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## MP3 (MPEG Layer III Audio Encoding)

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### Format Description Properties

- ID: fdd000012
- Short name: MP3\_ENC
- Content categories: sound
- Format Category: encoding
- Other facets: unitary, binary, symbolic
- Last significant FDD update: 2017-05-03
- Draft status: Full

### Identification and description

<b>Full name</b>	MP3 (common name). MPEG Layer III audio encoding is defined in two ISO/IEC specification families (MPEG-1: 11172-3 and MPEG-2: 13818-3).
<b>Description</b>	MP3 compression employs <i>perceptual coding</i> , an approach based on psychoacoustic models that permit the codec to discard or reduce the precision of audio components that are less audible to human hearing. The three classes of audio compression associated with MPEG-1 and -2 specifications are known as Layers I, II, and III; MP3 is shorthand for Layer III.

	Each higher level designation increases the trade-off between increased syntax and coding complexity and improved coding efficiency. An MP3 file created with a bitrate of 128 kbit/s by about 1/11 the size of an uncompressed <a href="#">LPCM</a> file at compact disk levels of quality (44.1 kHz, 16 bits deep). An MP3 file can also be recorded at higher or lower bit rates, with higher or lower resulting quality. See <a href="#">Notes</a> for more information.
<b>Production phase</b>	Generally used for final-state, end-user delivery.
<b>Relationship to other formats</b>	
<b>Subtype of</b>	MPEG-1 encoding family (ISO/IEC 11172-3), not separately described at this site; see the description for the related <a href="#">MPEG-1</a> (H.261) video encoding format
<b>Subtype of</b>	<a href="#">MPEG-2 family</a> , MPEG-2 Encoding Family
<b>Has subtype</b>	MP3, Constant Bit Rate, not described at this site at this time.
<b>Has subtype</b>	MP3, Variable Bit Rate, not described at this site at this time.
<b>Used by</b>	<a href="#">MP3_FF</a> , MP3 File Format
<b>Used by</b>	<a href="#">AudCom_MP3</a> , Audible.Com MP3
<b>Used by</b>	<a href="#">QTA_MP3</a> , QuickTime Audio, MP3 Codec
<b>Used by</b>	<a href="#">Matroska_MP3</a> , Matroska File Format with MP3 Audio Encoding
<b>Used by</b>	Other file or wrapper formats, not documented at this time

## Local use i

<b>LC experience or existing holdings</b>	MP3_ENC in <a href="#">MP3_FF</a> , used extensively as a service format for American Memory. Used as the accepted format for electronic registration of sound recordings by the U.S. Copyright Office in the CORDS online registration support system (late 1990s, early 2000s), and likely to be used in successor copyright-related systems.
<b>LC preference</b>	General preference for preservation-oriented recorded sound is <a href="#">WAVE LPCM</a> . For compressed sound, MP3 is acceptable, especially at data rates of 128 Kb/s (mono) or 256 Kb/s (stereo) or higher.

## Sustainability factors i

<b>Disclosure</b>	Open standard. Developed by the Moving Picture Experts Group (MPEG), Coding of audio, picture, multimedia and hypermedia information.
<b>Documentation</b>	(1) MPEG-1: ISO/IEC 11172-3. Information technology -- Coding of moving pictures and associated audio for digital

	<p>storage media at up to about 1,5 Mbit/s -- Part 3: Audio. (2) MPEG-2: ISO/IEC 13818-3. Information technology -- Generic coding of moving pictures and associated audio information -- Part 3: Audio.</p> <p>These specifications describe the syntax and semantics for three classes of compression methods known as Layers I, II, and III. MP3 is Layer III. See list of ISO documents in <a href="#">Format specifications</a> below; see also <a href="#">MPEG-1</a> and <a href="#">MPEG-2</a>.</p>
<b>Adoption</b>	Widely adopted for World Wide Web dissemination and playback on specialized devices. Many software tools exist for encoding and decoding.
<b>Licensing and patents</b>	Patents associated with MP3 usage expired in April 2017 according to the <a href="#">Fraunhofer IIS</a> website which states that "on April 23, 2017, Technicolor's mp3 licensing program for certain mp3 related patents and software of Technicolor and Fraunhofer IIS has been terminated." Gary McGrath on his Mad File Format Science blog has a informative series of posts about the <a href="#">demise of MP3 licensing</a> and <a href="#">Wikipedia</a> provides more information about the history and impact of MP3 patents. Historically, various authorities cited a number of patent claims associated with MP3; see for example <a href="#">A Big List of MP3 Patents (and supposed expiration dates)</a> although the practical impact of these claims is not clear.
<b>Transparency</b>	Depends upon algorithms and tools to read; requires sophistication to build tools.
<b>Self-documentation</b>	<p>Technical (coding) information is contained in the headers for the "frames" that make up the MP3 bitstream.</p> <p>The lack of <i>descriptive</i> metadata motivated the producer community to develop <a href="#">ID3</a>, a separately specified structure for metadata to support discovery and other purposes.</p>
<b>External dependencies</b>	None
<b>Technical protection considerations</b>	None

## Quality and functionality factors i

Sound	
<b>Normal rendering</b>	Good support.
<b>Fidelity (high audio resolution)</b>	Moderate to good, given that this is a format for compression. Outcome will depend on the type and extent of compression, and the encoder used. Most commentators report that, at a given data rate, the quality of <a href="#">AAC MP2</a> and <a href="#">AAC MP4</a> (Advanced Audio Coding associated with MPEG-2 and -4)

