

LaserWriter 4/600 PS Printer

Developer Press

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About This Note

The LaserWriter 4/600 PS printer is a new member of the Apple Computer LaserWriter printer family. This developer note describes the features and capabilities of the printer, and it is intended for use by software and hardware developers.

To use this note, you need to understand the Adobe™ PostScript™ Level 2 programming language and printer terminology commonly referred to in PostScript programming documentation. You should also be familiar with the computer for which you intend to develop software.

You do not need to use this note if you are simply running packaged programs for your Apple computer, but it is useful if you are writing or modifying a program that is used with the LaserWriter 4/600 PS printer.

Your owner's guide provides instructions for connecting the printer to your computer, inserting paper, and performing other routine operating tasks. This note does not provide that type of information.

This preface describes the contents of the note, explains visual cues and conventions used in the note, and lists other books to which you can refer.

What This Note Contains

This note consists of four chapters and an index.

- Chapter 1, "Introduction to the LaserWriter 4/600 PS Printer," describes the hardware features of the LaserWriter 4/600 PS printer, including the built-in communication port and the printer's paper-handling capabilities.
- Chapter 2, "PostScript Software," provides general information about the PostScript Level 2 programming language, the LaserWriter 4/600 PS driver, the utility program, and page types.
- Chapter 3, "PostScript Level 1 Compatibility Operators," explains how to set the different software parameters using the LaserWriter 4/600 PS printer's compatibility operators. They enable the LaserWriter 4/600 PS printer, which uses PostScript Level 2, to maintain compatibility with printers that use PostScript Level 1.
- Chapter 4, "Communication Channels," describes the software support provided for the LaserWriter 4/600 PS printer's LocalTalk communication channel.

Conventions and Abbreviations

This developer note uses the following typographical conventions and abbreviations.

Typographical Conventions

Computer-language text—any text that is literally the same as it appears in computer input or output—appears in `Courier` font.

Certain terms used in this note may appear in different typographical formats—for example, `BuildTime` and `buildtime`. `BuildTime` is the format used for the PostScript system parameter, and `buildtime` is the format used for the operator `buildtime`.

Note
A note like this contains information that is interesting but not essential for an understanding of the text. ◆

IMPORTANT
A note like this contains important information that you should read before proceeding. ▲

▲ **WARNING**
A note like this directs your attention to something that could cause damage or result in a loss of data. ▲

Standard Abbreviations

When unusual abbreviations appear in this developer note, the corresponding terms are also spelled out. Standard units of measure and other widely used abbreviations are not spelled out. The following abbreviations are used in this note:

AMBT	Adobe Memory Booster™ Technology
AMD	Advanced Micro Devices
dpi	dots per inch
DRAM	dynamic RAM
EEPROM	electronically erasable and programmable ROM
EPROM	electronically programmable ROM
I/O	input/output
KB	kilobyte

MB	megabyte
MHz	megahertz
PAP	printer access protocol
PDL	page-description language
ppm	pages per minute
RAM	random-access memory
ROM	read-only memory
VM	virtual memory

Other Reference Material

This developer note assumes that you are familiar with printer technology and know how to operate and program Apple LaserWriter printers. Additional information is available in the following publications:

- The owner's guide that is shipped with every Apple printer explains how to set up the printer in the standard configuration. The guide gives basic operating information on how to load toner cartridges, load the paper tray, and so forth. It also provides basic troubleshooting information.
- *PostScript Language Reference Manual*, second edition, published by Addison-Wesley, is required if you plan to write programs in the PostScript Level 2 programming language. The supplement to this manual, the *PostScript Language Reference Manual Supplement,* or simply the *Supplement*, is available from Adobe Systems, Inc.
- *PostScript Language Tutorial and Cookbook*, published by Addison-Wesley, provides a basic introduction to the PostScript programming language. It also includes sample PostScript programs that help you to understand how the PostScript programming language works.
- *PostScript Language Program Design*, published by Addison-Wesley, is written for programmers who want to take advantage of the PostScript programming language to design efficient PostScript programs and printer devices.

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CHAPTER 1

Introduction to the LaserWriter 4/600 PS Printer

The LaserWriter 4/600 PS printer is a mainstream network laser printer designed for the small-business market. Replacing the Personal LaserWriter 320, it supports PostScript Level 2 functions and produces up to four printed pages per minute. The LaserWriter 4/600 PS printer has improved imaging capabilities and supports 600-dpi (dots per inch) resolution. Using Adobe™ Memory Booster™ Technology (AMBT) it accomplishes this with only 2 MB of DRAM.

The LaserWriter 4/600 PS printer works with the LocalTalk interface, and may be connected to one or more Macintosh computers, or any other computers that support LocalTalk. The printer is available in 110-volt and 220-volt versions.

This chapter describes

- hardware features of the printer
- LocalTalk port
- status lights
- memory capabilities
- Adobe Memory Booster Technology
- basic operation
- page types
- paper-handling capabilities
- startup page

Features of the Printer

The LaserWriter 4/600 PS printer supports the entire PostScript™ Level 2 language as specified in the second edition of the *PostScript Language Reference Manual*. In addition, it has features, capabilities, and operating modes not present in other PostScript language printers. You may access these additional facilities by executing special PostScript operators that exist only in the LaserWriter 4/600 PS printer's PostScript interpreter.

Table 1-1 lists functional features of the LaserWriter 4/600 PS printer.

Table 1-1 LaserWriter 4/600 PS printer features

Feature	Specifications
Printing speed	4 ppm (pages per minute)
Imaging	600 dpi (dots per inch)
Processor	32-bit RISC processor (AMD 29200, 16 MHz)
Paper handling	Standard output: 25-page face-down tray A lever on the back of the printer enables face-up output Standard inputs: single-sheet manual feed slot 100-sheet universal adjustable cassette For more information, see the sections "Page Types" on page 8, and "Paper Handling" on page 9
ROM	4 MB of onboard, fast, masked ROM
DRAM	2 MB of onboard DRAM
DRAM expansion	4 MB expansion card
EEPROM	512 bytes of onboard electronically erasable and programmable memory
Interface port	Mini-DIN 8-pin serial port for LocalTalk
SCC chip	Single-channel Z85C233 SCC chip implements the LocalTalk interface
Adobe Memory Booster Technology (AMBT)	AMBT software reduces the amount of RAM needed to render and print 600 dpi pages
Fonts	35 PostScript Type I resident fonts
PDL (page-description language)	Adobe PostScript Level 2
Support for *n*-up printing	Allows 1, 2, or 4 pages to be printed on one sheet of paper (This feature is a function of the LaserWriter 8 Driver)

Communication Port for LocalTalk

The LaserWriter 4/600 PS printer supports one communication port, an 8-pin mini-DIN serial port for LocalTalk. Figure 1-1 shows the connector pin designations for the 8-pin connector, and Table 1-2 lists the pin functions.

Figure 1-1 The 8-pin mini-DIN connector for LocalTalk

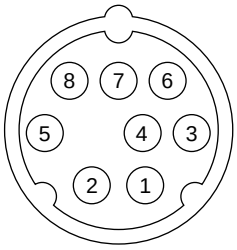

Table 1-2 Signal descriptions for LocalTalk

Pin number	Signal name	Description
1, 2, 7	NC	Not connected
3	/TXD	Transmit data (inverted)
4	GND	Signal ground
5	/RXD	Receive data (inverted)
6	TXD	Transmit data
8	RXD	Receive data

Status Lights

The LaserWriter 4/600 PS printer has three status lights on the left side of the printer. Figure 1-2 shows the lights, and Table 1-3 describes their functions.

Figure 1-2 Printer status indicators

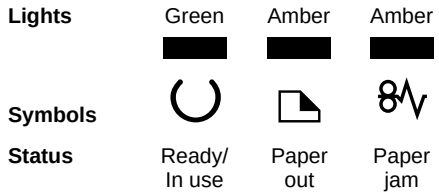

Table 1-3 Status light messages

Light	Light's state	Printer's state
Ready/In use (green)	On	The printer is ready to use.
	Off	The printer cannot print because there is an error condition, or because the printer cover is open.
	Flashing	The printer is warming up, or it is processing data for the next print job.
Paper out (amber)	On	Paper tray is empty, or it has been removed from the printer.
	Off	There is an adequate supply of paper in the paper tray.
	Flashing	The printer is in manual-feed mode and is ready for the next sheet of paper.
Paper jam (amber)	On	There is a paper jam.
	Off	Paper is feeding correctly through the printer.
	Flashing	Printer requires service.

NOTE If all three lights (Ready, Out of Paper, Paper Jam) are off and the printer is on, it indicates that there is no toner cartridge installed.

The LaserWriter 4/600 PS printer uses an instant-on fuser that minimizes the amount of power consumed when the printer is not printing. For this reason, there is no power on/off switch, and the printer is always on when it is plugged into a power source.

Memory Capabilities

The standard configuration of the LaserWriter 4/600 PS printer comes with 2 MB of DRAM mounted on the printer's controller (main circuit board). The printer also accommodates a 4 MB DRAM expansion card that brings DRAM capacity up to 6 MB. The amount of DRAM installed significantly changes the printer's performance as well as the quality of the output.

The minimum amount of memory allocated to represent the rendered page data (not including the display list) is determined by the amount of space needed to store the "lossy" compressed algorithm.

IMPORTANT

The term *lossy* is applied to a compression technique that, in order to print an entire page, may introduce some loss of detail into the page. ▲

LaserWriter 4/600 PS memory capabilities are enhanced by the Adobe Memory Booster Technology described in the next section.

