## MPEG Headers Quick Reference

This is a quick reference to the various headers and streams found in MPEG/DVD. For a complete description you should get a copy of ISO/IEC 13818.   
This is an incomplete work-in-progress

### The header

Every stream or table begins with a 32-bit start code, codes 00 through B8 are video stream start codes (fully defined in 13818-2), and codes B9-FF are stream-id's

|  |  |  |  |
| --- | --- | --- | --- |
| **byte 0** | **byte 1** | **byte 2** | **byte 3** |
| **0000 0000 0000 0000 0000 0001 Start code prefix** | | | Stream ID |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | **Start code** | **used for** | | 0x00 | [Picture](http://dvd.sourceforge.net/dvdinfo/mpeghdrs.html#picture) | | 0x01 - 0xAF | slice | | 0xB0 | reserved | | 0xB1 | reserved | | 0xB2 | user data | | 0xB3 | [Sequence header](http://dvd.sourceforge.net/dvdinfo/mpeghdrs.html#seq) | | 0xB4 | sequence error | | 0xB5 | [extension](http://dvd.sourceforge.net/dvdinfo/mpeghdrs.html#ext) | | 0xB6 | reserved | | 0xB7 | sequence end | | 0xB8 | [Group of Pictures](http://dvd.sourceforge.net/dvdinfo/mpeghdrs.html#gop) | | |  |  | | --- | --- | | **Stream ID** | **used for** | | 0xB9 | Program end (terminates a program stream) | | 0xBA | [Pack header](http://dvd.sourceforge.net/dvdinfo/packhdr.html) | | 0xBB | System Header | | 0xBC | Program Stream Map | | 0xBD | [Private stream 1](http://dvd.sourceforge.net/dvdinfo/pes-hdr.html) | | 0xBE | [Padding stream](http://dvd.sourceforge.net/dvdinfo/pes-hdr.html) | | 0xBF | [Private stream 2](http://dvd.sourceforge.net/dvdinfo/pes-hdr.html) | | 0xC0 - 0xDF | [MPEG-1 or MPEG-2 audio stream](http://dvd.sourceforge.net/dvdinfo/pes-hdr.html) | | 0xE0 - 0xEF | [MPEG-1 or MPEG-2 video stream](http://dvd.sourceforge.net/dvdinfo/pes-hdr.html) | | 0xF0 | ECM Stream | | 0xF1 | EMM Stream | | 0xF2 | ITU-T Rec. H.222.0 | ISO/IEC 13818-1 Annex A or ISO/IEC 13818-6\_DSMCC\_stream | | 0xF3 | ISO/IEC\_13522\_stream | | 0xF4 | ITU-T Rec. H.222.1 type A | | 0xF5 | ITU-T Rec. H.222.1 type B | | 0xF6 | ITU-T Rec. H.222.1 type C | | 0xF7 | ITU-T Rec. H.222.1 type D | | 0xF8 | ITU-T Rec. H.222.1 type E | | 0xF9 | ancillary\_stream | | 0xFA - 0xFE | reserved | | 0xFF | Program Stream Directory | |

### Picture header (0100)

Variable length.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 4** | | | | | | | | **byte 5** | | | | | | | | **byte 6** | | | | | | | | **byte 7** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| temperal sequence number | | | | | | | | | | frame type 1=I, 2=P 3=B, 4=D | | | VBV delay | | | | | | | | | | | | | | | | --- | | |

additional fields appended beginning at byte 7 bit 2:   
If frame type = 2 (P) or 3 (B) the following 4 bits are appended to the header:

|  |  |  |  |
| --- | --- | --- | --- |
| **3** | **2** | **1** | **0** |
| full\_pel\_forward\_vector | forward\_f\_code | | |

This field is used by MPEG-1 only, for MPEG-2 it should be set to 0 1 1 1

If frame type = 3 (B) the following 4 bits are appended to the header:

|  |  |  |  |
| --- | --- | --- | --- |
| **3** | **2** | **1** | **0** |
| full\_pel\_backward\_vector | backward\_f\_code | | |

This field is used by MPEG-1 only, for MPEG-2 it should be set to 0 1 1 1

additionally if the next bit is "1" (extra\_bit\_picture) it is followed by 8 bits of "extra" data (discarded by decoders). This continues until a "0" bit is encountered.

### Sequence header (01B3)

Variable length.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 4** | | | | | | | | **byte 5** | | | | | | | | **byte 6** | | | | | | | | **byte 7** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| horizontal size | | | | | | | | | | | | vertical size | | | | | | | | | | | | aspect ratio | | | | frame rate | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 8** | | | | | | | | **byte 9** | | | | | | | | **byte 10** | | | | | | | | **byte 11** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| bit rate | | | | | | | | | | | | | | | | | | **1** | VBV buffer size | | | | | | | | | | constrained parameters flag | load intra quantiser matrix | (load non-intra quantiser matrix) |

If either load quantiser matrix flag is =1, it is immediately followed by the 64 byte table (moving the "load non-intra quantiser matrix" flag, in the case of "load intra quantiser matrix")

|  |  |  |
| --- | --- | --- |
| **Code** | **Aspect Ratio** | **Frame Rate** |
| **0** | forbidden | forbidden |
| **1** | 1:1 | 24000/1001 (23.976) |
| **2** | 4:3 | 24 |
| **3** | 16:9 | 25 |
| **4** | 2.21:1(not used in DVD) | 30000/1001 (29.97) |
| **5** | reserved | 30 |
| **6** | reserved | 50 |
| **7** | reserved | 60000/1001 (59.94) |
| **8** | reserved | 60 |
| **9** | reserved | reserved |
| **:** | | |
| **15** | reserved | reserved |

### extension header (01B5)

There are a variety of extensions, denoted by the first 4 bits.

#### Sequence\_Extension

Fixed length.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 4** | | | | | | | | **byte 5** | | | | | | | | **byte 6** | | | | | | | | **byte 7** | | | | | | | | **byte 8** | | | | | | | | **byte 9** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0001 | | | | profile and level | | | | | | | | progressive\_sequence | chroma\_format | | horizontal size extension | | vertical size extension | | bit rate extension | | | | | | | | | | | | **1** | vbv buffer size extension | | | | | | | | low delay | frame rate extension n | | frame rate extension d | | | | |

#### Sequence\_Display\_Extension

Variable length.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 4** | | | | | | | | **byte 5** | | | | | | | | **byte 6** | | | | | | | | **byte 7** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0010 | | | | video format | | | color description flag **=0** | (not present) | | | | | | | | | | | | | | | | | | | | | | | |
| **=1** | color primaries | | | | | | | | transfer characteristics | | | | | | | | matrix coefficients | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 5 byte 8** | | | | | | | | **byte 6 byte 9** | | | | | | | | **byte 7 byte 10** | | | | | | | | **byte 8 byte 11** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| display horizontal size | | | | | | | | | | | | | | **1** | display vertical size | | | | | | | | | | | | | | **0 0 0** | | |

#### Picture\_Coding\_Extension

Variable length.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 4** | | | | | | | | **byte 5** | | | | | | | | **byte 6** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 1000 | | | | f\_code[0][0] (forward horizontal) | | | | f\_code[0][1] (forward vertical) | | | | f\_code[1][0] (backward horizontal) | | | | f\_code[1][1] (backward vertical) | | | | intra\_DC\_precision | | picture\_structure | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 7** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| Top\_Field\_First | frame\_pred\_frame\_dct | concealment\_motion\_vectors | q\_scale\_type | intra\_vlc\_format | alternate\_scan | Repeat\_First\_Field | chroma\_420\_type |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 8** | | | | | | | | **byte 9** | | | | | | | | **byte 10** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| progressive\_frame | composite\_display **=0** | **0 0 0 0 0 0** | | | | | | (not present) | | | | | | | | | | | | | | | |
| **=1** | v\_axis | field\_sequence | | | sub\_carrier | burst\_amplitude | | | | | | | sub\_carrier\_phase | | | | | | | | **0 0** | |

### Group Of Pictures (GOP) (01B8)

Fixed length, contains 3 flags and the time stamp for the first frame.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 4** | | | | | | | | **byte 5** | | | | | | | | **byte 6** | | | | | | | | **byte 7** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| drop frame flag | hour (0-23) | | | | | minute (0-59) | | | | | | **1** | second (0-59) | | | | | | frame (0-59) | | | | | | closed GOP | broken GOP | **0 0 0 0 0** | | | | |

[[http://dvd.sourceforge.net/dvdinfo/dvd-sm.gif](http://dvd.sourceforge.net/dvdinfo/index.html)DVD-Video](http://dvd.sourceforge.net/dvdinfo/index.html) home

## Program Stream System Header

The Program Stream System Header contains a 12 byte fixed portion followed by any number of 3-byte [stream\_bound](http://www.mpucoder.com/DVD/sys_hdr.html" \l "sb) entries.

