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| MPEG Audio Layer I/II/III frame header |
| Within an MPEG audio file, there is no main header, as an MPEG audio file is just built up from a succession of smaller parts called frames. Each frame is a datablock with its own header and audio information.      In the case of Layer I or Layer II, frames are totally independent from each other, so you can cut any part of an MPEG audio file and play it correctly. The player will then play the music starting from the first full valid frame it will find. However, in the case of Layer III, frames are not always independant. Due to the possible use of the "byte reservoir", wich is a kind of internal buffer, frames are often dependent of each other. In the worst case, 9 input frames may be needed before beeing able to decode one single frame.      If you need to retrieve information about an MPEG audio file, you might simply locate the first frame, and retrieve information from its header. Information within other frames should be consistent with the first one, except for the bitrate, as you might be retrieving information from a variable bitrate (VBR) file. In a VBR file, the bitrate can be changed in each frame. It can be used, as an exemple, to keep a constant sound quality during the whole file, by using more bits when the music is more complex and thus requires more bits to be encoded with a similar quality.      The frame header itself is 32 bits (4 bytes) length. The first twelve bits (or first eleven bits in the case of the MPEG 2.5 extension) of a frame header are always set to 1 and are called "frame sync". Frames may also feature an optional CRC checksum. It is 16 bits long and, if it exists, immediately follows the frame header. After the CRC comes the audio data. By re-calculating the CRC and comparing its value to the sored one, you can check if the frame has been altered during transmission of the bitstream.      Here are the details of what is within a frame header:  **0**  **AAAAAAAA AAABBCCD EEEEFFGH IIJJKLMM**   |  |  |  |  | | --- | --- | --- | --- | | **Sign** | **Length (bits)** | **Position (bits)** | **Description** | | A | 11 | (31-21) | Frame sync (all bits must be set) | | B | 2 | (20,19) | MPEG Audio version ID 00 - MPEG Version 2.5 (later extension of MPEG 2) 01 - reserved 10 - MPEG Version 2 (ISO/IEC 13818-3) 11 - MPEG Version 1 (ISO/IEC 11172-3)  Note: MPEG Version 2.5 was added lately to the MPEG 2 standard. It is an extension used for very low bitrate files, allowing the use of lower sampling frequencies. If your decoder does not support this extension, it is recommended for you to use 12 bits for synchronization instead of 11 bits. | | C | 2 | (18,17) | Layer description 00 - reserved 01 - Layer III 10 - Layer II 11 - Layer I | | D | 1 | (16) | Protection bit 0 - Protected by CRC (16bit CRC follows header) 1 - Not protected | | E | 4 | (15,12) | Bitrate index   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | bits | V1,L1 | V1,L2 | V1,L3 | V2,L1 | V2, L2 & L3 | | 0000 | free | free | free | free | free | | 0001 | 32 | 32 | 32 | 32 | 8 | | 0010 | 64 | 48 | 40 | 48 | 16 | | 0011 | 96 | 56 | 48 | 56 | 24 | | 0100 | 128 | 64 | 56 | 64 | 32 | | 0101 | 160 | 80 | 64 | 80 | 40 | | 0110 | 192 | 96 | 80 | 96 | 48 | | 0111 | 224 | 112 | 96 | 112 | 56 | | 1000 | 256 | 128 | 112 | 128 | 64 | | 1001 | 288 | 160 | 128 | 144 | 80 | | 1010 | 320 | 192 | 160 | 160 | 96 | | 1011 | 352 | 224 | 192 | 176 | 112 | | 1100 | 384 | 256 | 224 | 192 | 128 | | 1101 | 416 | 320 | 256 | 224 | 144 | | 1110 | 448 | 384 | 320 | 256 | 160 | | 1111 | bad | bad | bad | bad | bad |   NOTES: All values are in kbps V1 - MPEG Version 1 V2 - MPEG Version 2 and Version 2.5 L1 - Layer I L2 - Layer II L3 - Layer III  "free" means free format. The free bitrate must remain constant, an must be lower than the maximum allowed bitrate. Decoders are not required to support decoding of free bitrate streams. "bad" means that the value is unallowed.  