When the print job invokes lossy compression, the printer reports the error with the following message:

```
%%[ PrinterError: Complex page, image approximated ]%%
```

Adobe Memory Booster Technology

The LaserWriter 4/600 PS printer incorporates Adobe Memory Booster Technology (AMBT), which reduces significantly the amount of printer DRAM needed to render and print 600-dpi pages. Using AMBT, the printer with 2 MB of DRAM can print complex pages that usually require 6 MB of DRAM.

The AMBT software accomplishes this using a combination of on-the-fly band rendering and prerendered band compression. The normal compression algorithm is lossless and does not cause any degradation in print quality. Compression of prerendered bands may slow output, but this type of compression is used only on bands that cannot be rendered in real time while the page is moving through the print engine.

If a page contains too many bands that must be prerendered in this way, the page data may not fit in the available memory, since compressed bands occupy more memory space. In this case, AMBT reverts to a lossy compression algorithm for the entire page, to maximize the probability that it can be printed. The lossy compression algorithm renders the page at 600 dpi, intelligently downsizes the image to obtain a compressed representation, and upsamples it to 600 dpi just as it is being printed.

AMBT also uses techniques to print pages for which the display list is too large to fit in the available DRAM space. In this case, throughput of pages is significantly decreased.

If you install the 4 MB DRAM expansion card to bring the total DRAM capacity to 6 MB, a full-size 600-dpi bitmap buffer is allocated for letter and A4 pages. In this case, AMBT is essentially disabled, and maximum performance achieved. However, AMBT is still required when legal-size pages are printed, to store a compressed page image, and to leave enough DRAM for the display list and general virtual memory.

Note
The terms RAM (random-access memory) and DRAM (dynamic random-access memory) are used interchangeably in this publication. ◆

Basic Operation

The LaserWriter 4/600 PS printer operates in two modes: batch and interactive.

The printer's main function is to execute the PostScript language programs sent to it from a computer. In normal operation, the printer cycles endlessly through the following sequence of steps:

1. It sets up a clean initial execution environment (virtual memory) for the PostScript language program. This is known as setting up a job.
2. It executes the job by interpreting the standard input data stream, which is received on the LocalTalk port. Data stream sensing determines the start and end of PostScript print jobs.
3. When the printer encounters an end-of-job indicator (this may be a character or a packet) or when an error occurs, the printer cleans up after the job and restores the virtual memory to its initial state in preparation for the next job. Fonts downloaded outside the server loop persist in memory. These fonts may be released back to the memory pool as required. Fonts downloaded inside the server loop do not persist across jobs.

The main object of this process is to produce printed pages. However, a program may change some permanent parameters in the printer itself or may perform some computation that causes results to be sent back to the host computer rather than causing hard copy to be printed.

Batch Mode

Batch mode is the normal way of operating the LaserWriter 4/600 PS printer. In this mode, the printer operates as a printing device for a computer.

A batch-mode job executes a single file containing a PostScript language program. When an end-of-job character is reached, or the PostScript language terminates, the job is finished. In this mode, the only data transmitted from the LaserWriter 4/600 PS printer to the host is generated by the PostScript language print operator, or by errors. The printer provides no echoing, editing, or other user amenities.

Interactive Mode

You can use the LaserWriter 4/600 PS printer as a personal computer and control it directly by means of a terminal or other input device. This way of using the printer is known as interactive mode, and it allows you to experiment with the PostScript language.

In interactive mode, a job consists of a dialogue in which you issue a PostScript language statement and the server executes the statement and prompts you for the next one. The state of the PostScript interpreter's virtual memory persists until you explicitly end the job. While you are entering a statement, the printer echoes characters and provides you with limited means for making corrections.

Page Types

The page size (the area in which printed output may appear) is constrained by

- the physical size of the paper (paper size)
- the margins required by the printing engine
- the amount of memory available for the full-page frame buffer

Table 1-4 lists the page types and sizes supported by the LaserWriter 4/600 PS printer.

Table 1-4 Available page types

Name	Paper size in inches (mm)	Page size in inches (mm)	Description
`a4`	8.27 × 11.69 (210 × 297)	7.95 × 11.43 (201.8 × 290.4)	Standard page type for European A4-size paper
`a4small`	8.26 × 11.69 (210 × 297)	7.47 × 10.85 (189.7 × 275.5)	Smaller version of A4
`b5`	7.17 × 10.12 (182 × 257)	6.88 × 9.90 (174.8 × 251.5)	Standard page type for Japanese B5-size paper
`executivepage`	7.25 × 10.5 (184.2 × 266.7)	7.04 × 10.28 (178.8 × 261.1)	Standard page type for executive-size paper
`legal`	8.5 × l4 (215.9 × 355.6)	8.21 × 13.7 (208.6 × 348.7)	Standard page type for legal-size paper. This legal page size applies to printers configured with 6 MB of DRAM.
`letter`	8.5 × 11 (215.9 × 279.4)	8.21 × 10.7 (208.6 × 271.9)	Standard page type for letter-size paper
`lettersmall`	8.5 × 11 (215.9 × 279.4)	7.68 × 10.16 (195 × 258)	Smaller version of letter size

continued

Table 1-4 Available page types (continued)

Name	Paper size in inches (mm)	Page size in inches (mm)	Description
`c5`	6.38 × 9.02 (162 × 229)	6.13 × 8.85 (155.8 × 224.76)	Standard page type for the C5-size envelope
`com10`	4.13 × 9.5 (104.8 × 241.3)	4.0 × 9.25 (101.6 × 234.9)	Standard page type for the COM10-size envelope
`monarch`	3.87 × 7.5 (98.4 × 190.5)	3.73 × 7.25 (94.8× 184.1)	Standard page type for Monarch-size envelope
`dl`	4.33 × 8.66 (110 × 220)	4.16 × 8.42 (105.7 × 213.8)	Standard page type for DL-size envelope

NOTE Table 3-2 on page 40 provides further information about the maximum printable area allowed for each page size.

The default user clip path for any paper size should be the largest rectangle that can be centered about the center point of the physical page and, considering the constraints of word alignment, remain within the imageable area.

See the sections "Page Size Compatibility Operators" and "Paper Tray Compatibility Operators," in Chapter 3, for further information.

Paper Handling

The LaserWriter 4/600 PS printer offers two ways of handling paper. The printer comes with:

- an integral single-sheet manual feeder. You use it mainly to feed single sheets of paper that are different from the paper already in the paper cassette. For example, you can use the manual single-sheet feeder to insert envelopes, heavier paper, and paper of nonstandard sizes. The manual feed is left justified.

IMPORTANT

Envelopes must be fed using the manual feed slot. Envelope sizes supported are COM 10, Monarch, C5, and DL. ▲

- a universal 100-sheet cassette. This cassette can be adjusted to handle letter, A4, B5 (JIS), executive, and legal size paper. The engine does not sense the size of paper in the cassette, so the user must make sure that the page setup for each print job matches the paper in the cassette.

The normal paper exit path is a face-down tray on top of the printer. Using an optional lever, you can route the paper to a tray at the rear of the printer, where it is ejected face up. This route is preferable for labels, envelopes, transparencies, and heavy paper stock.

Startup Page

When the printer is powered up or restarted, PostScript initialization takes place. If you enable the startup page option, a startup page will be printed each time you power up the printer. This page tells you the basic configuration of the printer, the AppleTalk printer name, and the amount of memory installed. The factory default for this option is Enabled.

CHAPTER 2

PostScript Software

This chapter describes the LaserWriter 4/600 PS software. It includes

- an overview of the programming language, interpreter, driver, utility program, and page types
- a detailed description of the software parameters that enable you to set up and configure the LaserWriter 4/600 PS printer, including page device parameters, details dictionary, product strings, interpreter parameters, and resource categories

Software Overview

This section provides an overview of the PostScript programming language, the PostScript interpreter, the printer driver, the printer utility program, and the page types supported by the printer.

Adobe PostScript Programming Language

The LaserWriter 4/600 PS printer executes descriptions written in the PostScript language. The version of the PostScript language used has features and capabilities that might not be present in other PostScript output devices. This developer note describes only the supplementary PostScript language features of the LaserWriter 4/600 PS printer. You should use this note in conjunction with the *PostScript Language Reference Manual*, second edition.

PostScript Interpreter

You may access the special features of the LaserWriter 4/600 PS printer by executing PostScript operators that exist only in this printer's interpreter. The PostScript Interpreter version at the time of printing is 2014.107.

The special operators are intended for use by interactive users, by programmers of host software that carries out user requests, or by users who want to configure the LaserWriter 4/600 PS printer in nonstandard ways. Normally page descriptions should not refer to the special operators, since doing so impairs portability.

Printer Driver

The LaserWriter 4/600 PS printer driver (LaserWriter 8), and the PostScript Printer Description (ppd) files for the LaserWriter 4/600 PS shipped with the printer, provide a general interface to the LaserWriter 4/600 PS printer. The interface meets the needs of most Macintosh applications.