### The fixed portion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **byte 0** | **byte 1** | **byte 2** | **byte 3** | **byte 4** | **byte 5** |
| **0000 0000 0000 0000 0000 0001 1011 1011 Start code (00 00 01 BB)** | | | | header length | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 6** | | | | | | | | **byte 7** | | | | | | | | **byte 8** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **1** | rate\_bound | | | | | | | | | | | | | | | | | | | | | | **1** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 9** | | | | | | | | **byte 10** | | | | | | | | **byte 11** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| audio\_bound | | | | | | fixed\_flag | CSPS\_flag | system\_audio\_lock\_flag | system\_video\_lock\_flag | **1** | video\_bound | | | | | packet\_rate\_restriction\_flag | reserved\_byte | | | | | | |

|  |  |
| --- | --- |
| rate\_bound | 22-bit unsigned integer. Must be greater than or equal to (>=) the maximum value of the **program\_mux\_rate** coded in any [pack](http://www.mpucoder.com/DVD/packhdr.html) of the program stream.  For DVD-Video this value should be 25200 decimal. |
| audio\_bound | 6-bit unsigned integer, ranging from 0 to 32 inclusive. Must be greater than or equal to (>=) the maximum number of audio streams in the program stream.  ISO 13818-1 states this should be the MPEG audio streams, but DVD-Video counts all audio streams.  For DVD-Video this should be the number of audio streams of any type, from 0 to 8 inclusive. |
| fixed\_flag | 1-bit boolean. If TRUE (1) the program stream is multiplexed at a fixed bitrate.  For DVD-Video this flag should be FALSE (0). |
| CSPS\_flag | 1-bit boolean. If TRUE (1) the program stream meets the requirements of a "Constrained System parameter Program Stream".  For DVD-Video this flag must be FALSE (0). |
| system\_audio\_lock\_flag | 1-bit boolean. TRUE (1) indicates that there is a specified constant rational relationship between the audio sampling rate and the system\_clock\_frequency (27MHz).  For DVD-Video this flag should be TRUE (1). |
| system\_video\_lock\_flag | 1-bit boolean. TRUE (1) indicates that there is a specified constant rational relationship between the video picture rate and the system\_clock\_frequency (27MHz).  For DVD-Video this flag should be TRUE (1).  The PAL/SECAM ratio is 1080000 system clocks (3600 90KHz clocks) per displayed picture.  The NTSC ratio is 900900 system clocks (3003 90KHz clocks) per displayed picture. This rate differs slightly from the nominal rate for NTSC, but is fixed, and consistent with ITU-601. |
| video\_bound | 5-bit unsigned integer, ranging from 0 to 16 inclusive. Must be greater than or equal to (>=) the maximum number of video streams in the program stream.  For DVD-Video this value will always be 1. |
| packet\_rate\_restriction\_flag | 1-bit boolean. If CSPS\_flag is TRUE (1) this specifies which restraint is applicable to the packet rate, otherwise the flag has no meaning.  For DVD-Video this flag must be FALSE (0). |
| reserved\_byte | 7-bit reserved. Should always equal 111 1111. |

### Stream\_bound entries

These follow immediately after the header. By definition the processing of the Program Stream System Header will continue so long as the most significant bit of the next available byte is set, regardless of the header length.   
Each entry has the following.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 0** | | | | | | | | **byte 1** | | | | | | | | **byte 2** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| stream\_id | | | | | | | | **11** | | P-STD\_buffer\_bound\_scale | P-STD\_buffer\_size\_bound | | | | | | | | | | | | |

|  |  |
| --- | --- |
| stream\_id | 8-bit unsigned integer. Indicates to which stream the following buffer bound applies.  1011 1000 (0xB8) indicates all audio streams.  1011 1001 (0xB9) indicates all video streams.  Any other value must be greater than or equal to 1011 1100 (0xBC) and refers to the stream as defined for PES [stream ID](http://www.mpucoder.com/DVD/mpeghdrs.html) |
| P-STD\_buffer\_bound\_scale | 1-bit boolean. False (0) indicates the multiplier is 128, TRUE (1) indicates the multiplier is 1024.  Must be 0 for audio streams, 1 for video streams. May be 0 or 1 for other types. |
| P-STD\_buffer\_size\_bound | 13-bit unsigned integer. When multiplied by either 128 or 1024, as indicated by P-STD\_buffer\_bound\_scale, defines a value that is greater than or equal to the maximum P-STD buffer size for all packets of the designated stream in the entire program stream. |

Note: While the System header is flexible, for DVD-Video the length and content are fixed. There must be 4 stream\_bound entries:

* 1011 1001 (0xB9) video, maximum P-STD for stream 0xE0. (P-STD\_buffer\_bound\_scale = 1)
* 1011 1000 (0xB8) audio, maximum P-STD for any MPEG audio (0xC0 to 0xC7) streams. If there are none set to 4096 (32x128). (P-STD\_buffer\_bound\_scale = 0)
* 1011 1101 (0xBD) private stream 1 (audio other than MPEG and subpictures). (P-STD\_buffer\_bound\_scale = 1)
* 1001 1111 (0xBF) private stream 2, NAV packs, set to 2x1024.

This means that the length field will contain 18 (6 fixed data bytes plus 12 bytes of stream\_bound data).

|  |
| --- |
| [[http://www.mpucoder.com/DVD/dvd-sm.gif](http://www.mpucoder.com/DVD/index.html)DVD-Video](http://www.mpucoder.com/DVD/index.html) info home |

## Packetized Elementary Stream Headers

Depending on the Stream ID, a Packetized Elementary Stream (PES) header may contain various components.

### The header

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **byte 0** | **byte 1** | **byte 2** | **byte 3** | **byte 4** | **byte 5** |
| **0000 0000 0000 0000 0000 0001 Start code** | | | Stream ID | PES packet length | |

Stream ID's which pertain to DVD

|  |  |  |
| --- | --- | --- |
| **Stream ID** | **Stream type** | **extension present?** |
| 1011 1101 0xBD | Private stream 1 (non MPEG audio, subpictures) | Yes |
| 1011 1110 0xBE | Padding stream | No |
| 1011 1111 0xBF | Private stream 2 (navigation data) | No |
| 110x xxxx 0xC0 - 0xDF | MPEG-1 or MPEG-2 audio stream number x xxxx  note: DVD allows only 8 audio streams | Yes |
| 1110 xxxx 0xE0 - 0xEF | MPEG-1 or MPEG-2 video stream number xxxx  note: DVD allows only 1 video stream | Yes |

### The extension

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 6** | | | | | | | | **byte 7** | | | | | | | | **byte 8** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **10** | | PES scrambling control | | PES priority | data alignment indicator | copyright | original or copy | PTS DTS flags | | ESCR flag | ES rate flag | DSM trick mode flag | additional copy info flag | PES CRC flag | PES extension flag | PES header data length | | | | | | | |

The bit fields of the basic extension:

PES scrambling control -- 00 = not scrambled, others are user defined.

PES priority -- provides 2 priority levels, 0 and 1.

data alignment indicator -- if set to 1 indicates that the PES packet header is immediately followed by the video start code or audio syncword.

copyright -- 1 = packet contains copyrighted material.

original or copy -- 1 = original, 0 = copy.

