

APPENDIX C

Implementation Limits

In general, PDF does not restrict the size or quantity of things described in the file format, such as numbers, arrays, images, and so on. However, a PDF consumer application running on a particular processor and in a particular operating environment does have such limits. If an application attempts to perform an action that exceeds one of the limits, it displays an error.

PostScript interpreters also have implementation limits, listed in Appendix B of the *PostScript Language Reference*, Third Edition. It is possible to construct a PDF file that does not violate application limits but does not print on a PostScript printer. Keep in mind that these limits vary according to the PostScript LanguageLevel, interpreter version, and the amount of memory available to the interpreter.

This appendix describes typical limits for Acrobat. These limits fall into two main classes:

- *Architectural limits.* The hardware on which a viewer application executes imposes certain constraints. For example, an integer is usually represented in 32 bits, limiting the range of allowed integers. In addition, the design of the software imposes other constraints, such as a limit to the number of elements in an array or string.
- *Memory limits.* The amount of memory available to a viewer application limits the number of memory-consuming objects that can be held simultaneously.

PDF itself has one architectural limit: Because ten digits are allocated to byte offsets, the size of a file is limited to 10^{10} bytes (approximately 10 gigabytes).

Table C.1 describes the architectural limits for Acrobat viewer applications running on 32-bit machines. Because Acrobat implementations are subject to these

limits, applications producing PDF files are strongly advised to remain within them. Note, however, that memory limits are often exceeded before architectural limits (such as the limit on the number of indirect objects) are reached.

TABLE C.1 Architectural limits

QUANTITY	LIMIT	DESCRIPTION
integer	2,147,483,647	Largest integer value; equal to $2^{31} - 1$.
	-2,147,483,648	Smallest integer value; equal to -2^{31} .
real	$\pm 3.403 \times 10^{38}$	Largest and smallest real values (approximate).
	$\pm 1.175 \times 10^{-38}$	Nonzero real values closest to 0 (approximate). Values closer than these are automatically converted to 0.
	5	Number of significant decimal digits of precision in fractional part (approximate).
		<i>Note: To represent real numbers, Acrobat 6 uses IEEE single-precision floating-point numbers, as described in the IEEE Standard for Binary Floating-Point Arithmetic (see the Bibliography). Previous versions used 32-bit fixed-point numbers (16 bits on either side of the radix point), which have greater precision but a much smaller range than IEEE floating-point numbers. (Acrobat 6 still converts floating-point numbers to fixed point for some components, such as screen display and fonts.)</i>
string (in content stream)	32,767	Maximum length of a string, in bytes. <i>Note: This restriction applies only to strings in content streams. There is no effective restriction on other strings in PDF files.</i>
name	127	Maximum length of a name, in bytes.
indirect object	8,388,607	Maximum number of indirect objects in a PDF file.
q/Q nesting	28	Maximum depth of graphics state nesting by q and Q operators. (This is not a limit of Acrobat as such, but arises from the fact that q and Q are implemented by the PostScript gsave and grestore operators when generating PostScript output; see implementation note 176 in Appendix H.)
DeviceN components	32	Maximum number of colorants or tint components in a DeviceN color space.
CID	65,535	Maximum value of a CID (character identifier).

Acrobat has some additional architectural limits:

- Thumbnail images may be no larger than 106 by 106 samples, and should be created at one-eighth scale for 8.5-by-11-inch and A4-size pages.
- The minimum allowed page size is 3 by 3 units in default user space; the maximum is 14,400 by 14,400 units. In versions of PDF earlier than 1.6 (Acrobat 7.0), the size of the default user space unit was fixed at 1/72 inch, yielding a minimum of approximately 0.04 by 0.04 inch and a maximum of 200 by 200 inches. Beginning with PDF 1.6, the size of the unit may be set on a page-by-page basis; the default remains at 1/72 inch. (See implementation note 177 in Appendix H.)
- The magnification factor of a view is constrained to be between approximately 8 percent and 6400 percent. These limits are not fixed; they vary with the size of the page being displayed, as well as with the size of the pages previously viewed within the file.
- When Acrobat reads a PDF file with a damaged or missing cross-reference table, it attempts to rebuild the table by scanning all the objects in the file. However, the generation numbers of deleted entries are lost if the cross-reference table is missing or severely damaged. Reconstruction fails if any object identifiers do not appear at the start of a line or if the **endobj** keyword does not appear at the start of a line. Also, reconstruction fails if a stream contains a line beginning with the word **endstream**, aside from the required **endstream** that delimits the end of the stream.

Memory limits cannot be characterized as precisely as architectural limits because the amount of available memory and the ways in which it is allocated vary from one product to another. Memory is automatically reallocated from one use to another when necessary: when more memory is needed for a particular purpose, it can be taken from memory allocated to another purpose if that memory is currently unused or its use is nonessential (a cache, for example). Also, data is often saved to a temporary file when memory is limited. Because of this behavior, it is not possible to state limits for such items as the number of pages in a document, number of text annotations or hypertext links on a page, number of graphics objects on a page, or number of fonts on a page or in a document.