The printer driver

- provides full support for the PostScript Level 2 programming language
- supports a universal paper tray and an integral single-sheet manual feeder
- allows you to configure the driver according to your printer configuration

- presents error messages if they are reported back by the printer: for example, printer jam status, paper out
- supports both TrueType and Type 1 fonts
- is compatible with version 7.x of the Macintosh system software
- provides support for *n*-up printing, a feature offered by version 8.0 (or later) of the Macintosh LaserWriter driver, that allows you to print one, two, or four logical pages on a single sheet of paper

Printer Utility Program

The Apple Printer Utility, which is shipped with each printer, allows you to control and configure the printer. Using the Apple Printer Utility, you can perform the following types of functions:

- set printer parameters, such as printer name, start page mode, and so forth
- set printer density
- add or remove fonts and display or print a list of available fonts
- set page parameters and get the count of pages printed by the printer
- send PostScript files to the printer
- restart the printer
- set job handling options
- set the default paper size for the cassette tray

Page Types

The page types supported by the LaserWriter 4/600 PS printer are listed in Table 2-1. The LaserWriter 4/600 PS does not sense what the default paper tray is. The user must select the paper currently installed in the paper cassette. If a job requires a particular paper size, it should invoke the following PostScript commands to select the appropriate paper size for the job:

```
<< /PageSize [x y] /InputAttributes << 0 <</PageSize [x y] >> >>
>> setpagedevice
```

Refer to Table 2-1 on page 14 for the *x* and *y* values ([595 842], and so on) of the paper sizes supported by the LaserWriter 4/600 PS. When you change paper size using the commands shown above, the change is in effect only for the duration of the job.

If you want to change the paper size for the cassette tray permanently, use the following PostScript commands:

```
serverdict begin 0 exitserver
<< /PageSize [x y] /InputAttributes << 0 <</PageSize [x y] >> >>
>> setpagedevice
```

IMPORTANT

If the paper size currently selected does not match the paper size installed in the cassette, the printer reports a `wrong size paper` error. In this case, a paper jam or a paper out error may be reported. The type of error depends on the type of paper in the cassette and the type of paper you selected. To avoid this problem, if you are using the LaserWriter 8 driver, please make sure that the paper size selected from Page Setup matches the paper size in the cassette. ▲

Table 2-1 Paper size and corresponding paper size name

Name	Paper size
A4	[595 842]
B5	[516 729]
C5 envelope	[459 649]
COM10 envelope	[297 684]
DL envelope	[312 624]
Executive	[522 756]
Legal	[612 1008]
Letter	[612 792]
Monarch envelope	[279 540]

NOTE Page size is indicated by an array of two numbers ([595 842], and so on) that indicate width and height. Each unit is equivalent to 1/72 of an inch.

Device Setup

The PostScript language facilities set up the raster output device (printer) to fulfill the processing requirements of the page description. The `setpagedevice` operator performs the following device setup functions:

- specifies processing requirements, such as making multiple copies
- selects optional printer features, such as the proper input tray, paper size, and image area
- establishes device-dependent rendering parameters needed to produce output
- specifies default device setup or configuration parameters that may be used when the page description does not specify the parameters

The `currentpagedevice` operator is used to get the current accumulated values and the adjusted state of the page device. The parameters for the `setpagedevice` operator are cumulative: that is, each new call to `setpagedevice` does not reset the state in total but modifies it. In addition, on each call to `setpagedevice`, the resulting accumulated page device state is processed so that the printer can produce the required results. This may cause further modification of the page device state.

The LaserWriter 4/600 PS printer uses the Level 2 implementation, which provides device control operators defined in the special dictionary `statusdict`.

For more information about how the `setpagedevice` operator is used to specify the processing requirements of a document, refer to Section 4.11 of the *PostScript Language Reference Manual*, second edition.

Page Device Parameters

This section describes the page device parameters present in the LaserWriter 4/600 PS printer. Refer to Section 4.11.3 of the *PostScript Language Reference Manual*, second edition, for supplemental information on parameter semantics. Table 2-2 lists the page device parameters and their defaults and provides additional technical information.

Table 2-2 Page device parameters

Key	Type	Default	Description
`BeginPage`	*procedure*	`{pop}`	This parameter is executed at the beginning of each page: at the end of `setpagedevice`, at the end of `showpage` or `copypage`, and during any operation that reinstates a page device different from the existing one.
`EndPage`	*procedure*	`{exch pop 2 ne}`	This parameter is executed at the end of each page. End of page occurs at the beginning of each `showpage` or `copypage` and when the current page device is about to be replaced by a different page device.
`ExitJamRecovery`	*boolean*	`false`	If this parameter is `true`, pages that jam in the exit path are reprinted. If it is `false` (exit jam recovery disabled), pages that jam are not reprinted. In this case, performance may be improved because it is possible to overlap more page processing. Value persists across power cycles.

continued

Table 2-2 Page device parameters (continued)

Key	Type	Default	Description
`HWResolution`	*array*	`[600 600]`	This parameter controls the resolution of the output. It is used in conjunction with the `Policies` dictionary (described later in this table) and the amount of available memory in the printer to determine if compression will be attempted on the frame buffer and at which resolution the frame buffer will print.
`ImagingBBox`	*array* or *null*	`null`	This parameter is an optional bounding box. If not `null`, the value is an array of four numbers in the default user coordinate system stating lower-left *x*, lower-left *y*, upper-right *x*, and upper-right *y* of the page image bounding box. Any marks outide the rectangle specified by the `ImagingBBox` array will be printed.
`InputAttributes`	*dictionary*	<< 0 << /PageSize [612 792] >> >>	This parameter contains an entry for each source of input media available for use by the printer. The default always assumes that the cassette tray is installed with letter-size paper. "Page Types" on page 13 describes how to change the tray paper size, both temporarily and permanently. The entries for the slots in the `InputAttributes` dictionary correspond to the following input source in the LaserWriter 4/600 PS printer: Slot 0, the universal cassette.
`Install`	*procedure*	–	This procedure installs values in the graphics state during each invocation of `setpagedevice`, which calls this procedure after setting up the device and installing it as the current device in the graphics state but before executing the implicit `erasepage` and `initgraphics`. Install procedure: `{ << /MaxScreenItem currentuserparams /MaxScreenItem get >> <</MaxScreenItem 8000>> setuserparams /106x45d /Halftone findresource sethalftone setuserparams {}settransfer false setstrokeadjust /DefaultColorRendering /ColorRendering findresource setcolorrendering }`
`ManualFeed`	*boolean*	`false`	This parameter determines whether the input medium (paper) is to be drawn from the manual or the automatic feeder. It is `true` for manual feeding and `false` for feeding from the cassette tray.

continued

Table 2-2 Page device parameters (continued)

Key	Type	Default	Description
`ManualFeedTimeout`	*integer*	`60`	This parameter specifies the number of seconds the printer will wait for a page to be fed manually before generating a timeout error. The default is 60 seconds. If the value is set to `0`, there is no timeout, and the printer waits indefinitely. Value persists across power cycles.
`Margins`	*array*	`[0 0]`	This parameter is an array of two numbers that relocates the page image on the media by *x* units in the direction of the *x* coordinate, and *y* units in the direction of the *y* coordinate. The *x* and *y* values are expressed as 1/600s of an inch. The legal values for *x* and *y* are in the range –128 to 127. If you request margins outside `the` legal range, the request will either be ignored, or a configuration error will be generated (depending upon the page device policy for `Margins`). Value persists across power cycles.
`MediaColor`	*string* or *null*	`null`	This parameter specifies the color of the input media.
`MediaType`	*string* or *null*	`null`	This parameter specifies the type of media: paper, transparency, and so on.
`MediaWeight`	*number* or *null*	`null`	This parameter specifies the weight of the media.
`NumCopies`	*integer* or *null*	`null`	If this parameter is not `null`, it specifies the number of copies to produce. If `NumCopies` is `null`, `showpage` and `copypage` should consult the value of `#copies` in the current dictionary stack each time they are executed.
`OutputFaceUp`	*boolean*	`false`	This parameter determines whether the printed pages are output face up or face down in the output tray. If the value is `false`, the pages are output face up. If it is `true`, they are output face down. The parameter is used for information purposes only, and it does not change the behavior of the printer. Face-up printing is activated by the mechanical switch on the back of the LaserWriter 4/600 PS. Value persists across power cycles.

continued

Table 2-2 Page device parameters (continued)

Key	Type	Default	Description
`OutputPage`	*boolean*	`true`	If this parameter is `true`, pages are printed normally and output into the output tray. If it is `false`, no pages are actually printed. However, all other processing is done as if the pages were to be printed, including rasterizing to a frame buffer. In this case, the time required to process a page includes everything except the time spent waiting for the marking engine. In addition, rasterization occurs synchronously with the execution of `showpage` instead of being overlapped with the execution of subsequent pages. This function is used to measure the complete cost of executing a page.
`PageSize`	*array*	`[612 792]`	This parameter defines the overall page size that was assumed during generation of the page description. `PageSize` is an array of two numbers `[width height]`, which specify the overall size of the page, including borders. Matching tolerance is five default user space units in either dimension. Landscape mode (`[792 612]`) is also valid.

`Policies`	*dictionary*		This dictionary contains feature-policy pairs that specify what setpagedevice should do when a feature request cannot be satisfied. The default procedure is
			`<</PolicyNotFound 1`
			`/PageSize 0`
			`/PolicyReport {pop}`
			`/ProcesslColorModel 0`
			`/OutputDevice 0 >>`

`ProcessColorModel`	*name* or *string*	`/DeviceGray`	This name or string value specifies the colorant model used for rendering process colors in the device. It affects rendering for all color spaces, with the exception of `Separation` color spaces that actually produce separations. It does not affect the interpretation of color values in any color space, and controls only the rendering method. The only legal value is: `/DeviceGray` This value implies a native color space for the printer. The native color space is the PostScript language device color space into which user-specified colors are converted if necessary.

Table 2-1 on page 14 lists the different paper sizes. The LaserWriter 4/600 PS has one universal cassette. Table 2-3 shows the paper tray slot number and corresponding input source.

Table 2-3 Paper tray slot number and input source

Slot number	Input source
0	Universal cassette tray

Product Strings

The LaserWriter 4/600 PS printer's strings contain information about the printer and the printer software. Table 2-4 lists values assigned to the LaserWriter 4/600 PS product strings.