PTS DTS flags -- Presentation Time Stamp / Decode Time Stamp. 00 = no PTS or DTS data present, 01 is forbidden.   
if set to 10 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **0010** | | | | PTS 32..30 | | | **1** | PTS 29..15 | | | | | | | | | | | | | | | **1** | PTS 14..00 | | | | | | | | | | | | | | | **1** |

PTS DTS flags -- if set to 11 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **0011** | | | | PTS 32..30 | | | **1** | PTS 29..15 | | | | | | | | | | | | | | | **1** | PTS 14..00 | | | | | | | | | | | | | | | **1** |
| **0001** | | | | DTS 32..30 | | | **1** | DTS 29..15 | | | | | | | | | | | | | | | **1** | DTS 14..00 | | | | | | | | | | | | | | | **1** |

presentation and decoder time stamps use the 90KHz clock (SCR / 300)

ESCR -- if set to 1 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **00** | | ESCR base 32..30 | | | **1** | ESCR base 29..15 | | | | | | | | | | | | | | | **1** | ESCR base 14..00 | | | | | | | | | | | | | | | **1** | ESCR ext | | | | | | | | | **1** |

This is the Elementary Stream Clock Reference, used if the stream and system levels are not synchronized (i.e. ESCR differs from SCR in the PACK header).

ES rate -- if set to 1 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **1** | ES rate | | | | | | | | | | | | | | | | | | | | | | **1** |

The rate at which data is delivered for this stream, in units of 50 bytes/second.

DSM trick mode - not used by DVD

additional copy info -- if set to 1 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **1** | additional copy info | | | | | | |

PES CRC flag -- if set to 1 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| previous PES packet CRC | | | | | | | | | | | | | | | | |

The polynomial used is X16 + X12 + X5 + 1

PES extension flag -- if set to 1 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| PES private data flag | pack header field flag | program packet sequence counter flag | P-STD buffer flag | **111** | | | PES extension flag 2 |

The bit fields of the first extension:

PES private data flag -- if set to 1 16 bytes of user defined data is appended to the header data field.

pack header field flag -- if set to 1 the 8-bit pack field length value is appended to the header data field.

program packet sequence counter flag -- if set to 1 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **1** | packet sequence counter | | | | | | | **1** | MPEG1\_MPEG2 identifier | original stuffing length | | | | | |

P-STD buffer flag -- if set to 1 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **01** | | P-STD buffer scale 0 = 128 bytes 1 = 1024 bytes | P-STD buffer size | | | | | | | | | | | | |

PES extension flag 2 -- if set to 1 the following data is appended to the header data field:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **1** | PES extension field length | | | | | | | reserved | | | | | | | |

Which is then followed by the indicated number of bytes.

### The rest of the packet

Following all the extension data are optional stuffing bytes (0xFF), which are included in the header data length, and then the payload.   
In the case of private streams the first byte of the payload is the sub-stream number.

[[http://dvd.sourceforge.net/dvdinfo/dvd-sm.gif](http://dvd.sourceforge.net/dvdinfo/index.html)DVD-Video](http://dvd.sourceforge.net/dvdinfo/index.html) home

## Pack Header

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 0** | | | | | | | | **byte 1** | | | | | | | | **byte 2** | | | | | | | | **byte 3** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **0000 0000 0000 0000 0000 0001 start code** | | | | | | | | | | | | | | | | | | | | | | | | 1011 1010 PACK identifier | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 4** | | | | | | | | **byte 5** | | | | | | | | **byte 6** | | | | | | | | **byte 7** | | | | | | | | **byte 8** | | | | | | | | **byte 9** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **01** | | SCR 32..30 | | | **1** | SCR 29..15 | | | | | | | | | | | | | | | **1** | SCR 14..00 | | | | | | | | | | | | | | | **1** | SCR\_ext | | | | | | | | | **1** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **byte 10** | | | | | | | | **byte 11** | | | | | | | | **byte 12** | | | | | | | | **byte 13** | | | | | | | |
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| Program\_Mux\_Rate | | | | | | | | | | | | | | | | | | | | | | **1** | **1** | reserved | | | | | pack\_stuffing\_length | | |

PACK identifier -- 0xBA

* SCR and SCR\_ext together are the System Clock Reference, a counter driven at 27MHz, used as a reference to synchronize streams. The clock is divided by 300 (to match the 90KHz clocks such as PTS/DTS), the quotient is SCR (33 bits), the remainder is SCR\_ext (9 bits)
* Program\_Mux\_Rate -- This is a 22 bit integer specifying the rate at which the program stream target decoder receives the Program Stream during the pack in which it is included. The value of program\_mux\_rate is measured in units of 50 bytes/second. The value 0 is forbidden.
* pack\_stuffing\_length -- A 3 bit integer specifying the number of stuffing bytes which follow this field.
* stuffing byte -- This is a fixed 8-bit value equal to '1111 1111' that can be inserted by the encoder, for example to meet the requirements of the channel. It is discarded by the decoder.

[[http://dvd.sourceforge.net/dvdinfo/dvd-sm.gif](http://dvd.sourceforge.net/dvdinfo/index.html)DVD-Video](http://dvd.sourceforge.net/dvdinfo/index.html) home

MPEG program stream

From Wikipedia, the free encyclopedia

|  |  |
| --- | --- |
| **MPEG Program Stream** | |
| [**Filename extension**](http://en.wikipedia.org/wiki/Filename_extension) | .mpg, .mpeg, .ps |
| [**Internet media type**](http://en.wikipedia.org/wiki/Internet_media_type) | video/MP2P, video/MP1S[[1]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-0) |
| **Developed by** | [MPEG](http://en.wikipedia.org/wiki/MPEG) |
| **Initial release** | 1993[[2]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-11172-1-1) |
| **Type of format** | [Media container](http://en.wikipedia.org/wiki/Media_container) |
| **Container for** | Audio, video, data |
| **Extended to** | [VOB](http://en.wikipedia.org/wiki/VOB), [EVO](http://en.wikipedia.org/wiki/Enhanced_VOB), [MOD](http://en.wikipedia.org/wiki/MOD_and_TOD_(video_format)) |
| [**Standard(s)**](http://en.wikipedia.org/wiki/International_standard) | ISO/IEC 11172-1[[2]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-11172-1-1), ISO/IEC 13818-1[[3]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-13818-1-2), ITU-T H.222.0[[4]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-h2220-summary-3)[[5]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-h2220-4) |

**Program stream** (**PS** or **MPEG-PS**) is a [container format](http://en.wikipedia.org/wiki/Container_format_(digital)) for [multiplexing](http://en.wikipedia.org/wiki/Multiplexing) [digital audio](http://en.wikipedia.org/wiki/Digital_audio), [video](http://en.wikipedia.org/wiki/Video) and more. The PS format is specified in [MPEG-1](http://en.wikipedia.org/wiki/MPEG-1) Part 1 (ISO/IEC 11172-1) and [MPEG-2](http://en.wikipedia.org/wiki/MPEG-2) Part 1, Systems (ISO/IEC standard 13818-1[[6]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-mpeg2systems-neuron-5)/ITU-T H.222.0[[4]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-h2220-summary-3)[[5]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-h2220-4)). The MPEG-2 Program Stream is analogous and similar to ISO/IEC 11172 Systems layer and it is forward compatible.[[7]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-iso13818-6)[[8]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-7)

Program streams are used on [DVD-Video](http://en.wikipedia.org/wiki/DVD-Video) discs and [HD DVD](http://en.wikipedia.org/wiki/HD_DVD) video discs, but with some restrictions and extensions.[[9]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-mpeg-dvd-8)[[10]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-9) The filename extensions are [VOB](http://en.wikipedia.org/wiki/VOB) and [EVO](http://en.wikipedia.org/wiki/Enhanced_VOB) respectively.

|  |
| --- |
| **Contents**   [[hide](http://en.wikipedia.org/wiki/MPEG_program_stream)]   * [1 Coding structure](http://en.wikipedia.org/wiki/MPEG_program_stream#Coding_structure) * [2 Coding details](http://en.wikipedia.org/wiki/MPEG_program_stream#Coding_details) * [3 See also](http://en.wikipedia.org/wiki/MPEG_program_stream#See_also) * [4 References](http://en.wikipedia.org/wiki/MPEG_program_stream#References) * [5 External links](http://en.wikipedia.org/wiki/MPEG_program_stream#External_links) |