MPEG files may feature variable bitrate (VBR). Each frame may then be created with a different bitrate. It may be used in all layers. Layer III decoders must support this method. Layer I & II decoders may support it.  For Layer II there are some combinations of bitrate and mode which are not allowed. Here is a list of allowed combinations.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | bitrate | single channel | stereo | intensity stereo | dual channel | | free | yes | yes | yes | yes | | 32 | yes | no | no | no | | 48 | yes | no | no | no | | 56 | yes | no | no | no | | 64 | yes | yes | yes | yes | | 80 | yes | no | no | no | | 96 | yes | yes | yes | yes | | 112 | yes | yes | yes | yes | | 128 | yes | yes | yes | yes | | 160 | yes | yes | yes | yes | | 192 | yes | yes | yes | yes | | 224 | no | yes | yes | yes | | 256 | no | yes | yes | yes | | 320 | no | yes | yes | yes | | 384 | no | yes | yes | yes | | | F | 2 | (11,10) | Sampling rate frequency index   |  |  |  |  | | --- | --- | --- | --- | | bits | MPEG1 | MPEG2 | MPEG2.5 | | 00 | 44100 Hz | 22050 Hz | 11025 Hz | | 01 | 48000 Hz | 24000 Hz | 12000 Hz | | 10 | 32000 Hz | 16000 Hz | 8000 Hz | | 11 | reserv. | reserv. | reserv. | | | G | 1 | (9) | Padding bit 0 - frame is not padded 1 - frame is padded with one extra slot  Padding is used to exactly fit the bitrate.As an example: 128kbps 44.1kHz layer II uses a lot of 418 bytes and some of 417 bytes long frames to get the exact 128k bitrate. For Layer I slot is 32 bits long, for Layer II and Layer III slot is 8 bits long. | | H | 1 | (8) | Private bit. This one is only informative. | | I | 2 | (7,6) | Channel Mode 00 - Stereo 01 - Joint stereo (Stereo) 10 - Dual channel (2 mono channels) 11 - Single channel (Mono)  Note: Dual channel files are made of two independant mono channel. Each one uses exactly half the bitrate of the file. Most decoders output them as stereo, but it might not always be the case.     One example of use would be some speech in two different languages carried in the same bitstream, and then an appropriate decoder would decode only the choosen language. | | J | 2 | (5,4) | Mode extension (Only used in Joint stereo)  Mode extension is used to join informations that are of no use for stereo effect, thus reducing needed bits. These bits are dynamically determined by an encoder in Joint stereo mode, and Joint Stereo can be changed from one frame to another, or even switched on or off.  Complete frequency range of MPEG file is divided in subbands There are 32 subbands. For Layer I & II these two bits determine frequency range (bands) where intensity stereo is applied. For Layer III these two bits determine which type of joint stereo is used (intensity stereo or m/s stereo). Frequency range is determined within decompression algorithm.   |  |  | | --- | --- | | Layer I and II | Layer III | | |  |  | | --- | --- | | value | Layer I & II | | 00 | bands 4 to 31 | | 01 | bands 8 to 31 | | 10 | bands 12 to 31 | | 11 | bands 16 to 31 | | |  |  | | --- | --- | | Intensity stereo | MS stereo | | off | off | | on | off | | off | on | | on | on | | | | K | 1 | (3) | Copyright 0 - Audio is not copyrighted 1 - Audio is copyrighted  The copyright has the same meaning as the copyright bit on CDs and DAT tapes, i.e. telling that it is illegal to copy the contents if the bit is set. | | L | 1 | (2) | Original 0 - Copy of original media 1 - Original media  The original bit indicates, if it is set, that the frame is located on its original media. | | M | 2 | (1,0) | Emphasis 00 - none 01 - 50/15 ms 10 - reserved 11 - CCIT J.17  The emphasis indication is here to tell the decoder that the file must be de-emphasized, ie the decoder must 're-equalize' the sound after a Dolby-like noise supression. It is rarely used. | |
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