Table 2-4 Product string values

String name	Type	Value	Definition
`languagelevel`	*integer*	`2`	Level of the PostScript language
`product`	*string*	`(LaserWriter 4/600 PS )`	Product name
`revision`	*integer*	1	Current revision level of the printer
`serialnumber`	*integer*	Unique to each printer	Serial number of the printer
`version`	*string*	`2014.107`	Version of the PostScript language

Interpreter Parameters

Certain parameters control the operation and behavior of the PostScript interpreter. Many of them are connected with memory allocation and other specific-purpose resources. For instance, interpreter parameters control the maximum amount of memory allocated to virtual memory, font cache, and halftone screens.

The LaserWriter 4/600 PS printer is configured initially with interpreter parameter values appropriate for most applications. However, using a PostScript language program, you can alter the interpreter parameters to favor certain applications or

to adapt the printer to special requirements. There are three classes of interpreter parameters: user, system, and device. There are three types of device parameters for the LaserWriter 4/600 PS: file system, communications, and engine.

Each parameter class has a PostScript language operator to read the current parameter values and an operator to set parameter values. There are six resulting operators: `currentuserparams`, `setuserparams`, `currentsystemparams`, `setsystemparams`, `currentdevparams`, and `setdevparams`.

You can find information on parameter semantics in the *PostScript Language Reference Manual*, second edition, and in the *PostScript Language Reference Manual Supplement*.

User Parameters

Within reasonable limits, you can change user parameters without a special authorization or password, using any PostScript language program. User parameters establish temporary policies on issues such as size limits and inserting new items into caches.

The `setuserparams` operator sets user parameters, and the `currentuserparams` operator reads their current values. Unless otherwise indicated, all user parameters are subject to `save` and `restore` boundaries. Using `restore` resets all user parameters to their values at the time of the matching `save`. The initial value of the user parameters when the printer is turned on for the first time depends upon the product. Table 2-5 lists the user parameters present in the LaserWriter 4/600 PS printer.

Table 2-5 User parameters in the LaserWriter 4/600 PS printer

Key	Type	Default	Description
`AccurateScreens`	*boolean*	`false`	This is an optional parameter. If the value is `true`, the parameter invokes a special halftone algorithm that is extremely precise but requires a lot of computation.
`JobName`	*string*	`()`	This parameter establishes *string* as the name of the current job. It is recommended that the string contain no more than 32 characters.
`JobTimeout`	*integer*	`0`	This parameter sets the number of seconds a job is allowed to be executed before it is aborted and a `timeout` error is generated. It may be any number larger than `0`. If you set this parameter to `0`, timeout is disabled.
`MaxDictStack`	*integer*	`530`	This parameter determines the maximum number of elements in the dictionary stack. It may be set to `0` or any number larger than `0`.
`MaxExecStack`	*integer*	`10015`	This parameter determines the maximum number of elements in the execution stack. It may be set to `0` or any number larger than `0`.

continued

Table 2-5 User parameters in the LaserWriter 4/600 PS printer (continued)

Key	Type	Default	Description
`MaxFontItem`	*integer*	`12500`	This parameter determines the maximum number of bytes occupied by the pixel array of a single character in the font cache. It may be set to `0` or any number larger than `0`.
`MaxFormItem`	*integer*	`100000`	This parameter determines the maximum number of bytes occupied by a single cached form. It may be set to `0` or any number larger than `0`.
`MaxLocalVM`	*integer*	`2147483647`	This parameter determines the maximum number of bytes occupied by values in local virtual memory. It may be set to `0` or any number larger than `0`.
`MaxOpStack`	*integer*	`100000`	This parameter determines the maximum number of elements in the operand stack. It may be set to `0` or any number larger than `0`.
`MaxPatternItem`	*integer*	`20000`	This parameter determines the maximum number of bytes occupied by a single cached pattern. It may be set to `0` or any number larger than `0`.
`MaxScreenItem`	*integer*	`48000`	This parameter determines the maximum number of bytes occupied by a single halftone screen. It may be set to `0` or any number larger than `0`.
`MaxUPathItem`	*integer*	`5000`	This parameter determines the maximum number of bytes occupied by a single cached user path. It may be set to `0` or any number larger than `0`.
`MinFontCompress`	*integer*	`1250`	This parameter sets the threshold at which a cached character is stored in compressed form instead of as a full pixel array. It may be set to `0` or any number larger than `0`.
`VMReclaim`	*integer*	`0`	This parameter enables or disables local garbage collection: ■ `0` enables automatic collection ■ `-1` disables it for local VM ■ `-2` disables it for both local and global VM
`VMThreshold`	*integer*	`40000`	This parameter indicates the frequency of garbage collection. It is triggered whenever the number of bytes indicated by the setting has been allocated. It may be set to `0` or any number larger than `0`.
`WaitTimeout`	*integer*	`40`	This parameter indicates the current wait timeout, which is the number of seconds the interpreter waits to receive additional characters from the host before it aborts the current job by executing a `timeout` error. It may be set to `0` or any number larger than `0`.

System Parameters

System parameters alter the overall configuration of the printer. You can set system parameters using the `setsystemparams` operator and read them using the `currentsystemparams` operator. You must use a password to change system parameters. System parameters are not subject to `save` and `restore`. Their values persist across jobs and may persist across power cycles. Table 2-6 lists the system parameters present in the LaserWriter 4/600 PS printer.

Note

For further information about parameters listed in Table 2-6, refer to the *PostScript Language Reference Manual Supplement*, Section 3.4 and Section 3.9. ◆

Table 2-6 System parameters in the LaserWriter 4/600 PS printer

Key	Type	Default	Details
`BuildTime`	*integer*	Actual date the interpreter was built.	This read-only parameter is a time stamp that identifies the date the PostScript interpreter was built.
`ByteOrder`	*boolean*	`false`	This parameter determines the order of multiple-byte numbers in binary-encoded tokens: `false` indicates high-order byte first, `true` indicates low-order byte first.
`CurDisplayList`	*integer*	`0`	This read-only parameter identifies amount of RAM currently occupied by the display list.
`CurFontCache`	*integer*	`0`	This read-only parameter identifies amount of RAM currently occupied by the font cache.
`CurFormCache`	*integer*	`0`	This read-only parameter identifies amount of RAM currently occupied by the form cache.
`CurInputDevice`	*string*	`(%LocalTalk%)`	This read-only parameter indicates the name of the communications device that corresponds to the current input file for the PostScript language program currently being executed.
`CurOutlineCache`	*integer*	`0`	This read-only parameter identifies the amount of RAM currently occupied by the outline cache.
`CurOutputDevice`	*string*	`(%LocalTalk%)`	This read-only parameter indicates the name of the communications device that corresponds to the current output file for the PostScript language program currently being executed.

continued

Table 2-6 System parameters in the LaserWriter 4/600 PS printer (continued)

Key	Type	Default	Details
`CurPatternCache`	*integer*	`0`	This read-only parameter identifies the amount of RAM currently occupied by the pattern cache. It also indicates the name of the communications device that corresponds to the current input file for the PostScript language program currently being executed.
`CurScreenStorage`	*integer*	`0`	This read-only parameter identifies the amount of RAM currently occupied by screen storage.
`CurSourceList`	*integer*	`0`	This read-only parameter indicates the number of bytes currently occupied by source lists.
`CurStoredFont Cache`	*integer*	`0`	This read-only parameter indicates the number of bytes currently occupied by the storage device font cache.
`CurStoredScreen Cache`	*integer*	`0`	This read-only parameter indicates the number of bytes currently used for screen files on the storage device. It includes currently active screens.
`CurUPathCache`	*integer*	`0`	This read-only parameter indicates the number of bytes currently occupied by the User path cache.
`DoStartPage`	*boolean*	`true`	This parameter indicates whether or not the start page should print during system initialization. The start page prints if the value is `true`. Value is persistent across power cycles.
`FactoryDefaults`	*boolean*	`false`	This parameter is generally `false`. However, if you set it to `true` and immediately power down the printer, all nonvolatile parameters will revert to the factory default values the next time the printer is powered up. This feature is useful if you forget the printer's system password.
`FatalError Address`	*integer*	`0`	This integer is the hardware address of the last call to the fatal error handler. A nonzero value for this parameter indicates that a fatal system error has occurred earlier.
`FontResourceDir`	*string*	`(fonts/)`	This parameter controls the location of external fonts, which are resources in PostScript Level 2.

continued

Table 2-6 System parameters in the LaserWriter 4/600 PS printer (continued)

Key	Type	Default	Details
`GenericResourceDir`	*string*	`(Resource/)`	This parameter controls the location of external resources for the `Generic` category and all other categories based upon it.
`GenericResourcePathSep`	*string*	`(/)`	This parameter is used in conjunction with `GenericResourceDir` to control the location of external resources for the `Generic` category and all other categories based upon it. With `GenericResourceDir` as `(Resource/)` and `GenericResourcePathSep` as `(/)`, the `AdobeLogo` resource of the `Pattern` category would be in `Resource/Pattern/AdobeLogo`.
`JobTimeout`	*integer*	`0`	This parameter indicates the value in seconds to which the user parameter `JobTimeout` will be initialized at the beginning of each job. It may be set to `0` or any number larger than `0`.
`LicenseID`	*string*	`(LN-0001-016)`	This parameter contains the Adobe-assigned license identification. The value is unique to each product line.
`MaxDisplayList`	*integer*	Function of RAM size — 2 MB is `143866` 6 MB is `311658`	This parameter indicates the maximum number of bytes occupied by display lists, excluding those held in caches. This number is recomputed when the RAM configuration changes. It may be set to `0` or any number larger than `0`. The change to this value does not persist across cycles.
`MaxFontCache`	*integer*	Function of RAM size — 2 MB is `139000` 6 MB is `571950`	This parameter indicates the maximum number of bytes occupied by the font cache. Initial value is based on the amount of RAM installed.
`MaxFormCache`	*integer*	`100000`	This parameter indicates the maximum number of bytes occupied by the form cache. It may be set to `0` or any number larger than `0`.
`MaxImageBuffer`	*integer*	`65536`	This parameter indicates the maximum number of bytes that can be used for a single image buffer. The image buffer holds an internal data representation for sampled image source data. The interpreter may round the value down if the value requested is out of range.