[[edit](http://en.wikipedia.org/w/index.php?title=MPEG_program_stream&action=edit&section=1)]Coding structure

Program streams are created by combining one or more [Packetized Elementary Streams](http://en.wikipedia.org/wiki/Packetized_Elementary_Stream) (PES), which have a common time base, into a single stream. It is designed for reasonably reliable media such as disks, in contrast to [MPEG transport stream](http://en.wikipedia.org/wiki/MPEG_transport_stream)which is for data transmission in which loss of data is likely. Program streams have variable size records and minimal use of [start codes](http://en.wikipedia.org/wiki/Start_code) which would make over the air reception difficult, but has less overhead. Program stream coding layer allows only one [program](http://en.wikipedia.org/wiki/MPEG_transport_stream#Programs) of one or more elementary streams to be packaged into a single stream, in contrast to transport stream, which allows multiple programs.[[7]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-iso13818-6)

MPEG-2 Program stream can contain MPEG-1 Part 2 video, [MPEG-2 Part 2](http://en.wikipedia.org/wiki/MPEG-2_Part_2) video, MPEG-1 Part 3 audio ([MP3](http://en.wikipedia.org/wiki/MPEG-1_Audio_Layer_III), [MP2](http://en.wikipedia.org/wiki/MPEG-1_Audio_Layer_II), [MP1](http://en.wikipedia.org/wiki/MPEG-1_Audio_Layer_I)) or MPEG-2 Part 3 audio.[[7]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-iso13818-6) It can also contain [MPEG-4 Part 2](http://en.wikipedia.org/wiki/MPEG-4_Part_2) video, MPEG-2 Part 7 audio ([AAC](http://en.wikipedia.org/wiki/Advanced_audio_coding)) or MPEG-4 Part 3 (AAC) audio,[[7]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-iso13818-6) but they are rarely used.[[*citation needed*](http://en.wikipedia.org/wiki/Wikipedia:Citation_needed)] The MPEG-2 Program stream has provisions for non-standard data (e.g. [AC-3](http://en.wikipedia.org/wiki/AC-3) audio or subtitles) in the form of so-called private streams.[[11]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-whatisvob-10) International Organization for Standardization authorized[SMPTE](http://en.wikipedia.org/wiki/SMPTE) Registration Authority, LLC as the registration authority for MPEG-2 format identifiers. It publishes list of compression formats which can be encapsulated in MPEG-2 transport stream and program stream.[[12]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-11)

[[edit](http://en.wikipedia.org/w/index.php?title=MPEG_program_stream&action=edit&section=2)]Coding details

If you open up an unencrypted VOB file or other program stream with a [hex editor](http://en.wikipedia.org/wiki/Hex_editor) you will see the following structure.

|  |  |  |
| --- | --- | --- |
| **Partial Program Stream Pack header format**[[13]](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_note-12) | | |
| **Name** | **Number of**[**bits**](http://en.wikipedia.org/wiki/Bit) | **Description** |
| [sync bytes](http://en.wikipedia.org/wiki/Sync_byte) | 32 | 0x000001BA |
| marker bits | 2 | 01[b](http://en.wikipedia.org/wiki/Binary_numeral_system) |
| System clock [32..30] | 3 | [System Clock Reference](http://www.bretl.com/mpeghtml/SCR.HTM) (SCR) bits 32 to 30 |
| marker bit | 1 | 1 Bit always set. |
| System clock [29..15] | 15 | System clock bits 29 to 15 |
| marker bit | 1 | 1 Bit always set. |
| System clock [14..0] | 15 | System clock bits 14 to 0 |
| marker bit | 1 | 1 Bit always set. |
| SCR extension | 9 |  |
| marker bit | 1 | 1 Bit always set. |
| [bit rate](http://en.wikipedia.org/wiki/Bit_rate) | 22 | In units of 50 bytes per second. |
| marker bits | 2 | 11 Bits always set. |
| reserved | 5 | reserved for future use |
| stuffing length | 3 |  |
| stuffing bytes | 8\*stuffing length |  |
| system header (optional) | 0 or more | if system header start code follows: 0x000001BB |

|  |  |  |
| --- | --- | --- |
| **Partial system header format** | | |
| **Name** | **Number of**[**bytes**](http://en.wikipedia.org/wiki/Bytes) | **Description** |
| [sync bytes](http://en.wikipedia.org/wiki/Sync_byte) | 4 | 0x000001BB |
| header length | 2 |  |
| rate bound and marker bits | 3 |  |
| audio bound and flags | 1 |  |
| flags, marker bit, and video bound | 1 |  |
| Packet rate restriction and reserved byte | 1 |  |

[[edit](http://en.wikipedia.org/w/index.php?title=MPEG_program_stream&action=edit&section=3" \o "Edit section: See also)]See also

* [Elementary stream](http://en.wikipedia.org/wiki/Elementary_stream)
* [MPEG transport stream](http://en.wikipedia.org/wiki/MPEG_transport_stream)
* [MPEG-1](http://en.wikipedia.org/wiki/MPEG-1)
* [MPEG-2](http://en.wikipedia.org/wiki/MPEG-2)

[[edit](http://en.wikipedia.org/w/index.php?title=MPEG_program_stream&action=edit&section=4" \o "Edit section: References)]References

1. [**^**](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-0) ["RFC 3555 - MIME Type Registration of RTP Payload Formats"](http://tools.ietf.org/html/rfc3555#page-39). 2003-07. Retrieved 2010-03-20.
2. ^ [***a***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-11172-1_1-0) [***b***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-11172-1_1-1) ISO (1993). ["ISO/IEC 11172-1:1993 - Information technology -- Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s -- Part 1: Systems"](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=19180). Retrieved 2010-07-18.
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4. ^ [***a***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-h2220-summary_3-0) [***b***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-h2220-summary_3-1) ITU-T (2006-05). ["H.222.0 Summary"](http://www.itu.int/dms_pubrec/itu-t/rec/h/T-REC-H.222.0-200605-I!!SUM-HTM-E.htm). Retrieved 2010-06-03.
5. ^ [***a***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-h2220_4-0) [***b***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-h2220_4-1) ITU-T. ["H.222.0 : Information technology - Generic coding of moving pictures and associated audio information: Systems"](http://www.itu.int/rec/T-REC-H.222.0). Retrieved 2010-06-03.
6. [**^**](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-mpeg2systems-neuron_5-0) (PDF) [*ISO/IEC 13818-1:2000 - Information technology -- Generic coding of moving pictures and associated audio information: Systems*](http://neuron2.net/library/mpeg2/iso13818-1.pdf), neuron2.net, 2000-12-01, retrieved 2010-06-03
7. ^ [***a***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-iso13818_6-0) [***b***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-iso13818_6-1) [***c***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-iso13818_6-2) [***d***](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-iso13818_6-3) ISO (2000-12-01) [ISO/IEC 13818-1 : 2000, Second edition](http://neuron2.net/library/mpeg2/iso13818-1.pdf) Page X, Retrieved on 2009-07-25
8. [**^**](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-7) [Data Broadcasting, MPEG-2 Transport Basics, MPEG-2 Program Stream](http://books.google.com/books?id=L7N0LQvBKtYC&lpg=PA39&ots=P9VPn4q1zA&dq=mpeg%20program%20stream%20specification&hl=cs&pg=PA39), Retrieved on 2009-07-25
9. [**^**](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-mpeg-dvd_8-0) [DVD - MPeg differences](http://dvd.sourceforge.net/dvdinfo/dvdmpeg.html), Retrieved on 2009-07-24
10. [**^**](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-9) MPEG.org (July 21, 1996) [DVD Technical Notes - Video Data Specifications](http://www.mpeg.org/MPEG/DVD/Book_B/Video.html), Retrieved on 2009-07-25
11. [**^**](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-whatisvob_10-0) [What is a VOB file](http://www.mpucoder.com/DVD/vobov.html), Retrieved on 2009-07-26
12. [**^**](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-11) [SMPTE Registration Authority, LLC - registration authority for MPEG-2 format identifiers](http://smpte-ra.org/mpegreg/mpeg.html) Retrieved on 2009-07-06
13. [**^**](http://en.wikipedia.org/wiki/MPEG_program_stream#cite_ref-12) [Pack Header](http://dvd.sourceforge.net/dvdinfo/packhdr.html)