	<p>encodings surpass the quality of MP3.</p> <p>As is noted in the section of this document devoted to multi-channel sound, MP3 offers a mode called <i>joint stereo</i>, and this is seen as having an adverse effect on fidelity. Variable bit rate may also have an adverse effect. As an example of preferences, the Webcaster <a href="#">SomaFM</a> informs content providers to send files at a "256kb constant bit rate, 'normal stereo' (NOT joint stereo) . . . encoded at the highest quality setting."</p>
<b>Multiple channels</b>	Supports five main channels and an optional LFE (Low Frequency Encoding or Effects) channel, i.e., 5.1 surround sound. <sup>1</sup> Note that in addition to a stereo sound field (aural space representation), MP3 offers <i>joint stereo</i> , a more efficient compression in which the separation of sound is limited to mid- to high frequencies.
<b>Support for user-defined sounds, samples, and patches</b>	None
<b>Functionality beyond normal rendering</b>	None

## File type signifiers and format identifiers i

Tag	Value	Note
<b>Filename extension</b>	Not applicable.	See <a href="#">MP3_FF</a> .
<b>Internet Media Type</b>	Not applicable.	See <a href="#">MP3_FF</a> .
<b>Magic numbers</b>	Not applicable.	See <a href="#">MP3_FF</a> .
<b>Pronom PUID</b>	fmt/134	See <a href="http://www.nationalarchives.gov.uk/PRONOM/fmt/134">http://www.nationalarchives.gov.uk/PRONOM/fmt/134</a> .
<b>Wikidata Title ID</b>	See note.	Wikidata's Q42591 for MP3 does not specify if it is relevant to the MP3_ENC or MP3_FF.

## Notes i

General	
<b>History</b>	The following was paraphrased from the <a href="#">Wikipedia article</a> (consulted February 28, 2012): MP3 was designed by the Moving Picture Experts Group (MPEG) as part of its MPEG-1 standard and later extended in MPEG-2 standard. The first MPEG audio subgroup included engineers from Fraunhofer

IIS, University of Hannover, AT&T-Bell Labs, Thomson-Brandt, CCETT, and others. MPEG-1 Audio (MPEG-1 Part 3), which included MPEG-1 Audio Layer I, II and III was approved as a committee draft of ISO/IEC standard in 1991, finalized in 1992, and published in 1993 (ISO/IEC 11172-3:1993). Backwards compatible MPEG-2 Audio (MPEG-2 Part 3) with additional bit rates and sample rates was published in 1995 (ISO/IEC 13818-3:1995).

## Format specifications i

- ISO/IEC 11172-3:1993. Information technology -- Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s -- Part 3: Audio. Describes syntax and semantics for three classes of compression methods known as Layers I, II, and III.
- ISO/IEC 11172-3:1993/Cor 1:1996
- ISO/IEC 13818-3 (Second edition, 1998). Information technology -- Coding of moving pictures and associated audio information -- Part 3: Audio. Describes syntax and semantics for three classes of compression methods known as Layers I, II, and III.

## Useful references

### URLs

- [How Is MP3 Built?](http://www.id3.org/mp3Frame) (http://www.id3.org/mp3Frame). About the structure of MP3's atoms.
- [MPEG Audio Compression Basics](http://www.datavoyage.com/mpgscript/mpeghdr.htm) (http://www.datavoyage.com/mpgscript/mpeghdr.htm).
- [Discussion of MP3 patents](http://www.mp3-tech.org/patents.html) (http://www.mp3-tech.org/patents.html).
- [SomaFM](http://SomaFM.com/contact/) (http://SomaFM.com/contact/). Information for the providers of sound recordings to this Webcaster.
- [A Big List of MP3 Patents](http://www.tunequest.org/a-big-list-of-mp3-patents/20070226/) (http://www.tunequest.org/a-big-list-of-mp3-patents/20070226/). A list of MP3 patents and their expiration dates. (From 2007)
- [PRONOM entry for fmt/134](http://www.nationalarchives.gov.uk/pronom/fmt/134) (http://www.nationalarchives.gov.uk/pronom/fmt/134). Information in PRONOM from UK National Archives about MP3. PUID: fmt/134.
- [Wikidata entry for Q42591](https://www.wikidata.org/wiki/Q42591) (https://www.wikidata.org/wiki/Q42591). Information in Wikidata about MP3. Wikidata Title ID: Q42591.
- [MP3 licensing officially ends April 23](https://madfileformatscience.garymcgath.com/2017/04/20/mp3-april-23/) (https://madfileformatscience.garymcgath.com/2017/04/20/mp3-april-23/). Post by Gary McGrath on his Mad File Format Science blog about the sunseting of patents
- [MP3 Overview - End of MP3 patents](https://www.iis.fraunhofer.de/en/ff/amm/prod/audiocodec/audiocodecs/mp3.html) (https://www.iis.fraunhofer.de/en/ff/amm/prod/audiocodec/audiocodecs/mp3.html). Notice on Fraunhofer IIS website about cessation of MP3 patents and discontinuation of MP3 products
- [Wikipedia entry for MP3](https://en.wikipedia.org/wiki/MP3) (https://en.wikipedia.org/wiki/MP3). Especially helpful for licensing information

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