continued

Table 2-6 System parameters in the LaserWriter 4/600 PS printer (continued)

Key	Type	Default	Details
`MaxOutlineCache`	*integer*	`65536`	This parameter indicates the maximum number of bytes occupied by cached character outlines (`CharStrings`) for fonts whose definitions are kept on disk instead of in VM. It may be set to `0` or any number larger than `0`.
`MaxPatternCache`	*integer*	`100000`	This parameter indicates the maximum number of bytes occupied by the pattern cache. It may be set to `0` or any number larger than `0`.
`MaxRasterMemory`	*integer*	2 MB is `1030648` 6 MB is `4088560`	This parameter indicates the largest amount of memory, in bytes, that may be allocated to the frame buffer.
`MaxScreenStorage`	*integer*	`75000`	This parameter indicates the maximum number of bytes occupied by all active halftone screens. Initial value is 75,000 bytes for each 2 MB of RAM installed, up to a maximum of 120,000 bytes. This number is recomputed when the RAM configuration changes. It may be set to `0` or any number larger than `0`.
`MaxSourceList`	*integer*	`16384`	This parameter indicates the maximum number of bytes that can be used by source lists. It may be set to `0` or any number larger than `0`.
`MaxUPathCache`	*integer*	`300000`	This parameter indicates the maximum number of bytes occupied by the user path. It may be set to `0` or any number larger than `0`.
`PageCount`	*integer*	`0`	This read-only parameter indicates how many pages have been successfully printed since manufacture.
`PrinterName`	*string*	`(LaserWriter 4/600 PS)`	This parameter establishes *string* as the current name of the printer. You may set this parameter to any string of 32 or fewer characters. The colon (`:`) the at symbol (`@`), and the asterisk (`*`) are not allowed.
`RamSize`	*integer*	Function of RAM size	This read-only parameter indicates in bytes the amount of installed RAM available to the printer. The LaserWriter 4/600 PS ships with 2 MB of RAM installed, and you can add a further 4 MB.
`RealFormat`	*string*	`(IEEE)`	This parameter provides native representation of real numbers in binary-encoded tokens.

continued

Table 2-6 System parameters in the LaserWriter 4/600 PS printer (continued)

Key	Type	Default	Details
`Revision`	*integer*	`1`	This read-only parameter designates the current revision level of the ROM in which the interpreter is running.
`StartJobPassword`	*string*	`()`	This write-only password authorizes the use of the `startjob` operator, and it will not be read by `currentsystemparams`. Any string of 32 or fewer characters may be used.
`StartupMode`	*integer*	`0`	This parameter controls whether the system start file or some other startup procedure should be executed during system initialization. If the value is `0`, there are no special startup procedures. Other values may be used that are product specific, and they result in product-dependent startup procedures.
`SystemParams Password`	*string*	`()`	This write-only password authorizes the use of the `setsystemparams` and `setdevparams` operators, and it will not be read by `currentsystemparams`. Any string of 32 or fewer characters may be used. Value is persistent across power cycles.
`ValidNV`	*boolean*	`true`	This parameter indicates whether non-volatile memory is currently used to store persistent parameters. This is a read-only parameter.
`WaitTimeout`	*integer*	`40`	This parameter indicates the value in seconds to which the user parameter `WaitTimeout` will be initialized at the beginning of each job. It may be set to `0` or any number larger than `0`. A value of `0` indicates an infinite wait period.

NOTE Parameter names in the first column of this table are all one word; names may have been split for visual clarity.

Device Parameters

Each PostScript interpreter supports a collection of input/output and storage devices, such as communication channels, disks, and cartridges. You may set device parameters using the `setdevparams` operator, and you may read them using the `currentdevparams` operator. Like system parameters, device parameters require a password, are global to the PostScript environment, and have similar persistence characteristics. (Some of them are stored in nonvolatile memory.)

Device parameters are different from both system and user parameters in that device parameters may be interdependent. This means that the legality of a given parameter may depend on the value of another parameter.

Device parameters fall into sets that correspond to the particular device (for example, `%LocalTalk%`). Some device parameters may correspond to a software entity, such as a language emulator.

Note
Even if two printers are using the same I/O storage device, the parameters in the set may be different, because the hardware support for that device is different. ◆

This section describes the three sets of device parameters available with the LaserWriter 4/600 PS printer:

- file system device parameters
- communication device parameters
- engine device parameters

File System Device Parameters

File system parameters enable you to access named files stored in secondary storage devices from PostScript programs. In the case of the LaserWriter 4/600 PS printer, this storage is onboard ROM. Table 2-8 lists the factory defaults settings for `%rom%`.

Table 2-7 Parameters for `%rom%`

Key	Type	Default	Description
`BlockSize`	*integer*	`1`	This read-only constant indicates the ROM formatting size of a page (for the logical and physical size of the media. The units of the value indicate one byte per block, so the LaserWriter 4/600 PS ROM formatting size for a page is one byte per block. Any nonzero positive integer is valid.
`CartridgeID`	*integer*	`9110`	This read-only parameter indicates an ID that uniquely identifies the storage device (ROM). The interpreter uses `CartridgeID` to determine if the storage device has been removed or a different device installed.
`CartridgeType`	*integer*	`4`	This read-only parameter indicates the category classification of the storage device. This classification is a registry maintained by Adobe Systems, and the value is derived from the ROM.

continued

Table 2-7 Parameters for `%rom%` (continued)

Key	Type	Default	Description
`Free`	*integer*	`0`	This parameter indicates the amount of free space available on the ROM. The unit indicates the number of pages, with the page size determined by `BlockSize`. The parameter is valid only if the ROM is actually installed, and `Mounted` is `true`. If the value is `0`, it indicates that either the ROM is not installed or that it is completely full.
`HasNames`	*boolean*	`true`	This read-only constant indicates whether or not the printer supports named files. If it is `true`, the printer supports named files. If it is `false`, the printer does not support named files. The parameter is valid only when `Mounted` is `true`, indicating that a storage device is installed.
`Initialize Action`	*integer*	`0`	This parameter specifies the action required to initialize the device. The following value is valid: ■ `0` indicates no action. This is the value returned when the parameter is read.
`LogicalSize`	*integer*	Should return the value for LaserWriter 4/600 PS	When it is queried, this parameter indicates the current size of the entire ROM installed. It indicates size in pages, where the page size is specified by the parameter `BlockSize`. A value of `0` indicates that no ROM is installed.
`Mounted`	*boolean*	`true`	If this parameter is `true`, the system attempts to mount the ROM. If it is `false`, it attempts to dismount the ROM. When the ROM is mounted, it is known to the system, and it is readable. The ROM will not mount successfully if it does not contain a valid file system.
`PhysicalSize`	*integer*	Should return the value for LaserWriter 4/600 PS	This read-only parameter indicates the size of the ROM installed. Size is measured in pages, and the page size is determined by the parameter `BlockSize`.
`Removable`	*boolean*	`false`	This parameter indicates whether or not the storage device is removable. If it is `true`, the device is removable. If it is `false`, the device is not removable. The ROM is, of course, not removable.

continued

Table 2-7 Parameters for `%rom%` (continued)

Key	Type	Default	Description
`Searchable`	*boolean*	`true`	This parameter indicates whether the ROM participates in file searches, in which the file name is specified but the storage device is not. If the parameter is `true`, the ROM participates. If it is `false`, it does not participate.
`SearchOrder`	*integer*	`11`	This parameter indicates the priority order at which the ROM participates in file search operations where no device has been specified. Any nonnegative integer is valid, and the lower the integer, the higher the priority. This parameter is ignored if `Searchable` is `false`.
`Type`	*name*	`FileSystem`	This read-only parameter represents the general category of device represented by the parameter set. It always returns the value `FileSystem` in this context.
`Writeable`	*boolean*	`false`	This parameter indicates whether the files in the ROM can be open for a write access. It is always false in this context.

NOTE Parameter names in the first column of this table are all one word; names may have been split for visual clarity.

Communication Device Parameters

The LaserWriter 4/600 PS printer has an 8-pin serial connector configured to use the `%LocalTalk%` channel.

Section 3.5.2 in the *PostScript Language Reference Manual Supplement* also provides further information on the LocalTalk parameter set.

For each channel there are three related parameter sets: RAM, nonvolatile (NV), and pending. Table 2-8, starting on page 30, lists the factory defaults settings for `%LocalTalk%`, `%LocalTalk_NV%`, and `%LocalTalk_Pending%`.