[[edit](http://en.wikipedia.org/w/index.php?title=MPEG_program_stream&action=edit&section=5" \o "Edit section: External links)]External links

* [MPEG-2](http://mpeg.chiariglione.org/standards/mpeg-2/mpeg-2.htm)
* [Official MPEG web site](http://mpeg.chiariglione.org/)
* [BBC On MPEG](http://www.bbc.co.uk/rd/pubs/papers/index-mpeg-vision.shtml)
* [RFC 3555](http://tools.ietf.org/html/rfc3555#page-40) - MIME Type Registration of RTP Payload Formats (video/MP2P, video/MP1S)

# MPEG transport stream

From Wikipedia, the free encyclopedia

|  |  |
| --- | --- |
| **MPEG Transport Stream** | |
| [**Filename extension**](http://en.wikipedia.org/wiki/Filename_extension) | .ts |
| [**Internet media type**](http://en.wikipedia.org/wiki/Internet_media_type) | video/MP2T[[1]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-0) |
| **Developed by** | [MPEG](http://en.wikipedia.org/wiki/MPEG) |
| **Initial release** | 1995[[2]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-h2220-199507-1) |
| **Type of format** | [Media container](http://en.wikipedia.org/wiki/Media_container) |
| **Container for** | Audio, video, data |
| **Extended to** | [M2TS](http://en.wikipedia.org/wiki/M2TS), [TOD](http://en.wikipedia.org/wiki/MOD_and_TOD_(video_format)) |
| [**Standard(s)**](http://en.wikipedia.org/wiki/International_standard) | ISO/IEC 13818-1, ITU-T Recommendation H.222.0[[3]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-mpeg2systems-itu-summary-2)[[4]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-mpeg2system2-itu-rec-3)[[5]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-mpeg2systems-neuron-4)[[6]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-13818-1-5) |

**MPEG transport stream** (**TS**) is a standard format for transmission and storage of [audio](http://en.wikipedia.org/wiki/Digital_audio), [video](http://en.wikipedia.org/wiki/Digital_video), and [Program and System Information Protocol](http://en.wikipedia.org/wiki/Program_and_System_Information_Protocol) (PSIP) data,[[7]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-afterdawn-ts-6) and is used in broadcast systems such as [DVB](http://en.wikipedia.org/wiki/Digital_Video_Broadcasting) and [ATSC](http://en.wikipedia.org/wiki/ATSC_Standards).

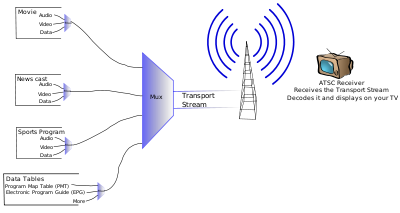
Transport Stream is specified in [MPEG-2](http://en.wikipedia.org/wiki/MPEG-2) Part 1, Systems (formally known as [ISO](http://en.wikipedia.org/wiki/International_Organization_for_Standardization)/[IEC](http://en.wikipedia.org/wiki/International_Electrotechnical_Commission) standard 13818-1 or ITU-T Rec. H.222.0).[[3]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-mpeg2systems-itu-summary-2)[[4]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-mpeg2system2-itu-rec-3)[[5]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-mpeg2systems-neuron-4)

Transport stream specifies a [container format](http://en.wikipedia.org/wiki/Container_format_(digital)) encapsulating [packetized elementary streams](http://en.wikipedia.org/wiki/Packetized_elementary_stream), with [error correction](http://en.wikipedia.org/wiki/Error_detection_and_correction) and stream synchronization features for maintaining transmission integrity when the signal is degraded.

Transport streams differ from the similarly named [Program Streams](http://en.wikipedia.org/wiki/Program_Stream) in several important ways: Program Streams, also called PS, are designed for reasonably reliable media, such as discs (like DVDs), while TS is designed for less reliable transmission, namely terrestrial or satellite broadcast. Further, a Transport Stream may carry multiple Programs.

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| --- |
| Contents  [[hide](http://en.wikipedia.org/wiki/MPEG_transport_stream)]   * [1 Layers of communication](http://en.wikipedia.org/wiki/MPEG_transport_stream#Layers_of_communication) * [2 Important elements of a transport stream](http://en.wikipedia.org/wiki/MPEG_transport_stream#Important_elements_of_a_transport_stream)   + [2.1 Packet](http://en.wikipedia.org/wiki/MPEG_transport_stream#Packet)   + [2.2 PID](http://en.wikipedia.org/wiki/MPEG_transport_stream#PID)   + [2.3 Programs](http://en.wikipedia.org/wiki/MPEG_transport_stream#Programs)   + [2.4 Program Specific Information (PSI)](http://en.wikipedia.org/wiki/MPEG_transport_stream#Program_Specific_Information_.28PSI.29)     - [2.4.1 PAT](http://en.wikipedia.org/wiki/MPEG_transport_stream#PAT)     - [2.4.2 PMT](http://en.wikipedia.org/wiki/MPEG_transport_stream#PMT)   + [2.5 PCR](http://en.wikipedia.org/wiki/MPEG_transport_stream#PCR)   + [2.6 Null packets](http://en.wikipedia.org/wiki/MPEG_transport_stream#Null_packets) * [3 Modifications of transport stream specification for random-access media (M2TS)](http://en.wikipedia.org/wiki/MPEG_transport_stream#Modifications_of_transport_stream_specification_for_random-access_media_.28M2TS.29)   + [3.1 Timecode](http://en.wikipedia.org/wiki/MPEG_transport_stream#Timecode) * [4 See also](http://en.wikipedia.org/wiki/MPEG_transport_stream#See_also) * [5 Programs that open TS files](http://en.wikipedia.org/wiki/MPEG_transport_stream#Programs_that_open_TS_files)   + [5.1 Multiple OS](http://en.wikipedia.org/wiki/MPEG_transport_stream#Multiple_OS)   + [5.2 Linux](http://en.wikipedia.org/wiki/MPEG_transport_stream#Linux)   + [5.3 Windows](http://en.wikipedia.org/wiki/MPEG_transport_stream#Windows)   + [5.4 Mac OS X](http://en.wikipedia.org/wiki/MPEG_transport_stream#Mac_OS_X) * [6 References](http://en.wikipedia.org/wiki/MPEG_transport_stream#References) * [7 External links](http://en.wikipedia.org/wiki/MPEG_transport_stream#External_links) |

## [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=1" \o "Edit section: Layers of communication)]Layers of communication

[](http://en.wikipedia.org/wiki/File:MPEG_Transport_Stream_HL.svg)

[http://bits.wikimedia.org/skins-1.17/common/images/magnify-clip.png](http://en.wikipedia.org/wiki/File:MPEG_Transport_Stream_HL.svg)

Multiple MPEG programs are combined then sent to a transmitting antenna. In the US broadcast digital TV system, an [ATSC receiver](http://en.wikipedia.org/wiki/ATSC_tuner) then decodes the TS and displays it. In most other parts of the world, transmission would be accomplished by one or more variants of the modular DVB system.

Similar to the [OSI network](http://en.wikipedia.org/wiki/OSI_model#Description_of_OSI_layers) [protocol stack](http://en.wikipedia.org/wiki/Protocol_stack), a transport stream is processed by the receiver in layers. An example stream containing video may be processed as follows:

1. Composition of the various programs
2. [Packetized elementary stream](http://en.wikipedia.org/wiki/Packetized_elementary_stream) (PES)
3. [Elementary stream](http://en.wikipedia.org/wiki/Elementary_stream) (ES) — audio or video (the below is for video only)
4. [Group of pictures](http://en.wikipedia.org/wiki/Group_of_pictures) (GOP) — providing random access points
5. Slice — preventing an error from being propagated through intra prediction
6. Macroblock—consisting of 6 to 12 [DCT](http://en.wikipedia.org/wiki/Discrete_cosine_transform) blocks
7. Encoding block or just block—a [DCT](http://en.wikipedia.org/wiki/Discrete_cosine_transform) encoding block, 8x8 pixels

An example of data that is [muxed](http://en.wikipedia.org/wiki/Multiplexer" \o "Multiplexer) into the transport stream is an [electronic program guide](http://en.wikipedia.org/wiki/Electronic_program_guide). See [Program and System Information Protocol](http://en.wikipedia.org/wiki/Program_and_System_Information_Protocol) for more information.