Table 2-8 `%LocalTalk%`, `%LocalTalk_NV%`, and `%LocalTalk_Pending%` parameters

Key	Type	Default	Description
`DelayedOutputClose`	*boolean*	`false`	This parameter selects the way the output channel is managed after each job has finished executing. The printer does not wait for the pages of one job to finish printing before it starts executing the next job. `DelayedOutputClose` is set independently for each communication channel. However the LaserWriter 4/600 PS printer uses only one channel, LocalTalk. When `DelayedOutputClose` is `true`: ■ An EOF (end of file) is not sent until all pages of a job have been printed. The channel remains open until the job finishes printing. ■ If a job produces output, and there are preceding jobs that have not finished printing and that are using the same output channel, the output will not be sent until those jobs have finished printing and the EOFs for them have been sent. ■ Spontaneous messages, such as printer error messages, are sent to the channel it if is either the output channel for the job executing or the output channel for jobs that have finished executing but have not finished printing. When `DelayedOutputClose` is `false`: ■ An EOF (end of file) is sent as soon as the job finishes executing in the interpreter. The connection may be closed as soon as the job finishes executing, even though pages produced by the job have not finished printing. ■ Output generated by a job can be transmitted without delay, even if there are previous jobs that have not finished printing using the same output channel. For these jobs EOF will already have been sent. ■ Spontaneous messages, such as printer error messages, are sent to the channel only if it is the output channel for the job executing, even if it is the output channel for previous jobs that have not finished printing.

continued

Table 2-8 %LocalTalk%, %LocalTalk_NV%, and %LocalTalk_Pending% parameters (continued)

Key	Type	Default	Description
Enabled	*boolean*	true	This parameter indicates whether data arriving at the printer should be scheduled for execution. If it is true, data is executed. If it is false, data is not executed. Note that this parameter cannot be modified.
HasNames	*boolean*	false	This read-only constant indicates whether the device supports named files.
Interpreter	*name*	/PostScript	This parameter indicates the type of executable job represented by the arriving data.
LocalTalkType	*string*	(LaserWriter)	This parameter represents the Type portion of the LocalTalk entity name. It is set to the name of the printer type. In the case of the LaserWriter 4/600 PS printer, the type is LaserWriter.
NodeID	*integer*	0	This read-only constant represents the local network address of the printer. Legal addresses are values between 128 and 254. A value of 0 indicates that the address has not yet been set.
On	*boolean*	true	This parameter indicates whether or not the printer driver for the communications device is turned on and able to receive and send data. If this value is false, data sent to the printer is lost. This parameter cannot be modified. If you try to modify it, you will get a configuration error.
Type	*name*	/Communications	This read-only constant indicates the general category of device represented by the parameter set.

NOTE All values, with the exception of Type, persist across power cycles and restarts. Parameter names in the first column of this table are all one word; names may have been split for visual clarity.

Engine Device Parameters

The `%Engine%` device contains parameters that control the print engine itself. The LaserWriter 4/600 PS printer's `%Engine%` device contains the parameters listed in Table 2-9.

Table 2-9 `%Engine%` communication parameters

Key	Type	Default	Details
`Darkness`	*real*	`0.5`	This parameter controls the amount of toner applied to the paper, and therefore the darkness of the rendered page. A value of `0.0` signifies the minimum darkness, and a value of `1.0` signifies the maximum darkness. Values outside this range are not legal. The LaserWriter 4/600 PS printer supports 16 levels of darkness, so this parameter is divided into 16 steps. A value of `0.0` is not distinguishable from `0.05`, but it is distinguishable from `0.1`. Changes in the `Darkness` parameter are not sent to the engine until there are no pages in the paper path, either feeding or being copied. This value persists across power cycles.
`Type`	*name*	`/Parameters`	This read-only constant always returns a value of `/Parameters`.

Resource Categories

In PostScript language Level 2, PostScript objects such as fonts, patterns, and filters can be managed as open-ended collections of resources grouped into categories. A resource is requested by resource category and name. If the resource does not reside in virtual memory, the resource management mechanism loads it from an external source, such as a disk, a ROM cartridge, or a network file server. The *PostScript Language Reference Manual*, second edition, discusses named resources in detail.

There are several groups of resources:

- New resources in the regular resource categories can be added. These include such items as font and pattern resources (see Table 2-10).
- Categories of implicit resources represent built-in capabilities of the LaserWriter 4/600 PS interpreter. For example, the `FormType` category indicates that the interpreter understands Type 1 only (see Table 2-11).
- Some resources are used to define new categories (see Table 2-12).

Most of the instances listed in the following tables are described in the *PostScript Language Reference Manual*, second edition, or the *PostScript Language Reference Manual Supplement*.

Table 2-10 lists the new resources in regular resource categories.

Table 2-10 Regular resource categories

Category name	Instances
Font	AvantGarde-Book AvantGarde-BookOblique AvantGarde-Demi AvantGarde-DemiOblique Bookman-Demi Bookman-DemiItalic Bookman-Light Bookman-LightItalic Courier Courier-Bold Courier-BoldOblique Courier-Oblique Helvetica Helvetica-Bold Helvetica-BoldOblique Helvetica-Narrow Helvetica-Narrow-Bold Helvetica-Narrow-BoldOblique Helvetica-Narrow-Oblique Helvetica-Oblique NewCenturySchlbk-Bold NewCenturySchlbk-BoldItalic NewCenturySchlbk-Italic NewCenturySchlbk-Roman Palatino-Bold Palatino-BoldItalic Palatino-Italic Palatino-Roman Symbol Times-Bold Times-BoldItalic Times-Italic Times-Roman ZapfChancery-MediumItalic ZapfDingbats

continued

Table 2-10 Regular resource categories (continued)

Category name	Instances
`Encoding`	`ISOLatin1Encoding` `StandardEncoding`
`Form`	No instances defined.
`Pattern`	No instances defined.

`ProcSet`	`SamplePages`
	`ProcSet` is a procedure set, or a dictionary, containing named procedures. The LaserWriter 4/600 PS printer has one predefined `ProcSet` instance. `SamplePages` contains named start page procedures, including `StartPage`, which is used to print out the LaserWriter 4/600 PS startup page. You can print out the startup page at any time by executing the following PostScript code:
	`/SamplePages /ProcSet findresource /StartPage get cvx exec`

`ColorSpace`	No instances defined.

`Halftone`	`DefaultHalftone`
	`85x45`
	`106x45d`
	`60x45`

`ColorRendering`	`DefaultColorRendering`
`OutputDevice`	`Default` The LaserWriter 4/600 PS printer supports the `OutputDevice` type `Default`. This resource category has an instance for each type plus an instance called `Default` for the default output device characteristics. The default output device is equivalent to the `Printer` instance. Each instance is represented as a dictionary that contains key-value pairs describing certain capabilities of that particular output device.

Table 2-11 lists categories of implicit resources that have the built-in capabilities of the LaserWriter 4/600 PS interpreter.

Table 2-11 Resources with implicit instances

Category name	Instances
Filter	ASCII85Decode ASCII85Encode ASCIIHexDecode ASCIIHexEncode CCITTFaxDecode CCITTFaxEncode DCTDecode DCTEncode LZWDecode LZWEncode NullEncode RunLengthDecode RunLengthEncode SubFileDecode
ColorSpaceFamily	CIEBasedA CIEBasedABC DeviceCMYK DeviceGray DeviceRGB Indexed Pattern Separation
ColorRenderingType	1
FMaptype	2, 3, 4, 5, 6, 7, 8
FormType	1
FontType	0, 1, 3, 4, 5, 6, 42 The integers 0, 1, 3, 4, 5, and 6 are the instances supported for the LaserWriter 4/600 PS printer. Type 42, a TrueType font with the PostScript rasterizer, is also supported.
HalftoneType	1, 2, 3, 4, 5, 6
ImageType	1
IODevice	%Engine% %LocalTalk% %LocalTalk_NV% %LocalTalk_Pending% %rom%
PatternType	1

Table 2-12 defines resources used to define new categories.

Table 2-12 Resources to define new categories

Category	Instances
Category	Category ColorRendering ColorRenderingType ColorSpace ColorSpaceFamily Emulator Encoding Filter FMapType Font FontType Form FormType Generic Halftone HalftoneType HWOptions ImageType IODevice OutputDevice Pattern PatternType ProcSet
Generic	No instances defined

The LaserWriter 4/600 PS printer supports the `OutputDevice` type `Default`. This resource category has an instance for each type plus an instance called `Default` for the default output device characteristics. The default output device is equivalent to the `Printer` instance. Table 2-13 lists the contents of the resource dictionary for `OutputDevice` type `Printer`.

Table 2-13 Resource dictionary for `OutputDevice` type `Printer`

Key	Value
HWResolution	[[600 600]]
ManualSize	[[612 792] [612 1008] [595 842] [522 756] [516 729] [297 684] [279 540] [460 649] [312 624]]
PageSize	[[612 792] [612 1008] [595 842] [522 756] [516 729] [297 684] [279 540] [460 649] [312 624]]

CHAPTER 3

PostScript Level 1 Compatibility Operators

The PostScript language is designed to be a universal standard for device-independent page descriptions, but each PostScript language implementation supports features and capabilities particular to that implementation, and for that reason PostScript has undergone a number of significant extensions. Appendix D, "Compatibility Strategies," in the *PostScript Language Reference Manual*, second edition, presents guidelines for taking advantage of language extensions while maintaining compatibility with PostScript interpreters.

The LaserWriter 4/600 PS printer is a Level 2 printer. This chapter describes the compatibility operators that make the LaserWriter 4/600 PS printer compatible with existing PostScript Level 1 language driver software. It also explains how to set system, page device, user, device, and communication parameters.

Overview of Compatibility Operators

The compatibility operators present in the LaserWriter 4/600 PS printer appear in three dictionaries: `statusdict`, `userdict`, and `systemdict`. These operators set

- system parameters
- page device parameters
- user parameters
- device parameters
- communication parameters

This chapter describes the page size and paper tray compatibility operators. It also shows you how to set the parameters just listed.

▲ **WARNING**
The operators described in this chapter are included only to support compatibility. You should not use them in PostScript Level 2 programs. ▲

Table 3-1 provides a complete list of compatibility operators arranged by dictionary group.

Table 3-1 Compatibility operators

statusdict

a4tray	monarchtray
appletalktype	pagecount
b5tray	pagestackorder
buildtime	papersize
byteorder	printername
c5tray	product
checkpassword	ramsize
com10tray	realformat
defaulttimeouts	revision
dlenvelopetray	setdefaulttimeouts
dltray	setdostartpage
dostartpage	setjobtimeout
executivetray	setmargins
jobname	setpagestackorder
jobtimeout	setprintername
legaltray	setsoftwareiomode
lettertray	softwareiomode
manualfeed	waittimeout
margins	

userdict

#copies	dl
a4	legal
a4small	letter
a5	lettersmall
b5	monarch
c5	note
com10	

systemdict

devdismount	devmount
devforall	devstatus
devformat	

Page Size Compatibility Operators

The page size operators are in the user dictionary `userdict`. Each operator requests a specific paper size and imaging boundary box, as shown in Table 3-2. The operators use the sizes indicated in the table as a page device `PageSize` parameter. All operators set `PageSizePolicy` to `7`, which guarantees that the imaging area established is correct for the size requested, regardless of which paper tray is chosen.

The only error generated is `limitcheck`, which occurs when there is not sufficient memory for the imaging area requested.

Table 3-2 Page size compatibility operators

Operator	Page size	Imaging boundary box	Imageable area
`a4`	[595 842]	null	[6.96 9.66 579.12 832.86]
`a4small`	[595 842]	[25 25 570 817]	[6.96 9.66 579.12 832.86]
`b5`	[516 729]	null	[7.2 9.66 502.56 722.7]
`c5`	[459 649]	null	[6.48 6.06 448.08 643.02]
`com10`	[297 684]	null	[6.48 6.06 294.48 672.067]
`dl`	[312 624]	null	[6.48 8.46 306.0 614.46]
`legal`	[612 1008]	null	[7.20 9.06 598.56 997.38]
`letter`	[612 792]	null	[7.08 9.66 598.44 780.3]
`lettersmall`	[612 792]	[25 25 587 767]	[7.08 9.66 598.44 780.3]
`monarch`	[279 540]	null	[6.48 4.26 275.78 526.26]
`note`	[*width height*]	[25 25 *width* –25 *height* –25]	

NOTE Units shown (595, for example) are points. 1 point is $^{1}/_{72}$ inch.

The `note` operator modifies the current page device settings by establishing an `ImagingBBox` parameter of [25 25 *width* minus 25 *height* minus 25] if the current `PageSize` parameter is [*width height*]. The imageable area is the same as the page size.

Paper Tray Compatibility Operators

The paper tray operators are in the status dictionary `statusdict`. Each operator requests a tray containing a specific paper size. The only difference between the operators is the size of paper requested. The `PageSize` and `ImagingBBox` parameters requested are the same as those for the corresponding page size operator. These operators use the specified size as a page device `PageSize` parameter. All the operators set the `PageSizePolicy` parameter to `0`, which guarantees that a `rangecheck` error is generated if a tray containing the requested paper size is not found. In addition, a `limitcheck` error can occur if there is not sufficient memory for the imaging area requested.

The paper tray compatibility operators and associated page sizes and imaging boundary box parameters are shown in Table 3-3.

Table 3-3 Paper tray compatibility operators

Operator	Page size	Imaging boundary box
`a4tray`	[595 842]	null
`b5tray`	[516 729]	null
`c5tray`	[459 649]	null
`com10tray`	[297 684]	null
`dltray`	[312 624]	null
`legaltray`	[612 1008]	null
`lettertray`	[612 792]	null
`monarchtray`	[279 540]	null

Setting System Parameters

System parameters have a systemwide impact, and they may be changed only by a program that presents a valid password. Alterations made to system parameters may persist through restarts of the PostScript interpreter. This section describes the compatibility operators that set Level 2 system parameters. It also shows the default values (values set at the factory) of the parameters.

buildtime

Syntax – **`buildtime`** *int*

Definition This operator is a time stamp that identifies the specific time a build of the PostScript interpreter took place. It returns an integer with the same value as the system parameter `BuildTime`.

Default value: The actual date the interpreter is built

Error(s) `stackoverflow`

byteorder

Syntax - **`byteorder`** *bool*

Definition This is a boolean operator with the same value as the system parameter `ByteOrder`.

Default value: `false`

Error(s) `stackoverflow`

checkpassword

Syntax *int* **`checkpassword`** *bool*

or

string **`checkpassword`** *bool*

Definition This operator checks whether *string* or *int* (*int* is converted to a *string*) is the valid password for either `SystemParamsPassword` or `StartJobPassword`. If the password is valid, it returns `true`. Otherwise, after delaying for one second, it returns `false`.

Default value: `0` or `false`

Error(s) `stackoverflow`, `stackunderflow`, `typecheck`

defaulttimeouts

Syntax – **`defaulttimeouts`** *job manualfeed wait*

Definition This operator returns the following values:

- default job
- manual feed
- wait timeout

Default values: `0 60 40`

Time is measured in seconds.

Error(s) `stackoverflow`

dostartpage

Syntax – **`dostartpage`** *bool*

Definition This operator returns the boolean value set during the most recent execution of `DoStartPage`.

Default value: `true`

Error(s) `stackoverflow`

printername

Syntax *string* **`printername`** *substring*

Definition This operator stores the value of the system parameter `PrinterName` in *string* and returns a string object designating the substring actually used.

Default value: `(LaserWriter 4/600 PS)`

Error(s) `stackoverflow`, `stackunderflow`, `rangecheck`, `typecheck`

product

Syntax – **`product`** *string*

Definition This operator is a *string* object that is the name of the laser printer product. If a program needs to know what type of printer it is running on, it should check this string.

Default value: `(LaserWriter 4/600 PS)`

Error(s) `stackoverflow`

ramsize

Syntax – **`ramsize`** *int*

Definition This operator returns the number of bytes of RAM in the printer. It does this by returning an integer with the same value as the system parameter `RamSize`.

Default value: Depends upon the amount of RAM installed.

Error(s) `stackoverflow`

realformat

Syntax – **`realformat`** *string*

Definition This operator is a string with the same value as the system parameter `RealFormat`.

Default value: `(IEEE)`

Error(s) `stackoverflow`

revision

Syntax – **`revision`** *int*

Definition This operator is an integer that designates the current revision level of the machine-dependent portion of the PostScript interpreter. It does this by returning an integer with the same value as the system parameter `Revision`.

Default value: `1`

Error(s) `stackoverflow`

setdefaulttimeouts

Syntax *job manualfeed wait* **`setdefaulttimeouts`** –

Definition This operator establishes the default values for the three timeouts. Default values: `0 60 40`

Error(s) `invalidaccess`, `rangecheck`, `stackunderflow`, `typecheck`

setdostartpage

Syntax *bool* **`setdostartpage`** –

Definition This operator sets the system parameter `DoStartPage` to the value of *bool*. A *boolean* value `true` means the startup page will print after power up. A value `false` means that no startup page will print after power up.

Default value: `true`

Error(s) `invalidaccess`, `stackunderflow`, `typecheck`

setprintername

Syntax *string* **setprintername** –

Definition This operator establishes the string to be the printer's name by setting the system parameter `PrinterName` to the value of *string*.

The string should be no longer than 32 characters. It should consist entirely of printing characters and should not contain the following three characters: colon (`:`), at sign (`@`), or asterisk (`*`).

Default value: `(LaserWriter 4/600 PS)`

Error(s) `invalidaccess`, `limitcheck`, `stackunderflow`, `typecheck`

setsoftwareiomode

Syntax *int* **setsoftwareiomode** -

Definition This operator sets the values of the Interpreter, and, if appropriate, Protocol device parameters for the current communications device parameter set. The valid settings are:

- `0`, which indicates an `Interpreter` value of `PostScript`, with `Protocol` value `Normal`
- `100`, which indicates an `Interpreter` value of `PostScript`, with `Protocol` value `Binary`

Default value: `0`

Error(s) `stackoverflow`

softwareiomode

Syntax - **softwareiomode** *int*

Definition This operator returns an integer value, which indicates the interpretation code for the current communications device. See `setsoftwareiomode`.

Default value: `0`

Error(s) `stackoverflow`

Setting Page Device Parameters

Page device parameters control page formatting, for example, margins and paper size. They also control the output processing of pages, determining whether pages are output face up or face down, which paper tray is selected, and so forth. This section describes compatibility operators that set Level 2 page device parameters in the LaserWriter 4/600 PS printer. It also shows the default values (values set at the factory) of the parameters.

margins

Syntax – **`margins`** *top left*

Definition This operator returns the *x* and *y* components of the page device `Margins` parameter as *left* and *top*, respectively.

Default values: `0 0`

Error(s) `stackoverflow`

pagecount

Syntax – **`pagecount`** *int*

Definition This operator returns the value of the system parameter `PageCount`. That is, it returns the number of pages that have been printed by the LaserWriter 4/600 PS printer.

Default value: `0`

Error(s) `stackoverflow`

pagestackorder

Syntax – **`pagestackorder`** *bool*

Definition This operator returns the last value set by `setpagestackorder`. It should be `true` if the pages are to be stacked face down in the output tray, and `false` if the pages are to be stacked face up.

Default value: `true`

Error(s) `stackoverflow`

papersize

Syntax – **`papersize`** *name bool*

Definition This operator returns the name of the compatibility operator that selects a tray containing paper of the current size. For example, if the current paper size is letter, this operator returns the value `/lettertray`. The value of *bool* is `true` if the page feeds short edge first, `false` if the page feeds long edge first.