## [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=2)]Important elements of a transport stream

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=3)]Packet

A packet is the basic unit of data in a transport stream. It consists of a [sync byte](http://en.wikipedia.org/wiki/Syncword), whose value is 0x47, followed by three one-[bit](http://en.wikipedia.org/wiki/Bit) flags and a 13-bit Packet Identifier (PID). This is followed by a 4-bit continuity counter. Additional optional transport fields, as signaled in the optional adaptation field, may follow. The rest of the packet consists of payload. Packets are 188 bytes in length[[5]](http://en.wikipedia.org/wiki/MPEG_transport_stream" \l "cite_note-mpeg2systems-neuron-4) , but the communication medium may add some error correction bytes to the packet. [ISDB-T](http://en.wikipedia.org/wiki/ISDB-T) and DVB-T/C/S uses 204 bytes and ATSC 8-VSB, 208 bytes as the size of emission packets (transport stream packet + [FEC](http://en.wikipedia.org/wiki/Forward_error_correction) data). ATSC transmission adds 20 bytes of [Reed-Solomon](http://en.wikipedia.org/wiki/Reed-Solomon) [forward error correction](http://en.wikipedia.org/wiki/Forward_error_correction) to create a packet that is 208 bytes long.[[8]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-7) The 188-byte packet size was originally chosen for compatibility with [ATM systems](http://en.wikipedia.org/wiki/Asynchronous_Transfer_Mode).[[9]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-8)[[10]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-9)

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| **Partial Transport Stream Packet Format** | | |
| **Name** | **Number of**[**bits**](http://en.wikipedia.org/wiki/Bit) | **Description** |
| [sync byte](http://en.wikipedia.org/wiki/Sync_byte) | 8 | 0x47 |
| Transport Error Indicator (TEI) | 1 | Set by [demodulator](http://en.wikipedia.org/wiki/Demodulator) if can't correct errors in the stream, to tell the demultiplexer that the packet has an uncorrectable error [[11]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-10) |
| Payload Unit Start Indicator | 1 | 1 means start of [PES](http://en.wikipedia.org/wiki/Packetized_Elementary_Stream) data or [PSI](http://en.wikipedia.org/wiki/Program_Specific_Information) otherwise zero only. |
| Transport Priority | 1 | 1 means higher priority than other packets with the same PID. |
| PID | 13 | Packet ID |
| Scrambling control | 2 | '00' = Not scrambled.   The following per DVB spec:[[12]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-11)   '01' = Reserved for future use,   '10' = Scrambled with even key,   '11' = Scrambled with odd key |
| Adaptation field exist | 2 | 01 = no adaptation fields, payload only  10 = adaptation field only 11 = adaptation field and payload |
| Continuity counter | 4 | Incremented only when a payload is present (i.e., adaptation field exist is 01 or 11)[[13]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-12) |
|  |  | Note: the total number of bits above is 32 and is called the transport stream 4-byte prefix or Transport Stream Header. |
| Adaptation field | 0 or more | Depends on flags |
| [Payload](http://en.wikipedia.org/wiki/Payload_(software)) [Data](http://en.wikipedia.org/wiki/Data) | 0 or more | Depends on flags |

|  |  |  |
| --- | --- | --- |
| **Adaptation Field Format** | | |
| **Name** | **Number of bits** | **Description** |
| Adaptation Field Length | 8 | Number of bytes in the adaptation field immediately following this byte |
| Discontinuity indicator | 1 | Set to 1 if current TS packet is in a discontinuity state with respect to either the continuity counter or the program clock reference |
| Random Access indicator | 1 | Set to 1 if the PES packet in this TS packet starts a video/audio sequence |
| [Elementary stream](http://en.wikipedia.org/wiki/Elementary_stream) priority indicator | 1 | 1 = higher priority |
| PCR flag | 1 | 1 means adaptation field does contain a PCR field |
| OPCR flag | 1 | 1 means adaptation field does contain an OPCR field |
| Splicing point flag | 1 | 1 means presence of splice countdown field in adaptation field |
| Transport private data flag | 1 | 1 means presence of private data bytes in adaptation field |
| Adaptation field extension flag | 1 | 1 means presence of adaptation field extension |
| Below fields are optional | variable | Depends on flags |
| PCR | 33+9 | Program clock reference, stored in 6 octets in big-endian as 33 bits base, 6 bits padding, 9 bits extension. |
| OPCR | 33+9 | Original Program clock reference. Helps when one TS is copied into another |
| Splice countdown | 8 | Indicates how many TS packets from this one a splicing point occurs (may be negative) |
| stuffing bytes | variable |  |

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=4)]PID

Each table or elementary stream in a transport stream is identified by a 13-bit packet ID (PID). A [demultiplexer](http://en.wikipedia.org/wiki/Inverse_multiplexer" \o "Inverse multiplexer) extracts elementary streams from the transport stream in part by looking for packets identified by the same PID. In most applications, [Time-division multiplexing](http://en.wikipedia.org/wiki/Time-division_multiplexing) will be used to decide how often a particular PID appears in the transport stream.

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=5)]Programs

Transport stream has a concept of programs. Each single program is described by a Program Map Table (PMT) which has a unique PID, and the elementary streams associated with that program have PIDs listed in the PMT. For instance, a transport stream used in digital television might contain three programs, to represent three television channels. Suppose each channel consists of one video stream, one or two audio streams, and any necessary metadata. A [receiver](http://en.wikipedia.org/wiki/ATSC_tuner) wishing to decode a particular "channel" merely has to decode the payloads of each PID associated with its program. It can discard the contents of all other PIDs. A transport stream with more than one program is referred to as MPTS - Multi Program Transport Stream. A single program transport stream is referred to as SPTS.

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=6)]Program Specific Information (PSI)

*Main article:*[*Program Specific Information*](http://en.wikipedia.org/wiki/Program_Specific_Information)

There are 4 [PSI](http://en.wikipedia.org/wiki/Program_Specific_Information) tables: Program Association (PAT), Program Map (PMT), Conditional Access (CAT), and Network Information (NIT). The MPEG-2 specification does not specify the format of the CAT and NIT.

#### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=7)]PAT

PAT stands for Program Association Table. It lists all programs available in the transport stream. Each of the listed programs is identified by a 16-bit value called **program\_number**. Each of the programs listed in PAT has an associated value of PID for its Program Map Table (PMT).

The value 0x0000 of **program\_number** is reserved to specify the PID where to look for Network Information Table (NIT). If such a program is not present in PAT the default PID value (0x0010) shall be used for NIT.

TS Packets containing PAT information always have PID 0x0000.

#### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=8)]PMT

Program Map Tables (PMTs) contain information about programs. For each program, there is one PMT. While the MPEG-2 standard permits more than one PMT section to be transmitted on a single PID, most MPEG-2 "users" such as ATSC and SCTE require each PMT to be transmitted on a separate PID that is not used for any other packets. The PMTs provide information on each program present in the transport stream, including the program\_number, and list the elementary streams that comprise the described MPEG-2 program. There are also locations for optional descriptors that describe the entire MPEG-2 program, as well as an optional descriptor for each elementary stream. Each elementary stream is labeled with a stream\_type value.

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=9)]PCR

To enable a decoder to present synchronized content, such as audio tracks matching the associated video, at least once each 100 ms a *Program Clock Reference*, or PCR is transmitted in the adaptation field of an MPEG-2 transport stream packet. The PID with the PCR for an MPEG-2 program is identified by the pcr\_pid value in the associated Program Map Table. The value of the PCR, when properly used, is employed to generate a system\_timing\_clock in the decoder. The STC decoder, when properly implemented, provides a highly accurate time base that is used to synchronize audio and video elementary streams. Timing in MPEG2 references this clock, for example the presentation time stamp ([PTS](http://en.wikipedia.org/wiki/Presentation_time_stamp)) is intended to be relative to the PCR. The first 33 bits are based on a 90 kHz clock. The last 9 are based on a 27 MHz clock. The maximum jitter permitted for the PCR is +/- 500 ns.

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=10)]Null packets

Some transmission schemes, such as those in [ATSC](http://en.wikipedia.org/wiki/ATSC_Standards) and [DVB](http://en.wikipedia.org/wiki/Digital_Video_Broadcasting), impose strict constant bitrate requirements on the transport stream. In order to ensure that the stream maintains a constant bitrate, a [Multiplexer](http://en.wikipedia.org/wiki/Multiplexer) may need to insert some additional packets. The PID 0x1FFF is reserved for this purpose. The payload of null packets may not contain any data at all, and the receiver is expected to ignore its contents.

## [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=11)]Modifications of transport stream specification for random-access media (M2TS)

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=12)]Timecode

Transport Stream had been originally designed for broadcast. Later it was adapted for usage with digital video cameras, recorders and players by adding a 4-byte timecode (TC) to standard 188-byte packets, which resulted in a 192-byte packet.[[14]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bda-av-13)[[15]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bda-bdre-14) This is what is informally called [M2TS](http://en.wikipedia.org/wiki/.m2ts) stream.[Blu-ray Disc Association](http://en.wikipedia.org/wiki/Blu-ray_Disc_Association) calls it "[BDAV MPEG-2 transport stream](http://en.wikipedia.org/wiki/.m2ts)".[[14]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bda-av-13) JVC called it [TOD](http://en.wikipedia.org/wiki/MOD_and_TOD_(video_format)) (possibly an abbreviation for "Transport stream on disc") when used in HDD-based camcorders like [GZ-HD7](http://en.wikipedia.org/wiki/JVC_GZ-HD7).[[16]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-15)[[17]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-16) M2TS transport stream is also used for to record [HDV](http://en.wikipedia.org/wiki/HDV) video (onto tape and onto file-based media), and for [AVCHD](http://en.wikipedia.org/wiki/AVCHD) video files, which often have MTS extension.[[18]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-17) The timecode allows quick access to any part of the stream either from a media player, or from a non-linear video editing system.[[19]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-18) It is also used to synchronize video streams from several cameras in a multi-camera shoot.

Filename extension .m2ts is used on Blu-ray Disc Video for files which contain BDAV MPEG-2 transport stream.[[14]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bda-av-13)[[20]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bdav-videohelp-19) Blu-ray Disc Video titles authored with menu support are in the BDMV (Blu-ray Disc Movie) format and contain audio, video, and other streams in BDAV container, which is based on the MPEG-2 transport stream format.[[21]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bdvm-20)[[22]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bdav-21) There is also the BDAV (Blu-ray Disc Audio/Visual) format, the consumer oriented alternative to the BDMV format used for movie releases. The BDAV format is used on BD-REs and BD-Rs for audio/video recording.[[22]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bdav-21) Blu-ray Disc employs the MPEG-2 transport stream recording method. That enables transport streams of digital broadcasts to be recorded as they are without altering the format.[[15]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bda-bdre-14) It also enables flexible editing of a digital broadcast that is recorded as is and where the data can be edited just by rewriting the playback stream. Although it is quite natural, a function for high-speed and easy-to use retrieval is built in.[[15]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bda-bdre-14)[[23]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-bda-22) Blu-ray Disc Video use MPEG-2 transport streams, compared to DVD's program streams. This allows multiple video programs to be stored in the same file so they can be played back simultaneously (e.g. with "[Picture in picture](http://en.wikipedia.org/wiki/Picture_in_picture)" effect).

## [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=13" \o "Edit section: See also)]See also

* [ATSC tuner](http://en.wikipedia.org/wiki/ATSC_tuner)
* [AVCHD](http://en.wikipedia.org/wiki/AVCHD)
* [Digital Video Broadcasting](http://en.wikipedia.org/wiki/Digital_Video_Broadcasting) (DVB)
* [Elementary stream](http://en.wikipedia.org/wiki/Elementary_stream)
* [HDV](http://en.wikipedia.org/wiki/HDV)
* [IPTV](http://en.wikipedia.org/wiki/IPTV)
* [MPEG program stream](http://en.wikipedia.org/wiki/MPEG_program_stream)
* [Packetized elementary stream](http://en.wikipedia.org/wiki/Packetized_elementary_stream)
* [Program and System Information Protocol](http://en.wikipedia.org/wiki/Program_and_System_Information_Protocol)
* [Unidirectional Lightweight Encapsulation](http://en.wikipedia.org/wiki/Unidirectional_Lightweight_Encapsulation) (ULE)

## [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=14)]Programs that open TS files

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=15" \o "Edit section: Multiple OS)]Multiple OS

* [FFmpeg](http://en.wikipedia.org/wiki/FFmpeg)[[24]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-23)
* [MPlayer](http://en.wikipedia.org/wiki/MPlayer) [[25]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-24)
* [VLC media player](http://en.wikipedia.org/wiki/VLC_media_player) [[26]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-25)

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=16" \o "Edit section: Linux)]Linux

* [xine](http://en.wikipedia.org/wiki/Xine)
* [MythTV](http://en.wikipedia.org/wiki/MythTV)
* [GStreamer](http://en.wikipedia.org/wiki/GStreamer)
* [OpenCaster](http://en.wikipedia.org/wiki/OpenCaster)
* [Kdenlive](http://en.wikipedia.org/wiki/Kdenlive)

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=17" \o "Edit section: Windows)]Windows

* [Windows Media Player 12](http://en.wikipedia.org/wiki/Windows_Media_Player_12) [[27]](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_note-26)

### [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=18" \o "Edit section: Mac OS X)]Mac OS X

* [Roxio Toast](http://en.wikipedia.org/wiki/Toast_(software)) (through its Toast Video Player application)[[*citation needed*](http://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]

## [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=19" \o "Edit section: References)]References

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27. [**^**](http://en.wikipedia.org/wiki/MPEG_transport_stream#cite_ref-26) <http://msdn.microsoft.com/en-us/windows/dd239181.aspx>

## [[edit](http://en.wikipedia.org/w/index.php?title=MPEG_transport_stream&action=edit&section=20" \o "Edit section: External links)]External links

* [MPEG-2 Systems FAQ](http://mpeg.chiariglione.org/faq/mp2-sys/mp2-sys.htm)
* [MPEG-4 Systems FAQ](http://mpeg.chiariglione.org/faq/mp4-sys/mp4-sys.htm)
* [MPEG-1 description](http://mpeg.chiariglione.org/standards/mpeg-1/mpeg-1.htm)
* [DVB Overview: Introduction to MPEG-2 Compression and Transport Stream](http://chapters.scte.org/cascade/DVB%20Overview.ppt) (PowerPoint Presentation)
* [MPEG-2.PPT](http://www.glue.umd.edu/~karir/mpeg2/MPEG-2.PPT) (PowerPoint Presentation)
* [MPEG-2 Transport Stream](http://wiki.multimedia.cx/index.php?title=MPEG-2_Transport_Stream)
* [An example of live DVB-T transport stream analysis](http://igorfuna.com/dvb-t/slovenia/multiplex-a-transport-stream-analysis)

# Program Specific Information

From Wikipedia, the free encyclopedia

**Program Specific Information** (PSI) is [metadata](http://en.wikipedia.org/wiki/Metadata) about a program (channel) and part of a [MPEG transport stream](http://en.wikipedia.org/wiki/MPEG_transport_stream).

The PSI data contains five tables:

* [PAT](http://en.wikipedia.org/wiki/MPEG_transport_stream#PAT) (Program Association Table)
* CAT (Conditional Access Table)
* [PMT](http://en.wikipedia.org/wiki/MPEG_transport_stream#PMT) (Program Map Table)
* NIT (Network Information Table)
* TDT (Time and Date Table)

PSI is carried in the form of a table structure. The table structure can span multiple transport stream packets. [Adaptation field](http://en.wikipedia.org/wiki/MPEG_transport_stream#Packet) also occurs in [TS](http://en.wikipedia.org/wiki/MPEG_transport_stream) packets carrying PSI data. The PSI data will never be scrambled so that the decoder at the receiving end can easily identify the properties of the stream.