Default values: `lettertray true`

Error(s) `stackoverflow`

setmargins

Syntax *top left* **`setmargins`** –

Definition This operator sets the two margin adjustment parameters. Any integers in the range `-128` to `127` are legal values for the top and left margins.

Default values: `0 0`

Error(s) `invalidaccess`, `rangecheck`, `stackunderflow`, `typecheck`

setpagestackorder

Syntax *bool* **`setpagestackorder`** –

Definition This operator sets the value returned by `pagestackorder`. A value of `true` indicates that the output is going to the face-down tray. A value of `false` indicates that the output is directed to the face-up tray.

Default value: `true`

Error(s) `invalidaccess`, `rangecheck`, `stackunderflow`, `typecheck`

Setting User Parameters

User parameters enable you to control certain printer functions, such as defining job names and selecting the length of time the printer will wait before aborting a print job. Using a PostScript language program, you can change user parameters within reasonable limits, without special authorization. This section describes the compatibility operators that set Level 2 user parameters in the LaserWriter 4/600 PS printer.

jobname

Syntax – **`jobname`** *string*

Definition This operator is a string with the same value as the user parameter `JobName`. It specifies the name of the current job. If a PostScript language program defines `jobname`, status responses generated during the remainder of the job in progress will include a job field that reports the text of this string. The string should not contain the character semicolon (`;`) or end bracket (`]`), since they disrupt the syntax of the status messages.

Default value: Empty string `()`

Error(s) `stackoverflow`

jobtimeout

Syntax – **`jobtimeout`** *int*

Definition This operator returns the number of seconds remaining before the job timeout will occur. It does this by returning the value of the user parameter `JobTimeout`. If the returned value is `0`, the job will never time out.

Default value: `0`

Error(s) `stackoverflow`

manualfeedtimeout

Syntax – **`manualfeedtimeout`** *int*

Definition This operator is an integer that works in conjunction with the page device parameter `ManualFeed` to determine whether a page is fed manually. If either `manualfeed` or `ManualFeed` is true at the time of a `showpage` or `copypage`, then that page will be fed manually. The values of `manualfeed` and `ManualFeed` are determined independently, and the setting of one does not affect the value of the other.

Default value: `60`

Error(s) `stackoverflow`

setjobtimeout

Syntax *int* **`setjobtimeout`** –

Definition This operator sets the timeout for the current job to the value *int*, a non-negative integer specifying a time interval in seconds. If the current job continues for *int* seconds without either completing or executing `setjobtimeout` again, the PostScript interpreter executes a `timeout` error. The value `0` disables the job timeout.

At the beginning of a job, the server initially sets the job timeout to the default job timeout returned by `defaulttimeouts`. However, in interactive mode, the initial job timeout is always `0`.

Default value: `0`

Error(s) `rangecheck`, `stackunderflow`, `typecheck`

waittimeout

Syntax – **`waittimeout`** *int*

Definition This operator is the wait timeout currently in effect. It is the number of seconds the LaserWriter 4/600 PS printer will wait to receive additional characters from the host before it aborts the current job by executing a `timeout`. At the beginning of a job, the server initializes `waittimeout` to the default wait time returned by `defaulttimeout`. However, a PostScript language program may change it to any nonnegative integer value. In interactive mode, the wait timeout is always `0`.

Default value: `40`

Error(s) `stackoverflow`

Setting Device Parameters

Each PostScript interpreter supports a collection of input/output devices, such as disks, cartridges, and printers. Device parameters perform functions similar to the functions performed by system parameters. However, they are device dependent, which means they impact only the printer for which they are set. This section describes the compatibility operator that sets a Level 2 device parameter. It also shows the default value (value set at the factory) of the parameter.

manualfeed

Syntax – **`manualfeed`** *bool*

Definition This operator is a boolean that works in conjunction with the page device parameter `ManualFeed` to determine whether a page is to be fed manually. If either `manualfeed` or `ManualFeed` is `true` at the time of a `showpage` or `copypage`, then that page will be fed manually. Otherwise, the page will be fed automatically. The `manualfeed` compatibility operator is present in `statusdict` only if the page device parameter `ManualFeed` is defined for the product.

Default value: `false`

Error(s) `stackoverflow`

Setting Communication Parameters

Communication parameters control the functions of the different communication channels, such as the LocalTalk channel. The following compatibility operator returns the Level 2 communications parameter in the LaserWriter 4/600 PS printer. The default value is the value set at the factory.

appletalktype

Syntax – **`appletalktype`** *string*

Definition This operator is a string with the same value as the `LocalTalkType` device parameter found in the `%LocalTalk%` parameter set.

Default value: `(LaserWriter)`

Error(s) `stackoverflow`

CHAPTER 4

Communication Channels

This chapter deals with the software support for the LocalTalk communication channel. It describes

- LocalTalk communication
- communication protocols
- communication dynamics between the host computer and the printer
- the queries and messages that enable the host computer or the user to know what the printer is doing

You will find information about the physical characteristics of the communication channel connectors in the section "Communication Port for LocalTalk" on page 4 of Chapter 1. Further information is available in the following sections: "Communication Device Parameters" on page 29 of Chapter 2, and "Setting Communication Parameters" on page 50 of Chapter 3.

LocalTalk

The LaserWriter 4/600 PS printer can communicate with the host computer or other peripheral devices using the AppleTalk network system. The printer implements the AppleTalk standard protocol using the LocalTalk physical link. The transceiver for transmitting and receiving information over LocalTalk is built into every Macintosh host computer as well as into the LaserWriter 4/600 PS printer, making it easy to set up the printer-host interface.

Communication Protocols

Since the LaserWriter 4/600 PS is strictly designed to provide a low-cost, high-resolution printing solution for the Macintosh computer, it does not support the simple or binary serial communication protocols.

Communication Dynamics

Data transmitted by the LaserWriter 4/600 PS printer, whether it is generated by executing the PostScript language program or by some other spontaneous event such as an error, is logically asynchronous with respect to the data received. This means that the host computer must be prepared to consume data received from the printer while waiting to send more data to the printer. If the host computer is not set up to do this, the printer and the host may each wait for the other to consume data, and a deadlock will occur.

Typically, characters written to the standard output file by PostScript operators such as `print` are not sent immediately. They are buffered until a flush is executed.

A flush occurs automatically:

- at the end of a job
- in interactive mode, whenever the user is prompted to make an entry

IMPORTANT

If a PostScript language program writes data that is needed immediately by the host, for example, a reply to an environmental query, it is important to flush after writing the data. Otherwise, a deadlock may occur. ▲

Status Queries and Spontaneous Messages

The LaserWriter 4/600 PS printer provides a status query facility that enables the host or user to determine what the printer is doing. The printer responds to a status query asynchronously with respect to normal job execution. That is, it sends a response immediately, regardless of what has gone on before, or how much input data has been buffered. This facility primarily enables spoolers (printer control programs) to track the activities of the LaserWriter 4/600 PS printers under their control.

If the printer receives a PAPStatus (Printer Access Protocol Status) request packet from the active input channel in the AppleTalk call, it replies with a one-line status message over the active port's output channel. The message is bracketed by the text sequences `%%[` and `]%%`, to enable the host software to extract the message from the ordinary data generated by the job being executed.

The status message has standardized syntax that is intended to be machine readable. It consists of one or more key value pairs, separated by semicolons, for example:

```
%%[ job: Eddie's report; status: busy; source: LocalTalk ]%%
```

The possible keys, values, and meanings are as follows:

`job` The name of the job is stored as `jobname` entry in `statusdict` (Table 3-1 on page 39). This field is omitted if the current job has not defined `jobname`.

`status` Indicates what the printer is currently doing:

- `idle` indicates no job is in progress.
- `busy` means the printer is executing the user's PostScript language program.
- `waiting` means that the I/O is waiting in the middle of a job.
- `printing` indicates that the printer is printing and that paper is in motion.
- `PrinterError: reason` means that there is a printer error such as a paper jam or printer out of paper.
- `initializing` indicates the printer is starting up.

`source` `LocalTalk` indicates the source of the job that the server is currently executing (this field is omitted if the server is idle)

All messages generated spontaneously by the server (as opposed to those messages produced when the PostScript language program executes `print`) conform to the same syntax as status messages. They are sent as ordinary data through the communication channel in sequence with any other characters written to the standard output file. Consequently, they are always bracketed with `%%[` and `]%%`.

The following messages are generated spontaneously by the server:

```
%%[ Error: error; OffendingCommand: operator ]%%
```

This message indicates that an error has been detected by the PostScript interpreter, and the standard error handler (`handleerror`) has been invoked.

`error`	This is the name of the error operator originally invoked.
`operator`	This is the operator or other PostScript object being executed at the time of the error.

Refer to the *PostScript Language Reference Manual*, second edition, for further information on error handling.

```
%%[ PrinterError: reason ]%%
```

This message indicates that a problem has been reported by the printer mechanism.

`reason`	Indicates the type of problem: no paper, no paper tray, paper jam, cover open, and so forth.

A printer error can occur only during execution of `showpage` or `copypage`, that is, when the printer is actually trying to print a page. After generating this message, the server usually waits for the condition to be corrected and then continues printing automatically.

```
%%[ Flushing: rest of job (to end-of-file) will be ignored ]%%
```

This message indicates that because of a previous error or abort condition, for example, `stop` or Control-C interrupt, the remainder of the current job is being discarded. The server reads and discards characters from the standard input file until it receives an end-of-file indication.

```
%%[ exitserver: permanent state may be changed ]%%
```

This message indicates that the PostScript language program has successfully exited from the server's normal `save/restore` context and may now make permanent changes to the system parameters or to the virtual memory.

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