The PAT, CAT and TDT tables are associated with predefined PID as explained in the respective sections. There may be multiple independent PMT tables in a stream; these are given user-defined PID numbers (as are PES packets). PMT table PIDs are defined in the PAT, and are the only PIDs defined there (PES PIDs are defined in the PMT). Each table has predefined structure.

|  |
| --- |
| Contents  [[hide](http://en.wikipedia.org/wiki/Program_Specific_Information)]   * [1 PAT (Program Association Table)](http://en.wikipedia.org/wiki/Program_Specific_Information#PAT_.28Program_Association_Table.29) * [2 CAT (Conditional Access Table)](http://en.wikipedia.org/wiki/Program_Specific_Information#CAT_.28Conditional_Access_Table.29) * [3 PMT (Program Map Table)](http://en.wikipedia.org/wiki/Program_Specific_Information#PMT_.28Program_Map_Table.29) * [4 NIT (Network Information Table)](http://en.wikipedia.org/wiki/Program_Specific_Information#NIT_.28Network_Information_Table.29) * [5 TDT (Time and Date Table) / TOT (Time Offset Table)](http://en.wikipedia.org/wiki/Program_Specific_Information#TDT_.28Time_and_Date_Table.29_.2F_TOT_.28Time_Offset_Table.29) * [6 References](http://en.wikipedia.org/wiki/Program_Specific_Information#References) * [7 External links](http://en.wikipedia.org/wiki/Program_Specific_Information#External_links) |

## [[edit](http://en.wikipedia.org/w/index.php?title=Program_Specific_Information&action=edit&section=1)]PAT (Program Association Table)

|  |  |  |  |
| --- | --- | --- | --- |
| **Partial PAT Format**[[1]](http://en.wikipedia.org/wiki/Program_Specific_Information" \l "cite_note-0) | | | |
| **When exists** | **Name** | **Number of bits** | **Description** |
| If [TS payload unit start](http://en.wikipedia.org/wiki/MPEG_transport_stream#Important_elements_of_a_transport_stream) | Pointer field | 8 | Present if payload\_unit\_start\_indicator bit is set in the TS header bytes. Gives the number of bytes from the end of this field to the start of payload data. |
|  | Table ID | 8 | 0x00 |
|  | Section Syntax Indicator | 1 | Always 1 for PAT |
|  | 0 | 1 | Always 0 for PAT |
|  | Reserved | 2 | Always set to binary '11' |
|  | Section length | 2+10 | Informs how many programs are listed below by specifying the number of bytes of this section, starting immediately following this field and including the CRC. First two bits must be zero. |
|  | transport stream ID | 16 | User defined data. Value not important to demuxers or players. |
|  | Reserved | 2 | Set to 0 |
|  | Version Number | 5 | Table version number. Incremented by 1 when data in table changes. Wraps around from 31 to 0. |
|  | Current/next indicator | 1 | If 0, table data isn't applicable yet (becomes applicable when set to 1) |
|  | Section number | 8 | Index of this section in the sequence of all PAT table sections. First section is numbered 0 |
|  | Last section number | 8 | Index of last section of PAT table |
|  | | | |
| Repeated N times depending on section length | Program num | 16 |  |
| Reserved | 3 | Always set to binary '111' |
| Program PID | 13 | packets with this PID are assumed to be PMT tables (see below) |
|  | CRC32 | 32 |  |

The PAT is assigned PID 0x0000 and table id of 0x00. The transport stream contains at least one or more TS packets with PID 0x0000. Some of these consecutive packets form the PAT. At the decoder side the PSI [section filter](http://mhpkdbwiki.s3.uni-due.de/mhpkdbwiki/index.php/Section_Filtering) listens to the incoming TS packets. After the filter identifies the PAT table they assemble the packet and decode it. A PAT has information about all the programs contained in the TS. The PAT contains information showing the association of **Program Map Table** PID and Program Number. The PAT should end with a 32-bit [CRC](http://en.wikipedia.org/wiki/Cyclic_redundancy_check)

## [[edit](http://en.wikipedia.org/w/index.php?title=Program_Specific_Information&action=edit&section=2)]CAT (Conditional Access Table)

This table is used for conditional access to the streams. This table provides association with EMM stream. When the TS is scrambled then this section contains the EMM PID. The PID value is 0x0001.

## [[edit](http://en.wikipedia.org/w/index.php?title=Program_Specific_Information&action=edit&section=3)]PMT (Program Map Table)

|  |  |  |  |
| --- | --- | --- | --- |
| **Partial PMT Format** | | | |
| **When exists** | **Name** | **Number of bits** | **Description** |
| If [TS payload unit start](http://en.wikipedia.org/wiki/MPEG_transport_stream#Important_elements_of_a_transport_stream) | Pointer Field | 8 | Generally 0X00 for PMT |
|  | Table ID | 8 | Always 0x02 for PMT |  |
|  | Section syntax indicator | 1 |  |  |
|  | Always set to 0 | 1 |  |  |
|  | Reserved | 2 | Always set to binary '11' |  |
|  | Section length | 2+10 | Number of programs listed below. First two bits always zero. |  |
|  | Program num | 16 |  |  |
|  | Reserved | 2 |  |  |
|  | Version number | 5 | Incremented by 1 [mod](http://en.wikipedia.org/wiki/Modulo_operation) 32 each time the table data changes |  |
|  | Current Next indicator | 1 | If 1, this table is currently valid. If 0, this table will become valid next. |  |
|  | Section number | 8 | Always 0x00 |  |
|  | Last Section number | 8 | Always 0x00 |  |
|  | Reserved | 3 |  |  |
|  | PCR PID | 13 | PID of general timecode stream, or 0x1FFF |  |
|  | Reserved | 4 |  |  |
|  | Program Info length | 2+10 | Sum size of following program descriptors. First two bits must be zero. |  |
|  | Program Descriptor | N\*8 |  |  |
|  | | | |  |
| Repeated N times depending on section length | stream type | 8 |  |  |
| Reserved | 3 | Always set to binary '111' |  |
| Elementary PID | 13 |  |  |
| Reserved | 4 |  |  |
| ES Info length | 2+10 | First two bits must be zero. Entire value may be zero |  |
| ES Descriptor | N\*8 | If ES Info length is zero, this is omitted. |  |
|  | CRC32 | 32 |  |  |

This table contains PID numbers of elementary streams associated with the program and it has information about the type of these elementary streams (video, audio, etc). In addition it also contains the ECM PID number of the entitlement control message, which is associated with the program.

## [[edit](http://en.wikipedia.org/w/index.php?title=Program_Specific_Information&action=edit&section=4)]NIT (Network Information Table)

This table provides information about the multiplexes and transport streams on a given network.

Information about the current network uses table\_id of 0x40, that about other networks uses table\_id of 0x41.

It is segmented into network information sections and is carried on PID 0x0010. [ref EN300468]

Also this table contains the private stream information too. For example, TeleText, Subtitle and MHEG

## [[edit](http://en.wikipedia.org/w/index.php?title=Program_Specific_Information&action=edit&section=5)]TDT (Time and Date Table) / TOT (Time Offset Table)

The TDT provides the UTC (Universal Time) coded as MJD (Modified Julian Date). The TOT provides information regarding the local time offset from the UTC time. This is used to define the local time. The PID value for both tables is 0x0014.

For TDT - Table ID is 0x70. For TOT - Table ID is 0x73.

## [[edit](http://en.wikipedia.org/w/index.php?title=Program_Specific_Information&action=edit&section=6" \o "Edit section: References)]References

1. [**^**](http://en.wikipedia.org/wiki/Program_Specific_Information#cite_ref-0) <http://neuron2.net/library/mpeg2/iso13818-1.pdf> (needs password)

## [[edit](http://en.wikipedia.org/w/index.php?title=Program_Specific_Information&action=edit&section=7" \o "Edit section: External links)]External links

* [DVB system information chart](http://www.dunod.com/documents/49346/49346_DVB.pdf) (not available anymore)
* [mpeg-2 DVB](http://www.av.it.pt/research/rmom/dtv/PDFfiles/present/DTV_ICP_ch4.pdf) (not available anymore)